Biological and Conference Opinion

Issuance of a Section 10(a)(1)(B) Permit for the Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan

April 2013
File Number 81420-2009-F-0077

U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Endangered Species Division
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
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In Reply Refer To:
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Memorandum

To: Assistant Regional Director, Pacific Southwest Region, Sacramento, California

From: Acting Field Supervisor, Sacramento Fish and Wildlife Office, Sacramento, California

Subject: Intra-Service Biological Opinion and Conference Opinion on the Issuance of a Section 10(a)(1)(B) Incidental Take Permit to the County of Santa Clara, City of San Jose, City of Morgan Hill, City of Gilroy, Santa Clara Valley Water District, and Santa Clara Valley Transportation Authority for the Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan

In accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act) and its implementing regulations (50 CFR §402), this document transmits the intra-service biological and conference opinions (Opinion) of the U.S. Fish and Wildlife Service (Service), Sacramento Fish and Wildlife Office (SFWO), regarding the Pacific Southwest Region's (Region) proposed issuance of a section 10(a)(1)(B) incidental take permit (Permit) to the County of Santa Clara (County), City of San Jose, City of Morgan Hill, City of Gilroy, Santa Clara Valley Water District (SCVWD), and Santa Clara Valley Transportation Authority (VTA) (collectively referred to as the "Applicants") for the implementation of the Santa Clara Valley Habitat Conservation Plan (HCP)/Natural Community Conservation Plan (NCCP) (Plan or Santa Clara Valley Habitat Plan). The Plan identifies certain duties and obligations that must be fulfilled, in whole or in part, by an "Implementing Entity." The Applicants will establish a joint powers agency, which will be named the "Santa Clara Valley Habitat Agency," to serve as the Implementing Entity for the Plan (Santa Clara Valley Habitat Agency *et al.*, 2012). Although not formed at the time this Opinion was developed, the Santa Clara Valley Habitat Agency is included in references to "Applicants" in this Opinion. The Service proposes to issue the Permit to the Applicants for a period of 50 years.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction or the destruction of endangered plants on non-Federal areas in violation of State law or regulation (i.e. Fish & Game Code §§2050-2085) or in the course of any violation of a State criminal trespass law (i.e. Penal Code §§ 594-

625c). Therefore, although federally listed plants do not need to be included in an incidental take permit, plant species will be covered by the proposed Permit in recognition of the conservation benefits provided by the Plan. In addition, the Service is still required to review the effects of its own actions on listed plants, even when those listed plants are found on private lands. This intra-Service section 7 consultation will also determine if issuing the proposed Permit could "jeopardize the continued existence" of any listed plant. Assurances provided under the Service's "No Surprises" rule at 50 CFR. §17.13, 17.22(b)(5) and 17.32(b)(5) will extend to all Covered Species, including all plants proposed for coverage.

The Applicants are requesting a permit to incidentally take 9 wildlife species and are seeking assurances for 9 plant species, for a total of 18 Covered Species. Five wildlife species proposed for coverage are currently listed as federally threatened (T) or endangered (E) and four plant species proposed for coverage are currently listed as endangered. The Covered Species list is provided below:

Wildlife

1. Bay checkerspot butterfly (*Euphydryas editha bayensis)* (T)
2. California tiger salamander (Central California Distinct Population Segment [DPS]) (*Ambystoma californiense)* (T)
3. California red-legged frog (*Rana draytonii)* (T)
4. Foothill yellow-legged frog (*Rana boylii)*
5. Western pond turtle (*Clemmys marmorata)*
6. Western burrowing owl (*Athene cunicularia hypugea*)
7. Least Bell's vireo (*Vireo bellii pusillus)* (E)
8. Tricolored blackbird (*Agelaius tricolor)*
9. San Joaquin kit fox (*Vulpes macrotis mutica)* (E)

Plants

1. Tiburon Indian paintbrush (*Castilleja affinis* ssp. *neglecta)* (E)
2. Coyote ceanothus (*Ceanothus ferrisae*) (E)
3. Mount Hamilton thistle (*Cirsium fontinale* var. *campylon)*
4. Santa Clara Valley dudleya (*Dudleya setchellii*) (E)
5. Fragrant fritillary (*Fritillaria liliacea*)
6. Loma Prieta hoita (*Hoita strobilina*)
7. Smooth lessingia (*Lessingia micradenia* var. *glabrata*)
8. Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*) (E)
9. Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*)

Incidental take will be authorized for all listed wildlife Covered Species upon the execution of the Implementing Agreement by all Parties; issuance of both State and Federal permits; and adoption of a Plan implementing ordinance by all of the Cities and the County. The Applicants will implement the Plan's conservation strategy measures for each Covered Species, regardless of their current listing status.

The Service finds that the proposed action is not likely to adversely affect the federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*). Vernal pool fairy shrimp exist only in

vernal pools or vernal pool-like habitats (U.S. Fish and Wildlife Service, 2005b). Vernal pools have been documented at the Lucky Day Property, near Gilroy, in the Action Area. These are the only vernal pools that the Service is aware of in Santa Clara County. Santa Clara County is outside of the current known distribution of the species (U.S. Fish and Wildlife Service, 2005b). The closest documented occurrence of the species is in Alameda County, more than 16 miles away (California Department of Fish and Game, 2012). Although not definitive proof of absence, species surveys to date have not detected vernal pool fairy shrimp at the Lucky Day Property (Helm Biological Consulting, 2007; WRA, 2008). The Service finds that although the Covered Activities described in Chapter 2 of the Plan may affect vernal pool fairy shrimp, they are not likely to adversely affect vernal pool fairy shrimp because the species is extremely unlikely to occur based on the known distribution. Therefore, the vernal pool fairy shrimp will not be considered further in this Opinion. The SFWO will reinitiate consultation if new information becomes available indicating that adverse effects to the vernal pool fairy shrimp, or any other federally listed species not addressed in this Opinion, are likely as a result of the Region issuing a section 10(a)(1)(B) incidental take permit.

In addition, the Service finds that the proposed action may affect, but is not likely to adversely affect, the following federally listed coastal and tidal marsh species: endangered tidewater goby (*Eucyclogobius newberryi*), threatened western snowy plover (*Charadrius alexandrinus nivosus*), endangered California clapper rail (*Rallus longirostris obsoletus*), and endangered salt marsh harvest mouse (*Reithrodontomys raviventris*). Habitat degradation is one of the primary factors contributing to the decline of these species. The decline of the tidewater goby for example, is due in part, to channelization of habitat, diversions of water flows, groundwater over drafting, and alteration of water flows (U.S. Fish and Wildlife Service, 2005a). The western snowy plover is threatened by watercourse diversion, impoundments, and stabilization (U.S. Fish and Wildlife Service, 2007). Habitat degradation resulting from contamination of marsh sediments may also pose an ongoing threat to the clapper rail and the salt marsh harvest mouse, although the extent of these effects is poorly understood (U.S. Fish and Wildlife Service, 2010a). Although these species are not known to occur in the Action Area, the proposed action's Covered Activities may result in indirect effects that contribute to the ongoing degradation of the coastal and tidal marsh habitats inhabited by these species. However, the Service does not anticipate indirect adverse effects on the tidewater goby, western snowy plover, California clapper rail, or salt marsh harvest mouse with the proper implementation of the following Conditions described in Chapter 6 of the Plan:

- 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 7. *Rural Development Design and Construction Requirements*
- Condition 8. *Implement Avoidance and Minimization Measures for Rural Road Maintenance*
- Condition 11. *Stream and Riparian Setbacks*

Each of these Conditions is discussed further in Section 2.5.3 of this Opinion. Table 6-2 of the Plan lists avoidance and minimization measures for all water-related Covered Activities

described in Condition 3, 4, and 5 of the Plan. Each local jurisdiction, or the Implementing Entity in the case of projects conducted by the Applicants, will verify that all appropriate measures in Table 6-2 are implemented. The requirements listed in Table 6-2 include general, project design, construction, and post-construction avoidance and minimization measures. Proper implementation of these Conditions, will minimize effects on the San Francisco Bay to an insignificant and discountable level.

This Opinion was prepared using the following information, hereby incorporated by reference:

1. August 2012 Final Santa Clara Valley Habitat Plan, Santa Clara County, California[1];
2. August 2012 Santa Clara Valley Habitat Plan Final Environmental Impact Report/ Environmental Impact Statement, Santa Clara County, California;
3. Electronic mail correspondence, telephone conversations, site visits, and meetings between the Service and the Applicants between 2005-2013;
4. References cited in this Opinion; and
5. Other information available to the Service

1. CONSULTATION HISTORY

In 2001, the Service issued a biological opinion to the U.S. Army Corps of Engineers (USACE) for the U.S. Highway 101 Widening, Route 85/U.S. 101 South Interchange, Riparian and Wetland Consolidated Biological Mitigation Project, Bailey Avenue Extension/U.S. 101 Interchange, and Coyote Valley Research Park Projects (U.S. Fish and Wildlife Service, 2001). The development and implementation of a county-wide, multi-species HCP/NCCP was included as a conservation measure in the project description of the 2001 biological opinion. The HCP/NCCP conservation measure was intended to minimize VTA's project-related effects on the Bay checkerspot butterfly, California red-legged frog, Santa Clara Valley dudleya, Metcalf Canyon jewelflower, Coyote ceanothus, and Tiburon Indian paintbrush. The development of the HCP/NCCP was also intended to address growth inducing effects associated with projects proposed by the City of San Jose, County, and SCVWD. The Service determined that cumulative effects on the salt marsh harvest mouse and California clapper rail resulting from development authorized by the County and City of San Jose would likely be minimized, and otherwise compensated for, with the proposed HCP/NCCP conservation measure. Following the finalization of the 2001 biological opinion, the County (2001), City of San Jose (2001), and SCVWD (2001) submitted letters to the Service, memorializing their commitment to develop a regional HCP/NCCP.

In 2004, the Service issued a biological opinion (U.S. Fish and Wildlife Service, 2004) to the U.S. Bureau of Reclamation regarding interim water contract renewals. The 2004 biological opinion was necessary to amend the Service's February 29, 2000 biological opinion on interim water contract renewals (U.S. Fish and Wildlife Service, 2000), as amended by its

1 Includes the August 14, 2012 Santa Clara Valley Habitat Plan Implementing Agreement (see Appendix B of the Plan) and the April 4, 2013 Corrections, Clarifications and Updates to the Santa Clara Valley Habitat Plan (HCP/NCCP) (see Exhibit A of the Plan).

February 28, 2002 biological opinion (U.S. Fish and Wildlife Service, 2002a). In its 2004 biological opinion, the Service concluded that the proposed project would not likely jeopardize the continued existence of listed species and was not likely to destroy or adversely modify critical habitat. These conclusions were based on several key assumptions, including the development of a regional HCP/NCCP to address potential direct and indirect effects on federally listed species and their habitat in Santa Clara County (U.S. Fish and Wildlife Service, 2004).

In June 2004, the County, City of San Jose, VTA, and SCVWD signed a memorandum of understanding (MOU) agreeing to develop a joint HCP/NCCP and to share in its funding (City of San Jose *et al*., 2004). The Cities of Gilroy and Morgan Hill joined in the effort to develop the HCP/NCCP in 2005. The Applicants, Service, and California Department of Fish and Wildlife (CDFW, formally California Department of Fish and Game[2]) subsequently signed a Planning Agreement in October 2005 (County of Santa Clara *et al*., 2005). The Planning Agreement laid the groundwork for the development of the HCP/NCCP.

A Notice of Intent to prepare the Environmental Impact Report/Environmental Impact Statement (EIR/S) for the Federal action associated with the Plan was published in the **Federal Register** on September 6, 2007 (72 FR 51247). A public meeting was held at the Morgan Hill Community and Cultural Center on September 26, 2007. Public comments on the scope of the alternatives and associated environmental effects were accepted through October 22, 2007. A total of 25 comment letters were received. Major issues and responses are summarized in the *Scoping Report: Santa Clara County Habitat Plan Environmental Impact Report/Environmental Impact Statement* (CH2MHILL, 2008).

In November and December 2010, each of the Applicants submitted an application to the Service for a section 10(a)(1)(B) permit. A Notice of Availability of the Draft EIR/S, Plan, and Implementing Agreement (IA) was published in the **Federal Register** on December 17, 2010 (75 FR 79013). Public meetings were held at the Morgan Hill Community and Cultural Center on February 9, 2011 and the Peninsula Conservation Center in Palo Alto on February 15, 2011. Public comments were accepted through April 18, 2011. In total, 55 comment letters were received, and a response to each comment is included in the Final EIR/S, Vol. II (County of Santa Clara *et al*., 2012).

Seven years of close coordination between the Applicants, Service, and CDFW resulted in the publication of a Notice of Availability in the **Federal Register** for the Final EIR/S, Plan, and IA on August 31, 2012 (77 FR 53221). Public comments were accepted through October 1, 2012. In total, seven comment letters were received. The Plan was adopted by each Applicant on the following dates:

- Santa Clara Valley Water District: September 25, 2012
- County of Santa Clara: October 9, 2012
- City of Gilroy: October 15, 2012
- City of Morgan Hill: October 17, 2012

2 The California Department of Fish and Game is now referred to as the California Department of Fish and Wildlife, effective January 1, 2013.

- Santa Clara Valley Transportation Authority: December 6, 2012
- City of San Jose: January 29, 2013

2. BIOLOGICAL OPINION AND CONFERENCE OPINION

2.1 Description of the Proposed Action

The description the proposed action contained in this section is a high-level summary of the Santa Clara Valley Habitat Plan, for which the Region is proposing the issuance of a section 10(a)(1)(B) incidental take permit. Components of the proposed action that are relevant to the effects analysis are incorporated in Sections 2.4 - 2.8 of this Opinion. For a comprehensive overview of the proposed action, please refer to the Plan (ICF International, 2012).

The Applicants, Service, and CDFW (Wildlife Agencies) made their best efforts to make the Plan as internally consistent as possible. However, due to the scope of the Plan, it was not possible to completely eliminate all errors and inconsistencies. Corrections to inconsistencies and errors identified in the final Plan during the development of this Opinion are **underlined and bolded** below (also see Exhibit A of the Plan). We also underline and bold data that has been updated since the finalization of the Plan (i.e. Covered Species occurrence data). None of these clarifications and updates substantially change the effects analysis contained in this Opinion.

2.1.1 Covered Species

Refer to the Memorandum above.

2.1.2 Permit Area

The Permit Area is the area in which the Applicants are requesting incidental take authorization of Covered Species The Plan contains two Permit Areas: one Permit Area applies specifically to the western burrowing owl and the second applies to all other Covered Species.

The Permit Area for all Covered Species, with the exception of the western burrowing owl, is the same as the Plan's Study Area except it excludes portions of State Parks within the Study Area[3] (see Figure 1-2 of the Plan). Thus, the Permit Area for all Covered Species, with the exception of the western burrowing owl, is 460,205 acres[4].

The Permit Area for the western burrowing owl includes the Permit Area described above as well as the *expanded Study Area for burrowing owl conservation.* The *expanded Study*

3 State Parks declined to participate in the Plan. Therefore, Henry W. Coe and Pacheco State Parks were removed from the Permit Area during Plan implementation.

4 519,506-acre Study Area minus 58,642 acres of Henry W. Coe State Park and 659 acres of Pacheco State Park

Area for burrowing owl conservation includes portions of the cities of San Jose, Santa Clara, Mountain View, Milpitas, and Sunnyvale in northern Santa Clara County; Fremont in Alameda County; and a small portion of San Mateo County (see Figure 1-2 in the Plan). The *expanded Study Area for burrowing owl conservation* that falls outside of the Permit Area for all other Covered Species totals 48,464 acres. Thus, the Permit Area for the western burrowing owl is 508,669 acres[5]. Covered Activities in the *expanded Study Area for burrowing owl conservation* are limited to conservation actions for the western burrowing owl (See Section 5.4.6 of the Plan). Coverage for these activities is provided only to the Applicants and those under their jurisdiction. Incidental take coverage in this area will be limited to the western burrowing owl, not the other 17 Covered Species under the Plan.

The two Permit Areas may also include small, unmapped areas where land management and monitoring activities may occur on a conservation parcel that straddles the boundary of the Permit Areas 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 for both Permit Areas combined (ICF International, 2012, Section 1.2.2).

2.1.3 Permit Term

The Applicants are requesting a 50-year permit term. The permit term is the time period in which the Applicants may receive incidental take authorization for Covered Activities under the Plan. The permit term is also the time in which all conservation actions must be successfully completed to offset the effects of the Covered Activities. As fully described in Section 1.2.3 of the Plan, the permit term of 50 years was proposed because it would allow for the full and successful implementation of the Plan's Covered Activities, conservation strategy, monitoring and adaptive management program, and funding strategy.

2.1.4 Covered Activities

Section 2.3 of the Plan, as amended by Exhibit A of the Plan, fully describes the activities and projects within the Permit Area proposed for coverage. "Activities" are actions that occur repeatedly in one location or throughout the Permit Area, whereas "projects" are well-defined actions that occur once in a discrete location. Together, these activities and projects are referred to as "Covered Activities" for which incidental take authorization is being requested. Covered Activities will be implemented by both the Applicants and private developers subject to their jurisdictions.

As described in Section 2.3 of the Plan, and amended in Exhibit A of the Plan, a project, or portion thereof, that was in the process of receiving local jurisdiction approvals upon

5 460,205-acre Permit Area for all other Covered Species plus 48,464-acre *expanded Study Area for burrowing owl conservation*

the Operative Date[6] of the Plan (i.e., "pipeline project") are not activities subject to the Plan if all of the following apply:

1. it received at least one of the following approved development entitlements with a specified expiration date (including allowed renewals/extensions) prior to the Operative Date of the Plan: 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 one year of issuance of the Plan's State and Federal incidental take permits; and
3. the project has no effect on any of the Plan's Covered Species.

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

Projects and activities may only be covered by the Plan if an Applicant has control over design, avoidance and minimization, and mitigation associated with the projects. An 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, as determined by the Implementing Entity at the time the Covered Activity is proposed. For projects where there is some question as to whether 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[7];
- the activity or project is conducted by, or is subject to the jurisdiction of, one of the Applicants;
- the activity or project is a type of impact evaluated in Chapter 4 of the Plan; and
- adequate take coverage under the permits remains available for other Covered Activities.

For the purposes of this Plan, Covered Activities fall into the following seven general categories:

- Urban Development
- In-stream Capital Projects
- In-stream Operations and Maintenance
- Rural Capital Projects

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6 "Operative Date" is defined as the date upon which the implementing ordinances of the County and the Cities of Gilroy, Morgan Hill, and San Jose become operative, which will occur upon adoption by the Implementing Entity of the Mitigation Fees and the issuance of permits by the Wildlife Agencies (ICF International, 2013, Exhibit A).

7 The NCCP Act requires that the Applicants get concurrence from the Wildlife Agencies before adopting, amending, or approving any plan or project that is inconsistent with the objectives and requirements of the Plan (ICF International, 2012, Section 6.1).

- Rural Operation and Maintenance
- Rural Development
- Conservation Strategy Implementation

Each category of activities listed above is fully described in Sections 2.3.2 - 2.3.8 of the Plan. Activities or projects that do not fall clearly within the descriptions provided in Chapter 2 of the Plan 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 in Chapter 2, it will not receive coverage under the 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 partially overlaps with the Santa Clara Valley Habitat Plan Permit Area. The Three Creeks HCP includes the Stevens Creek, Guadalupe, and Coyote watersheds but does not include the Pajaro/Uvas/Llagas watersheds. The Santa Clara Valley Habitat Plan's Permit Area does not include the Stevens Creek watershed and the Los Gatos Creek portion of the Guadalupe watershed (See Plan Figure 1-3). The proposed Three Creeks HCP covers capital projects and operations and maintenance activities related to water supply within its study area. In addition, the proposed Three Creeks HCP contains a conservation program focused on listed fish species. Some of the conservation actions described in the Three Creeks HCP may have adverse effects on species covered under the Santa Clara Valley Habitat Plan, including the California tiger salamander, California red-legged frog, and western pond turtle. Therefore, the Santa Clara Valley Habitat Plan covers the activities contained in the draft Three Creeks HCP Conservation Program, as described in Section 2.3.4 of the Santa Clara Valley Habitat Plan, that are likely to affect species covered by the Santa Clara Valley Habitat Plan. Under the proposed Three Creeks HCP, SCVWD will request incidental take permits from the Service and CDFW (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 (ICF International, 2012, Section 1.2.5). Incidental take authorization associated with Three Creeks HCP projects covered under the Santa Clara Valley Habitat Plan would be effective upon SCVWD's compliance with all applicable laws, including consultation with the National Marine Fisheries Service (NMFS), as appropriate.

A small subset of the Covered Activities will require additional review and approval by the Wildlife Agencies to ensure they are adequately defined, consistent with the Plan, and incorporate appropriate Conditions described in Chapter 6 of the Plan (See Section 2.1.5 below). These projects are listed below. The allowable scope of Wildlife Agency review is fully described in Section 8.7.3 of the Plan, subheading, *Additional Review*.

- Highway, roadway, interchange upgrades, and mass transit projects occurring outside the planning limit of urban growth or in any in-stream area
- Flood protection projects proposed by SCVWD
- Levee reconstruction projects that go beyond the current footprint of the levee and result in permanent effects to the stream

- Supplemental water pipeline alignment associated with dam seismic retrofit projects that occurs in natural land cover types
- Borrow sites for dam seismic retrofit projects
- Alamitos Creek/Almaden Reservoir fish passage
- Dewatering events at reservoirs where flows will be released to local channels
- 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 of the Plan
- Activities that are major new point sources of nitrogen deposition that could adversely affect serpentine natural communities and associated Covered Species (i.e., new power plant, large diesel generators, or other facilities)

As explained in Section 6.2 of the Plan, a project proponent will not be required to comply with the Plan's Conditions described in Chapter 6 or pay Plan fees described in Chapter 9 if they provide written confirmation to the Implementing Entity that CDFW and the Service have determined that the activity is not subject to CESA and the Act, respectively; or has already received the necessary take authorizations under CESA and the Act; or has otherwise complied with CESA and the Act. An activity will be deemed to be in compliance with CESA and the Act by the Implementing Entity and thus be exempt from the Plan's Conditions and otherwise comply with the Plan if the following are provided:

- Letters from both the Service and CDFW that specifically refer to the activity and state 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

- A copy of an incidental take permit issued by CDFW for the activity, and copies of incidental take statements or incidental take permits issued by the Service that authorize the incidental take associated with the proposed activity.

As fully described in Section 2.4 of the Plan, and amended by Exhibit A of the Plan, the following projects and activities are explicitly excluded from coverage:

- Private sector activities that do not obtain a development, grading, building, or other construction permit
- SCVWD Stream Maintenance Program
- 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

- Expansion of cultivated agriculture into natural lands
- Vineyard development that is not assessed by the County through a County permit process
- Timber harvest operations
- Quarries and other mining, with the exception of the expansion of Freeman Quarry
- New and expanded landfills, with the exception of the Kirby Canyon and Pacheco Pass Landfill expansions and landfills occurring inside the planning limits of urban growth of the three applicant cities
- Mercury removal/remediation
- Projects led by USACE[8]
- Pacheco Dam reconstruction and reservoir enlargement
- Pesticide/herbicide application
- Installation and operation of groundwater wells
- Increased development due to the 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 that are not defined as a Changed Circumstance in Chapter 10 of the Plan
- Minor private development on existing developed parcels (ICF International, 2013, Exhibit A)
- Private development in a stream and riparian setback that does not change the existing footprint (ICF International, 2013, Exhibit A)
- Existing mitigation agreements with the Wildlife Agencies (ICF International, 2013, Exhibit A)
- Norman Y. Mineta San Jose International Airport (ICF International, 2013, Exhibit A)

2.1.5 Conditions on Covered Activities

Chapter 6 of the Plan contains a detailed description of measures to avoid and minimize take of Covered Species. An important part of the approval process for parties seeking coverage under the Plan is demonstrating that Plan Conditions have been incorporated or will be incorporated properly into proposed projects (ICF International, 2012, Section 2.3). Conditions on Covered Activities ensure that regional avoidance and minimization goals of the Plan are met, reducing the need for project-level avoidance and minimization. The Plan assumes that a certain level of take will result from Covered Activities and that unavoidable effects will be mitigated through the Plan's conservation strategy.

8 Projects that are led by USACE (i.e., USACE has control over design, avoidance and minimization measures, and mitigation), including levee and flood protection projects, are not Covered Activities. These projects will require a separate Section 7 consultation.

Sections 6.3 - 6.6 of the Plan describe in detail, the following 20 Plan Conditions:

- Condition 1. *Avoid Direct Impacts on Legally Protected Plant and Wildlife Species*
- Condition 2. *Incorporate Urban-Reserve System Interface Design Requirements*
- 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 6. *Design and Construction Requirements for Covered Transportation Projects*
- Condition 7. *Rural Development Design and Construction Requirements*
- Condition 8. *Implement Avoidance and Minimization Measures for Rural Road Maintenance*
- Condition 9. *Prepare and Implement a Recreation Plan*
- Condition 10. *Fuel Buffer*
- Condition 11. *Stream and Riparian Setbacks*
- Condition 12. *Wetland and Pond Avoidance and Minimization*
- Condition 13. *Serpentine and Associated Covered Species Avoidance and Minimization*
- Condition 14. *Valley Oak and Blue Oak Woodland Avoidance and Minimization*
- Condition 15. *Western Burrowing Owl*
- Condition 16. *Least Bell's Vireo*
- Condition 17. *Tricolored Blackbird*
- Condition 18. *San Joaquin Kit Fox*
- Condition 19. *Plant Salvage when Impacts are Unavoidable*
- Condition 20. *Avoid and Minimize Impacts to Covered Plant Occurrences*

Elements of these Conditions that are relevant to the effects analysis of this Opinion are incorporated into the species-level analysis that follows. For a comprehensive discussion of these Conditions, refer to Chapter 6 in the Plan.

Section 6.2 and Table 6-1 of the Plan fully describe exemptions from Plan Conditions and explain when effects resulting from projects exempt from Plan Conditions are tracked by the Implementing Entity and when they are not.

2.1.6 Effects

The Plan programmatically analyzes effects anticipated from Covered Activities. Plan Tables 4-5 a-h provide a summary of the methods and key assumptions used to conduct the effects analysis. These tables are not intended to be exhaustively inclusive of all Covered Activities. Rather, these tables show how effects were calculated for Covered

Activities that were significant enough to be estimated. Minor activities described in Chapter 2 of the Plan are covered even though they may not appear in Tables 4-5 a-h. Effects associated with these minor activities are assumed to be addressed sufficiently by the conservative estimation approach taken in the Plan's effects analysis. Although these tables quantify effects by project and Applicant, this was done for estimation purposes only. Compliance with the Plan will not be measured according to the estimated effects for each project or Applicant but rather by total land cover/habitat type affected by Covered Activities as a whole (ICF International, 2012, Section 4.4.1 and 8.10.2). Based on these estimates, the Plan contains impact limits described in the following ways:

- Permanent effects on land cover types and natural communities (Plan Table 4-2)
- Temporary effects on land cover types and natural communities (Plan Table 4-3)
- Permanent and temporary effects on Covered Species modeled habitat (Plan Table 4-4)
- Permanent effects on covered plant occurrences (Plan Table 4-6 and Table 5-16)
- Permanent and temporary effects on critical habitat (Plan Table 4-9)

As discussed in Chapter 1 of the Plan, California State Park lands are excluded from the Permit Area. Because of this exclusion, all impact percentages contained in Chapter 4 of the Plan, and summarized below, were calculated relative to the 460,205-acre Permit Area for all Covered Species, with the exception of the burrowing owl, where effects were calculated relative to the Permit Area for the western burrowing owl (See Section 2.1.2 above).

In many cases, effects in the Plan are described in percentages relative to existing open space in the Action Area. For the purposes of the Plan, lands identified as Type 1 and Type 2 Open Space 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 local, State, or Federal law. If land use protections are not in perpetuity, but the purpose of land management is still ecological protection, then the land is identified as Type 2 Open Space in the Plan. If ecological protection is not the primary goal, but the land is managed as open space with some ecological value, then it is identified as Type 3 Open Space. If the land is managed as open space, but offers little or no long-term or measurable ecological value, then it is identified as Type 4 Open Space (ICF International, 2012, Section 2.2.5).

As defined in Section 4.2 of the Plan, "permanent impacts" ("permanent effects" in this Opinion) are direct effects that permanently remove or alter a land cover, or that affect a land cover for more than one year during the implementation of a Covered Activity and/or more than one year after completion of the Covered Activity (i.e., creating a new road through grassland). Permanent impacts include indirect effects on wetlands that result in a permanent (i.e., more than one year after completion of the Covered Activity) change to wetland functions, such as development around a wetland that reduces the

surface water supply. Impacts that reduce the long-term viability of a plant occurrence are also considered permanent.

As further defined in Section 4.2 of the Plan, "temporary impacts" ("temporary effects" in this Opinion) are direct effects that alter land cover for less than one year and that allow the disturbed area to recover to pre-project or ecologically improved[9] conditions within one year of completing construction. For the purposes of the 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. 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 to document post-project conditions to confirm that impacts were temporary and that appropriate fees were paid (ICF International, 2012, Sections 6.8.3 and 6.8.6).

Section 4.3 of the Plan qualitatively describes the types of effects anticipated from the Plan's 7 categories of Covered Activities while Section 4.6 of the Plan contains a species-level effects analysis. Appendix D of the Plan describes habitat models for all Covered Species for which they were developed[10]. With the exception of the western burrowing owl[11], the maximum allowable permanent effect on modeled habitat of Covered Species ranges from 1-8 percent of the total modeled habitat mapped for the Plan (ICF International, 2012, Table 4-4). For all Covered Species, temporary effects will be limited to 1 percent or less of total modeled habitat mapped for the Plan (ICF International, 2012, Table 4-4).

The Plan describes effects on designated critical habitat in Section 4.7. As indicated in Table 4-9 of the Plan, maximum allowable permanent effects on California tiger salamander and California red-legged frog critical habitat are limited to 1 percent or less of the total critical habitat in the Permit Area. The maximum allowable permanent effects on Bay checkerspot butterfly critical habitat is limited to 3 percent of the total critical habitat in the Permit Area. Temporary effects on all designated critical habitat within the Permit Area are limited to less than 1 percent (ICF International, 2012, Table 4-9). A detailed discussion of effects on Bay checkerspot, California tiger salamander, and California red-legged frog critical habitat are provided below in Sections 2.4.5.1, 2.5.4.1, and 2.5.4.2 of this Opinion, respectively.

2.1.7 Conservation Strategy

The Plan's conservation strategy is fully described Chapter 5 of the Plan. Conservation actions specific to each of the 18 Covered Species are described in Section 5.4 of the

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9 *Ecologically improved* means that the site functions ecologically better than the functions present on the site prior to ground disturbance.

10 Habitat models were not developed for the Tiburon Indian paintbrush, Coyote ceanothus, and Santa Clara dudleya. See section 2.4.5 of this Opinion for a detailed impacts analysis of these Covered Species.

11 The maximum allowable impacts to western burrowing owl occupied nesting habitat is 15 percent of the total modeled habitat mapped by the Plan (See Section 2.6.4.1 below for details).

Plan. The conservation strategy mitigates all of the effects described in Chapter 4 of the Plan, including direct, indirect, temporary, permanent, and cumulative effects. The conservation strategy also contributes to species recovery.

The Plan is a single plan that must be implemented as a whole. The section 10(a)(1)(B) permit will be issued on the basis of the entire Plan being implemented (ICF International, 2012, Section 9.4.3). The Plan includes conservation measures to protect all 18 Covered Species, 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 (ICF International, 2012, *Executive Summary*). With the exception of aquatic (see Plan Table 5-12) and plant (see Plan Table 5-16) effects, the Plan's conservation strategy does not distinguish mitigation from conservation actions. The preservation and restoration mitigation ratios for streams and riparian forest and scrub are additive (see Plan Table 5-12)[12].

The conservation strategy is based on landscape-level, natural community-level, and species-level biological goals and objectives (see Plan Tables 5-1 a-d). In summary, the conservation strategy will accomplish the following (ICF International, 2012, Section 5.1):

- 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 acres of newly acquired land if all anticipated effects occur.
- In addition to newly acquired land, incorporate up to 13,291 acres of existing open space into the Reserve System to enhance their long-term management[13]. 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.

12 For example, for every 1 mile of stream affected, 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 effects. For every 1 acre of willow riparian forest and scrub or mixed riparian forest and woodland affected, 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 effects to willow riparian forest and scrub or mixed riparian forest and woodland. For every 1 acre of Central California sycamore alluvial woodland affected, 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 effects (ICF International, 2012, Section 5.3.6).

13 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.

- Restore a minimum of 70 acres and up to 428 acres of riparian woodland and wetlands. All restoration construction will be completed by Year 40.
- Create a minimum of 20 acres and up to 72 acres of ponds. All creation construction will be completed by Year 40.

Due to the scope of the Plan, it was not possible to develop biological goals and objectives that strictly adhere to the 5-Point Policy requirements as described in 65 FR 35242. 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, quantity/state, and timeframes. Conservation actions described in Chapter 5 of the Plan will be supplemented by plans developed during Plan implementation that will be reviewed and approved by the Wildlife Agencies (i.e., reserve unit management plans, site restoration plans, etc.) (ICF International, 2012, Section 5.2.1).

The Opinion's effects analysis often refers to specific conservation actions contained in Plan Tables 5-1 a-d. Conservation actions will be carried out to achieve the Plan's biological goals and objectives. We use the naming convention used in the Plan to refer to conservation actions (i.e. "STUDIES-5," "LM-5," and "GRASS-10").

In some cases, conservation actions include the phrases "if biologically appropriate" or "if biologically feasible." These conservation actions will be implemented unless the Implementing Entity, with the concurrence of the Wildlife Agencies, determines 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 to 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 Section 10.3 of the Plan (ICF International, 2012, Section 5.2.1).

In general, the conservation strategy is composed of the following primary components: preservation, enhancement, restoration, creation, and management. Land will be acquired from willing sellers in fee title or through the establishment of conservation easements (see Plan Appendix H for the template easement). Land acquisition requirements and processes are described in Sections 5.3.1 and 8.6 of the Plan. Section 5.2.5 of the Plan describes the Plan's definitions of enhancement, restoration, and creation. Plan Tables 5-11 through 5-19 and 5-20 summarize acquisition, enhancement, restoration, and creation commitments. Section 8.6.1 of the Plan provides a detailed discussion of how acquisition and restoration actions will be tracked and credited during Plan implementation.

As indicated in Section 5.2.3 of the Plan, in order to become part of the Reserve System, lands must:

- be consistent with the conservation strategy described in Chapter 5 of the Plan;
- be approved by the Implementing Entity and Wildlife Agencies; and
- be protected with a conservation easement[14] (see Plan Section 8.6.3).

Furthermore, to be incorporated into the Reserve System and count toward the land acquisition requirements of the Plan, acquired lands must meet the following criteria (ICF International, 2012, Section 8.6):

- Contribute to meeting the goals and objectives of the Plan
- Have a location, configuration, and quality consistent with the reserve design and assembly principles described in Section 5.2.3 of the Plan
- Meet multiple criteria in Chapter 5 of the Plan for landscape linkages, land cover types, plant occurrences, modeled species habitat, selected wildlife species occupancy, and other land acquisition criteria
- Protect the biological functions and values that contribute to the Plan
- Be managed in perpetuity according to a reserve unit management plan as described in Section 5.2.5 of the Plan
- Be monitored according to the requirements and guidelines described in Chapter 7 of the Plan
- Have no hazardous materials or property encumbrances that conflict with Plan goals and objectives
- Is not mitigation for a project or activity that is not covered by the Plan

All actions necessary to implement the conservation strategy would take place within the Reserve System, with the following possible exceptions: western burrowing owl conservation actions (see Plan Section 5.4.6 and Section 2.6.4.1 below), Coyote ceanothus creation (see Plan Section 5.4.11 and Section 2.4.5.3 below), onsite stream restoration activities conducted by the Applicants (see Plan Section 5.2.5), and monitoring and management on streams outside of the Reserve System (i.e. monitoring of streams hydrologically affected by existing dams – see Plan Section 7.3.3 and Section 2.5.3 below).

As indicated in Section 5.2.5 of the Plan, riparian and stream restoration that is counted towards the total conservation requirements of the Plan (see 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 an Applicant, including the Implementing Entity, or a third party under contract with an Applicant.

14 The exception to the conservation easement requirement is existing lands listed in Table 5-5 and owned by the Open Space Authority. See Section 9.4.2 of the Plan for details on the incorporation of Open Space Authority land into the Reserve System.

- Restoration is done consistent with the *Reserve Design and Assembly Principles* described in Plan Section 5.2.3[15].
- The site is restored to pre-project or ecologically improved conditions within five years of the end of the Covered Activity.
- A Wildlife Agency-approved site restoration plan is developed consistent with the requirements in Plan Section 5.3.6.
- There are no suitable and feasible restoration sites within the Reserve System.
- The restoration project meets the riverine and riparian requirements described in Plan Section 5.3.6.
- The site is maintained in perpetuity[16] according to the terms of the Plan by the Implementing Entity or another Applicant. 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 of the Plan.
- The Implementing Entity and Wildlife Agencies approve the project.

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. 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 (see Plan 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.

Section 5.3.1 of the Plan describes requirements to demonstrate that the following five wildlife Covered Species occupy the Reserve System:

- Bay checkerspot butterfly
- California red-legged frog
- California tiger salamander
- Western pond turtle
- Foothill yellow-legged frog

15 Restoration efforts need to remain in compliance with the Plan's Stay-Ahead provision, described in Section 8.6.1.

16 See Plan Section 5.2.5 for exceptions.

These species are the focus of the Plan's wildlife species occupancy requirements because they are known to consistently breed in multiple locations in the Permit Area or because they are so rare that it was necessary to ensure that occupied lands were protected and managed. As indicated in Sections 2.4.5 and 2.8 below, occurrences of covered plants must be preserved in the Reserve System prior to effects.

As described in Chapter 9 of the Plan, 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 Action Area as a result of the recent recession, development fees may not be accumulated prior to land acquisition 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 of the Plan's conservation strategy, the Implementing Entity may limit Reserve management to essential tasks and defer non-essential management tasks for up to five 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 process described in Chapters 7 and 8 of the Plan. Management in response to Changed Circumstances described in Chapter 10 of the Plan cannot be deferred (ICF International, 2012, Section 5.2.5).

As described in Section 8.6.2 of the Plan, credits sold by private mitigation banks within the Permit Area to project proponents can count toward the Plan. Mitigation banks selling credits to mitigate effects of Covered Activities must meet all of the relevant standards of habitat enhancement, adaptive management, and monitoring outlined in Chapters 5 and 7 of the Plan. All impacts and mitigation for impacts covered under the Plan must occur within the Permit Area analyzed in this Opinion.

The Plan's Stay-Ahead provision, described in Section 8.6.1 of the Plan, 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 (see Plan Tables 5-11 and 5-13) be roughly proportional to the effect on that land cover type as a proportion of the total effect anticipated by all Covered Activities (see Plan Table 4-2). For example, if 25 percent of the anticipated effects on mixed serpentine chaparral have occurred, then at least 25 percent of the required land acquisition for mixed serpentine chaparral must have also occurred. To provide flexibility during implementation, the Implementing Entity may fall behind by a maximum of 10 percent of its conservation strategy requirements and still be in compliance with the Plan's Stay-Ahead provision. This deviation accounts for the likely pattern of infrequent land acquisition of large parcels. However, once the section 10(a)(1)(B) permit ends (i.e., through expiration, suspension, revocation), the Applicants will be held responsible for any outstanding requirements in the permit, Implementing Agreement, and Plan. Furthermore, Section 8.6.1 of the Plan indicates that the Stay-Ahead provision also includes a requirement for

acquisition of covered plant occurrences to stay ahead of effects to each plant Covered Species (see Plan Table 5-16)[17]. The Stay-Ahead provision applies to each covered plant species separately (i.e., effects on, and conservation of, covered plant occurrences cannot be aggregated for purposes of the Stay-Ahead provision). The Plan also has a specific Stay-Ahead provision for the western burrowing owl, which is described further in Section 2.6.4.1 of this Opinion.

If effects occur more slowly than anticipated, strict adherence to the Stay-Ahead provision would result in the 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 aquatic restoration and creation goals, interim deadlines are established in Table 5-14 of the Plan (ICF International, 2012, Section 8.6.1). 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 (see Plan Table 5-13). These restoration and creation requirements are in addition to those required to offset effects on these land cover types (ICF International, 2012, Section 5.3.1).

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 effect, 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 (see Plan Table 5-13). Because there is a finite amount of these relatively rare land cover types in the Permit Area not already located in existing open space, the minimum protection levels can be met through preservation needed for mitigation[18]. In addition, the preservation ratios for aquatic land cover types include a recovery component (ICF International, 2012, Section 5.3.1).

Reserve unit management plans will be developed during Plan implementation for each reserve unit. Reserve units are defined as groups of contiguous or neighboring parcels that have similar natural communities, Covered Species, and infrastructure. Separate reserve unit management plans will be prepared for a minimum of five reserve units. A list of likely reserve units is listed below, based on the expected geographic distribution of the Reserve System (ICF International, 2012, Section 5.2.5):

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17 Exceptions to this are described for the Coyote ceanothus (see Plan Section 5.4.11).
18 For example, if all 25 acres of anticipated effects occur on 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 recovery commitments additive). In another example, if only 2 acres of anticipated effects on coastal and valley freshwater marsh occur, then the minimum of 10 acres of preservation must occur (applying the mitigation ratio of 2:1 only reaches 4 acres of preservation) (ICF International, 2012, Section 5.3.1).

- Upper Penitencia Creek
- Coyote Ridge
- Pacheco Watershed
- Southern Santa Cruz Mountains
- Santa Teresa Hills

All reserve unit management plans will be prepared in collaboration with the Wildlife Agencies and approved by the Implementing Entity and the Wildlife Agencies. Reserve unit management plans will be prepared as soon as reasonably possible but not longer than five years following acquisition of the first parcel in a reserve unit or of placing a conservation easement on the parcel. The following management issues will be addressed in each reserve unit management plan, as further detailed in Section 5.2.5 of the Plan*:*

- Objectives of the conservation area
- Vegetation management
- Management of invasive species
- Fire management
- Maintenance of infrastructure
- Monitoring requirements and adaptive management
- Recreational use
- Agricultural lands
- Mosquito abatement

Reserve unit management plans will be updated and revised as part of the Plan's adaptive management program described in Chapter 7. Until the first reserve unit management plan is developed and formally approved by the Wildlife Agencies, reserve lands will be managed to maintain and improve Covered Species habitats in accordance with the guidance in the Plan, best available science, and management methods currently being used in the Permit 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 unless demonstrated through management on other Plan reserves or elsewhere in the Permit Area, pilot studies, or other relevant studies that changing management will benefit natural communities or Covered Species. If the pre-existing management was damaging the resource(s) contained in that reserve, interim actions based on best available science will be implemented immediately and continued until the specific reserve unit management plan is completed[19] (ICF International, 2012, Section 5.2.5).

Finally, public education and outreach will be an integral component of reserve management. The focus of public education and outreach activities will be to raise landowner and public awareness of reserve management goals, actions and methods, and

19 For example, if a parcel was previously overgrazed, the stocking rate could be reduced to the point where it could reasonably be assumed that the modified level of grazing would sustain natural resources.

how the public can support and help implement them. 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 Action Area (ICF International, 2012, Section 5.3.2).

2.1.8 Monitoring and Adaptive Management

The Plan's monitoring and adaptive management strategy is fully described in Chapter 7. The two main types of monitoring that will occur during Plan implementation are compliance monitoring and effectiveness monitoring. Compliance monitoring will ensure effects are consistent with those analyzed in Chapter 4 of the Plan, conservation actions are conducted in accordance with Chapter 5 of the Plan, Conditions on Covered Activities are implemented as described in Chapter 6 of the Plan, and monitoring and management actions are carried out in accordance with Chapter 7 of the Plan. Effectiveness monitoring will assess the biological success of the Plan. Effectiveness monitoring will include monitoring the effects of management activities. The Implementing Entity will design, conduct, and report on 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 (ICF International, 2012, Section 7.2.1).

As indicated in Section 7.2 of the Plan, the following types of targeted studies will be conducted during Plan implementation: methods testing, pilot projects, and directed studies. Methods testing will be designed to evaluate alternative monitoring protocols and sampling designs and to select the best technique for obtaining information. Pilot projects will be conducted to ascertain, on a small scale, which management actions may ultimately yield the desired conservation gains prior to initiating a long-term project. Directed studies will be used to address critical uncertainties to reduce the levels of uncertainty related to achieving biological goals and objectives. All of the conservation actions identified as "STUDIES" in Plan Tables 5-2 a–b are considered directed studies.

Due to the programmatic nature of the Plan, it was not possible to develop a prescriptive monitoring plan prior to a permit decision being made. Instead, Chapter 7 of the Plan provides a framework on which detailed monitoring and adaptive management plans will be developed during Plan implementation. A monitoring and adaptive management plan will be incorporated into each reserve unit management plan, which will be submitted to the Wildlife Agencies for review and approval within five years of the acquisition of the first parcel of each reserve unit (ICF International, 2012, Section 7.1.3). Section 7.2.4 of the Plan provides a framework of indicators, protocols, and sampling design that the Implementing Entity will consider when developing the monitoring component of each reserve unit management plan. Section 7.3 of the Plan describes landscape-level, natural community-level, and species-level monitoring and management actions.

Species-level monitoring and management actions are specifically outlined in Section 7.3.3 of the Plan. Covered Species are categorized into three groups based on listing status and the portion of the species' range in the Permit Area. Group 1 species includes

most of the currently listed Covered Species as well as Covered Species for which the Permit Area constitutes a critical portion of the species' range. Species-specific conceptual models for Group 1 species will be initiated within one year of implementation. Within the year, monitoring variables and additional indicators 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[20]. Recommended annual monitoring is for species status only. However, monitoring frequency for species addressed in finalized U.S. Fish and Wildlife Service Recovery Plans will not fall below the recommended frequencies in these plans[21]. 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 a 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. The following Covered Species are currently included in Group 1:

- Bay checkerspot butterfly
- California tiger salamander
- California red-legged frog
- Western burrowing owl
- Tiburon Indian paintbrush
- Coyote ceanothus
- Santa Clara Valley dudleya
- Metcalf Canyon jewelflower

Group 2 species are not currently listed, but the Permit Area constitutes a critical portion of the species' range. Baseline surveys will be conducted within two years of land acquisition. Species-specific conceptual models will be developed on an as-needed basis. Monitoring variables and additional indicators will be selected within one year. A survey schedule will be developed to ensure that species status is monitored every two to three 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. The following Covered Species are currently included in Group 2:

- Foothill yellow-legged frog
- Western pond turtle
- Mount Hamilton thistle

20 For example, if California 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.

21 For example, at a minimum, Coyote ceanothus will be monitored every three years, as suggested in *The Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b).

- Fragrant fritillary
- Loma Prieta hoita
- Smooth lessingia
- Most beautiful jewelflower

Species in Group 3 may or may not be listed but the Action Area is not considered a critical component of the species' range. A relatively lower monitoring effort will be undertaken to document the status and trends of these species. Baseline surveys will be conducted within five years of land acquisition. Monitoring variables and additional indicators will be selected. A survey schedule will be developed to ensure that species status is monitored at least every five 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. The following Covered Species are currently included in Group 3:

- Least Bell's vireo
- Tricolored blackbird
- San Joaquin kit fox

The grouping of each species will be re-evaluated every five years or when listing status changes. Species may move between the three groups during the course of Plan implementation (ICF International, 2012, Section 7.3.3).

To ensure adequate tracking of permanent effects versus partial permanent impacts to covered plant species (as defined by Chapter 6 of the Plan, Condition 20), the Implementing Entity will monitor covered plant occurrences that may be partially adversely affected by Covered Activities[22.] The purpose of the monitoring will be to (1) assess whether the effect reduces the long-term viability of the occurrence and whether supplemental management actions are feasible and warranted and (2) determine whether additional occurrences must be protected, enhanced, or created in the Reserve System to offset the effect. 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 less than 5 percent of the total population size is affected, as measured by the number of individuals. If less than 5 percent of the total occurrence size is affected, then the effect is not considered significant with regard to long-term viability and will not require monitoring nor will it count as a permanent effect. This applies to all covered plant species except the Coyote ceanothus (ICF International, 2012, Sections 6.6.2 and 7.3.3). For annual plant species, the minimum post-construction monitoring period is five years. For perennial species, the minimum post-construction monitoring period will be three years (ICF International, 2012, Section 7.3.3).

Major shifts in the adaptive management program must be reviewed and approved by the Wildlife Agencies. Major shifts include, but are not limited to, proposing actions that

22 This will be in addition to status and trends monitoring described in Chapter 7 of the Plan.

may be inconsistent with the Plan or detrimental to Covered Species, introducing new and untested management techniques, discontinuing and replacing ineffective management techniques, or applying management techniques on a much larger or smaller scale than envisioned in the Plan (ICF International, 2012, Section 7.2.3).

Monitoring results will be incorporated into the annual reports prepared by the Implementing Entity and submitted to the Wildlife Agencies by March 15 each year.

2.1.9 Cost

As shown in Table 9-1 of the Plan, the total cost of the Plan over the 50 year permit term is $564,040,000. Major cost categories are listed below and described in detail in Section 9.3 of the Plan.

- Land acquisition
- Reserve management and maintenance, including adaptive management
- Habitat restoration, creation, and covered plant occurrence creation
- Monitoring, research, and scientific review
- Program administration
- Contingency
- Costs in perpetuity

2.1.10 Funding

To obtain State and Federal incidental take permits, the Plan contributes to the recovery ("conservation") of Covered Species. Proponents of private and public development activities will benefit from this comprehensive approach because 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 Plan include some of the costs associated with conservation actions. Therefore, the term "mitigation" in the Plan does not only refer to Federal mitigation requirements (ICF International, 2012, Section 9.4).

There are four main sources for Plan funding: Plan fees and land dedication, local funding, State and Federal funding, and interest income. Table 9-5 of the Plan summarizes the estimated revenues generated from each funding source over the permit term. A surplus of $560,000 is expected after comparing total Plan cost to total Plan funding.

Section 9.4.1 of the Plan describes how each of the following Plan development fees were derived and how they will be assessed. Table 9-6 of the Plan summarizes the projected fee amount for each of the following fees at the start of Plan implementation.

- Land Cover Fee
- Endowment Fee Component[23]
- Plan Preparation Cost Recovery Fee Component[24]
- Nitrogen Deposition Fee
- Serpentine Fee
- Burrowing Owl Fee
- Wetland Fee
- Temporary Impact Fee

As fully described in Section 8.6.7 of the Plan, Plan fees can be reduced or eliminated with land dedication. The Applicants or private landowners under their jurisdiction may own land that could meet conservation goals of the Plan. Project proponents that own land within a priority conservation area (see Plan Figure 5-8) may transfer fee title or place a conservation easement on the portion of their property within the Plan's targeted conservation areas. If approved by the Implementing Entity and Wildlife Agencies, the transfer or easement dedication could reduce or eliminate the land cover, serpentine, burrowing owl, and/or temporary impact fees required for developing the remaining portion of the property. In addition, 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 these lands could also eliminate or substantially reduce development fees. 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.

As described in Section 9.4.2 of the Plan, substantial funds for Plan implementation will come from local sources, aside from Plan fees. County Parks and some Participating Special Entities[25], including the Open Space Authority, will provide land (in fee title or subject to conservation easements) in lieu of fees[26]. Lands that are contributed in lieu of fees count toward the mitigation component of the Plan. Non-fee local funding will take many forms, 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

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23 To guarantee funding for post-permit costs, an *endowment fee component* will be charged as part of each fee (land cover, nitrogen deposition, serpentine, burrowing owl, wetland, and temporary impact fees) and gradually accumulated during the permit term.

24 All of the Plan's development fees include a component to partially reimburse the Applicants over time for the costs incurred to develop the Plan between 2005 and 2011. The *plan preparation cost recovery fee component* includes only the Plan preparation costs funded by the Applicants, not costs funded by the Section 6 Planning Grants.

25 Public entities, such as special districts or entities not subject to the jurisdiction of the Applicants, may request take authorization under the Plan as a Participating Special Entity. See Plan Section 8.4 for details.

26 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.

from local foundations. These non-fee local funding cannot be used for mitigation purposes and will be directed towards the recovery portion of the Plan (ICF International, 2012, Section 9.4). For further discussion, refer to Section 8.6.2 of the Plan.

As indicated in Section 9.4.3 of the Plan, the Federal and State governments will strive to assist local governments and property owners to assemble, manage, and monitor the Plan Reserve System[27]. This assistance will contribute to the land acquisition requirements of the Plan, contribute to recovery of listed species in the Permit Area, and reduce or avoid the need to list additional species as threatened or endangered. Potential Federal and State funding sources are listed in Table 9-13 of the Plan.

The final funding source anticipated during Plan implementation is the small source of income 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 (ICF International, 2012, Section 9.4.2).

The Plan includes two mechanisms for the Implementing Entity to adjust fee levels to ensure adequate funding over the permit term: automatic adjustments and periodic assessments. Both automatic adjustments and periodic assessments are described in Section 9.4.1 of the Plan.

Although land cannot be provided in lieu of the Plan's wetland fees, project proponents may implement their own wetland restoration or creation projects in lieu of all or a part of wetland fees. See Section 9.4.1 of the Plan for details.

2.1.11 Implementation

Chapter 8 of the Plan 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. The summary that follows highlights aspects of Chapter 8 that are relevant to this Opinion.

Implementation of the Plan begins when the Implementing Agreement is executed, the section 10(a)(1)(B) incidental take permit and NCCP permit are issued, and the local ordinances take effect. The permits will be contingent upon the adoption of local implementing ordinances in Gilroy, Morgan Hill, San Jose, and the County. This will allow the Wildlife Agencies to make findings that the Plan is adequately funded (ICF International, 2012, Sections 8.1 and 8.5). A model implementing ordinance is provided in Appendix B of the Plan, as an exhibit contained in the Implementing Agreement.

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27 Implementation of the Plan is subject to the Federal Anti-Deficiency Act and the availability of appropriated funds. Nothing in the Plan will require the obligation, appropriation, or expenditure of any money from the United States Treasury.

Although the Applicants are primarily responsible for implementing the Plan, 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 coordination among the Applicants, Wildlife Agencies, public land managers, and the private sector. Section 8.2 of the Plan describes the roles of the following entities during Plan implementation:

- Applicants (other than the Implementing Entity)
- Implementing Entity
- Other land and water management agencies
- Technical Advisory Committee
- Wildlife Agencies
- Independent Conservation Assessment Team
- Public

Roles and responsibilities of the Applicants, Implementing Entity, and Wildlife Agencies in reviewing applications for take authorization during Plan implementation are further discussed in Section 8.7 of the Plan. Specifically, the following would require Wildlife Agency approval during Plan implementation (ICF International, 2012, Section 8.7.3):

- Reserve unit management plans
- Site restoration plans
- Plant and pond creation proposals
- Covered Species translocation activities
- Tier 3 burrowing owl conservation actions
- Burrowing owl management agreements
- Burrowing owl passive relocation
- Conservation easements
- Land acquisition proposals
- Revisions to Plan Conditions (see Plan Section 6.3)
- Inclusion of Participating Special Entities (see Plan Section 8.4)
- Changes to modeled habitat maps and land cover maps (ICF International, 2013, Exhibit A)

To ensure the success of the Plan, the Implementing Entity will make progress on a variety of tasks simultaneously. Schedule guidelines and major milestones for Plan implementation are described in Table 8-1 (as amended by Exhibit A of the Plan) and Section 8.12 of the Plan. Table 8-2 of the Plan lists implementation tasks with deadlines that are tied to permit compliance.

As fully described in Section 8.10 of the Plan, the Implementing Entity will develop and maintain a comprehensive data repository to track permit compliance and all other aspects of the Plan. Section 8.10.2 of the Plan details the type of data that will be maintained by the Implementing Entity and reported to the Wildlife Agencies on an annual basis. See Section 8.11 of the Plan for a description of the content of annual reports.

Species models will be updated during implementation based on new information. Modeled habitat requirements will be tracked based on the most recent model update (ICF International, 2012, Section 5.3.1).

Section 8.6.1 of the Plan provides a detailed discussion of how acquisition and restoration actions will be tracked and credited during Plan implementation. Highlights are provided below:

- Reserve System infrastructure described in Section 2.3.8 of the Plan is assumed to be compatible with the Plan's goals and objectives if it is implemented consistent with the Conditions described in Chapter 6. Existing and new construction of 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.
- If 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.
- Land cover restored or created can receive credit for restoration or creation and preservation. 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.
- Wetland restoration credit may change if the wetland type changes (i.e., a pond becomes 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.

The process for receiving take authorization is fully described in Section 6.7 of the Plan. For private projects, an application must be submitted to the local jurisdiction for review and approval in order to receive coverage under the Plan. For their own projects, Applicants must submit an application package to the Implementing Entity. The application package will be critical in determining coverage, tracking effects, assessing fees, and ensuring all applicable Conditions are implemented. The six components of the application package are described in detail in Section 6.8 of the Plan.

Public entities, such as special districts or entities not subject to the jurisdiction of the Applicants, may conduct activities within the Permit Area that could affect listed species and may require take authorization from the Wildlife Agencies. These public agencies, referred to as Participating Special Entities in the Plan, may be able to receive incidental

take coverage through the process described in Section 8.4 of the Plan. Similarly, private applicants that are not subject to the Plan (see Plan Section 2.3.2) may request coverage through the opt-in process described in Section 6.7.2 of the Plan.

The Implementing Entity may or may not exist after the permit term. Regardless, all Applicants are obligated to continue to protect, manage, and maintain the Reserve System after the permit term. 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 Applicants would no longer be obligated to annually report the status of the Plan to the Wildlife Agencies upon expiration of the permit. Three to five years prior to the termination of the permit, the Applicants will determine how to handle the continuing obligations of the Implementing Entity, with the approval of the Wildlife Agencies (ICF International, 2012, Section 9.4.4).

2.2 Action Area

The Action Area is defined in 50 CFR §402.02 as, "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The Service describes the Action Area for the proposed action as the Permit Area previously described in Section 2.1.2 of this Opinion. Because there are effectively two Permit Areas for the Plan, the Action Area is equivalent to the larger of the two Permit Areas: the western burrowing owl Permit Area. To minimize confusion in this Opinion, when the term "Action Area" is used in the context of the western burrowing owl, we are referring to the burrowing owl Permit Area. When the term "Action Area" is used in the context of all other Covered Species, we are referring to the Permit Area for all Covered Species, with the exception of the burrowing owl.

The Service acknowledges that there will be some cumulative indirect effects outside of this defined Action Area, resulting from increased nitrogen deposition (N-deposition) directly and indirectly generated by Covered Activities. However, best available science does not currently support a meaningful analysis to measure, detect, or evaluate the effects of nitrogen deposition outside of the defined Action Area. The N-deposition effects analysis contained in this Opinion is based on extensive air quality modeling carried out specifically for the Plan (see Plan Appendix E), which represents the best available scientific data.

When defining the Action Area, the Service also considered potential indirect effects on water quality and hydrology. The northern watersheds of Santa Clara County drain northward into the San Francisco Bay, which is outside of the Permit Area. The southern watersheds of Santa Clara County drain southward into Monterey Bay, which is also outside of the Permit Area. The Action Area was defined as the Permit Area, as described in Section 2.1.2 of this Opinion, in part, because the Service determined that the Conditions described in Chapter 6 of the Plan, particularly Conditions 3, 4, 5, 7, 8, and 11 (ICF International, 2012, Chapter 6), will minimize the extent of indirect water-related effects on both San Francisco Bay and Monterey Bay to insignificant levels. That is, we are not currently able to meaningfully measure, detect, or evaluate indirect effects to the San Francisco Bay and Monterey Bay, given the Plan's minimization measures.

2.3 Analytical Framework for the Jeopardy and Adverse Modification Analysis

2.3.1 Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this Opinion relies on four components: (1) the *Status of the Species*, which evaluates the Covered Species' range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the species in the Action Area, the factors responsible for that condition, and the relationship of the Action Area to the survival and recovery of the Covered Species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the Covered Species; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the Action Area on these species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the Covered Species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of these species in the wild.

The jeopardy analysis in this Opinion places an emphasis on consideration of the range-wide survival and recovery needs of the Covered Species and the role of the Action Area in their survival and recovery as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

2.3.2 Adverse Modification Determination

This Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR §402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this Opinion relies on four components: (1) the *Status of Critical Habitat*, which evaluates the range wide condition of critical habitat for the Bay checkerspot butterfly, California tiger salamander (Central California DPS), and California red-legged frog in terms of Primary Constituent Elements (PCEs), the factors responsible for that condition, and the intended recovery function of the critical habitat at the provincial and range-wide scale; (2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the Action Area, the factors responsible for that condition, and the recovery role of the critical habitat in the Action Area; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how that will influence the

recovery role of affected critical habitat units and; (4) *Cumulative Effects* which evaluates the effects of future, non-Federal activities in the Action Area on the PCEs and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on the Bay checkerspot butterfly, California tiger salamander, and California red-legged frog critical habitat are evaluated in the context of the range-wide condition of the critical habitat at the provincial and range-wide scales, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the Bay checkerspot butterfly, California tiger salamander, and California red-legged frog.

The analysis in this Opinion places an emphasis on using the intended range-wide recovery function of Bay checkerspot butterfly, California tiger salamander, and California red-legged frog critical habitat and the role of the Action Area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

2.4 Serpentine Species

For the purposes of this Opinion, the Bay checkerspot butterfly, Tiburon Indian paintbrush, Coyote ceanothus, Mount Hamilton thistle, Santa Clara Valley dudleya, fragrant fritillary, smooth lessingia, Metcalf Canyon jewelflower, and most beautiful jewelflower are grouped together and identified as "serpentine species" because the serpentine communities in the Action Area either represent the entire range of these species or a significant portion of the known range of these species. As such, the effects on these species resulting from Covered Activities are anticipated to be similar. All but one of these species are also addressed in the Service's *Recovery Plan for Serpentine Soil Species of the San Francisco Bay* (1998b), which further emphasizes the threats and conservation needs shared by these species. This Opinion analyzes the effects on each of these species individually. They are grouped together here, for the purposes of streamlining the Opinion and minimizing repetition in Section 2.4.5, *Species-Specific Effects of the Action*.

2.4.1 Status of the Species/Critical Habitat

Nitrogen deposition (N-deposition) is the common factor affecting covered serpentine species. The combustion of fossil fuels (from vehicles, power plants, etc.) results in the production of a number of emissions, including various nitrogen-based substances such as nitrous oxides (N_2O), ammonia (NH_3), nitrogen oxides (NO_x), nitric acid (HNO_3), nitrate (NO_3-), and ammonium (NH_4). Nitrogen (N) is the primary limiting factor in plant growth. Within the grassland monitoring network in the San Francisco/San Jose area, N-deposition currently exceeds 10 kilograms of nitrogen per hectare per year (kg-N/ha/yr) (Fenn *et al.*, 2010). Three monitoring sites at Edgewood Natural Preserve

(Edgewood Park) provide a fine-scale N dry-deposition gradient ranging from to 5 kg-N/ha/yr[28] to more than 15 kg-N/ha/yr.

2.4.1.1 Bay Checkerspot Butterfly

Refer to the Bay checkerspot butterfly (*Euphydryas editha bayensis*) 5-Year Review: Summary and Evaluation (U.S. Fish and Wildlife Service, 2009) for the status of the species. An update on the species' status is provided below, based on Weiss and Niederer's *Bay Checkerspot Reintroduction, Coyote Ridge to Edgewood Natural Preserve* (2012).

The population of Bay checkerspot butterflies at Edgewood Park in San Mateo County was presumed extirpated in 2002. Since then, a total of 3 reintroduction attempts were made in 2007, 2011, and 2012. The source population for each reintroduction effort was Coyote Ridge. The 2007 reintroduction attempt failed to establish a population (Weiss, 2010).

An estimated 2,000 larvae were reported during the January and February 2012 larval surveys at Edgewood, demonstrating that Bay checkerspot butterflies were able to complete their lifecycle in large numbers. However, these results were still below the reintroduction rate (4,003 larvae and 60 adults were introduced in 2011).

In spring of both 2011 and 2012, host plants at Edgewood Park remained fresh three to four weeks after the peak flight season, suggesting high survivorship of pre-diapause larvae. A total of 333 Bay checkerspot butterflies were observed during the 2012 monitoring season (compared to 129 individuals in 2011). Larval monitoring in January and February 2013 will confirm what appears to be another year of successful reintroductions. However, these monitoring results are considered preliminary, as it is too early to determine whether these reintroduction attempts will result in a self-sustaining population.

Critical Habitat

Critical habitat for the Bay checkerspot butterfly was first published on April 30, 2001 (66 FR 21450). A proposed revised designation of critical habitat was published on August 22, 2007 (72 FR 48178), and a final revised critical habitat was published on August 26, 2008 (73 FR 50406).

A total of 13 critical habitat units were designated, 4 of which are located in San Mateo County and the remaining 9 are located in Santa Clara County (see Plan Figure 4-4). A total of 1,692 acres of critical habitat reside in the following 4 units in San Mateo County: Unit 1 (San Bruno Mountain), Unit 2 (Pulgas Ridge), Unit 3 (Edgewood Park), and Unit 4 (Jasper Ridge). A total of 16,601 acres of

28 This is one of three monitoring stations in Edgewood Park where grass invasion is greatly diminished and is thus used to establish the critical load for annual grass invasions of 5 kg N/ha/yr (Fenn *et al*., 2010).

critical habitat are contained in the 9 units located in Santa Clara County, the largest unit of which is Unit 13 (Kirby), constituting 5,446 acres.

The five primary constituent elements for the Bay checkerspot butterfly are:

- 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 (i.e., drought). Common grassland species include wild oats (*Avena fatua*), soft chess (*Bromus hordeaceus*), California oatgrass (*Danthonia californica*), Italian ryegrass (*Lolium multiflorum*), purple needlegrass (*Nassella pulchra*), and Idaho fescue (*Festuca idahoensis*); less abundant in these grasslands are annual and perennial forbs such as filaree (*Erodium botrys*), true clovers (*Trifolium* spp.), and dwarf plantain (*Plantago erecta*). These species, with the exception of dwarf plantain, are not required by the Bay checkerspot butterfly, but merely are provided here as an example of species commonly found in California grasslands;

- 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;

- The presence of adult nectar sources for feeding. Common nectar sources include desert parsley (*Lomatium* spp.), California goldfields (*Lasthenia californica*), tidy-tips (*Layia platyglossa*), sea muilla (*Muilla maritima*), scytheleaf onion (*Allium falcifolium*), false babystars (*Linanthus androsaceus*), and intermediate fiddleneck (*Amsinckia intermedia*);

- 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; and

- 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

All critical habitat units contained in San Mateo County were occupied at the time of listing. Each of the San Mateo critical habitat units contain all of the features essential for the conservation of the species (73 FR 50406). Populations in San Mateo County were presumed extirpated in 2002. However, 333 adults were observed at Edgewood Park (contained in Unit 3) during the 2012 monitoring season as result of 2011 reintroduction efforts. It is however, too early to

conclude whether translocation efforts will result in the establishment of a sustainable population in this unit (Weiss and Niederer, 2012). All of the Units contained in Santa Clara County are currently occupied and contain all of the features essential for the conservation of the species (73 FR 50406).

The following factors are responsible for the current condition of Bay checkerspot critical habitat:

- **Habitat loss and fragmentation.** Critical habitat has been lost to development. In addition, a number of serpentine grasslands have been partially destroyed by urban and suburban development, either directly or indirectly by adjacent land use. For example, water, either irrigation or runoff, from developed areas altered the vegetative structure of critical habitat, affecting habitat suitability for the Bay checkerspot butterfly.

- **Nitrogen deposition and non-native species.** The cumulative effects of nitrogen deposition continue to degrade critical habitat that is not managed (i.e. grazed) for serpentine species. Nitrogen deposition facilitates the invasion of nonnative invasive plant species that outcompete the Bay checkerspot's primary larval host plant and adult nectar sources (Weiss, 1999).

- **Illegal collection.** The collection and trade of butterflies, especially rare species, is well documented. The Bay checkerspot butterfly's rarity and beauty make it a desirable addition to butterfly collections. Because population numbers are so low, the collection of even a few individuals could have harmed the butterfly population (73 FR 50406).

- **Weather.** Periods of drought and deluge resulted in negative effects to Bay checkerspot butterflies (Singer, 1972; Hellmann, 2002). Weather patterns directly affect the abundance and distribution of primary larval host plants and adult nectar plants. Drought tends to cause Bay checkerspot butterfly populations to retreat to areas with moderate to cool microclimates. If a site does not have sufficient areas of moderate and cool microclimates, local extirpations could occur.

- **Vegetation management.** Both overgrazing and undergrazing have been identified as threats to the species (U.S. Fish and Wildlife Service, 2009). Appropriate grazing regimes reduce standing biomass of nonnative vegetation and increase the prevalence of native forbs, including Bay checkerspot butterfly larval hose plants.

- **Gopher control.** Bay checkerspot butterfly larval host plants located on or near soils recently tilled by gophers have been documented to stay green longer, increasing the availability of larval host plants into the dry season, potentially allowing more prediapause larvae to reach the fourth instar. Gopher control may have decreased the availability

of these tilled soils and resulted in the reduction of larval host plant availability (U.S. Fish and Wildlife Service, 2009).

Currently occupied habitat for the Bay checkerspot butterfly is highly fragmented and isolated; the majority of all extant occurrences are within an approximate 9-mile radius in Santa Clara County, with the exception of the recently reintroduced individuals in critical habitat Unit 3. The population estimates in San Mateo County are extremely small and those in Santa Clara County have declined significantly in recent years. As a result of population declines and fragmented habitats, critical habitat is essential to the conservation of the species (73 FR 50406).

Portions of critical habitat that were occupied at the time of listing, but are currently unoccupied, are essential to the conservation of the species because they currently contain the features that could support the species. These units were designated in an effort to reduce the likelihood of extinction by providing source (larger patches of high-quality habitat) or sink (small patches of marginal habitat) areas and ‘‘stepping stone’’ (often smaller, unconnected areas that bridge the distance between larger blocks of suitable habitat) habitats for the Bay checkerspot butterfly. Since the Bay checkerspot butterfly is susceptible to extreme weather events, units in San Mateo County will also reduce the risk of extinction from stochastic natural events and extreme weather conditions, and will help to ensure survival of the species by providing potential dispersal habitat for individuals that may be reintroduced in the future (73 FR 50406).

2.4.1.2 Tiburon Indian Paintbrush

Refer to the Tiburon Indian paintbrush (*Castilleja affinis* ssp. *neglecta*) 5-Year Review: Summary and Evaluation (U.S. Fish and Wildlife Service, 2012) for the current status of the species.

2.4.1.3 Coyote Ceanothus

Refer to the Coyote Ceanothus (*Ceanothus ferrisiae*) 5-Year Review: Summary and Evaluation (U.S. Fish and Wildlife Service, 2011a) for the current status of the species.

2.4.1.4 Mount Hamilton Thistle

Mount Hamilton thistle is not currently listed under the Act nor does it have designated critical habitat. A detailed description of the Mount Hamilton thistle’s physical characteristics can be found in Munz and Keck (1959) and Abrams and Ferris (1960). Mount Hamilton thistle is a large herbaceous perennial thistle measuring between 2 to 6.5 feet tall with a single stem. Flowering typically occurs between February and October (California Native Plant Society, 2010).

Mount Hamilton thistle is endemic to the San Francisco Bay Area and occurs in Santa Clara, Stanislaus, and Alameda Counties (California Native Plant Society, 2010). There are a total of 48 occurrences of Mount Hamilton thistle known within its range. All known occurrences are considered extant (ICF International, 2012, Appendix D). 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 individuals, and totals 28,962 individuals (California Department of Fish and Game, 2011 and Hillman pers. comm., as cited in ICF International, 2012, Section 5.4.12).

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 it sometimes occurs within foothill pine woodland or coast live oak forest and woodland (ICF International, 2012, Appendix D). The occurrences range in elevation from 320 feet to 2,900 feet (California Native Plant Society, 2010). The reproductive biology and demography of this species are unknown (U.S. Fish and Wildlife Service, 1998b).

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, 1998b; California Department of Fish and Game, 2011). One location in Santa Clara County supported over 18,000 plants in 1992 (California Department of Fish and Game, 2012). Populations of this species are conspicuous and have not shown any obvious signs of population decline or range contraction (Weiss pers. comm., 2006, as cited in ICF International, 2012).

Reported threats to the species include alteration of hydrologic regimes, urbanization, and grazing (U.S. Fish and Wildlife Service, 1998b; California Department of Fish and Game, 2012). The effects of livestock grazing on this species are unknown. Although, the spiny leaves of the Mount Hamilton thistle likely limit grazing of plant tissue it may be susceptible to trampling by cattle since they often occur in and near livestock water sources. Road construction or future landfills may also pose a threat.

Although the susceptibility of Mount Hamilton thistle to native or exotic insect herbivory is unknown, 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 located in Michigan resulted in substantial increases in plant survival, growth, and seed production where these insects were common (Bevill *et al*., 1999).

Furthermore, 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 used in North America to control Canada thistle (*Cirsium arvense*)

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.

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). 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* (Hillman pers. comm., 2006, as cited in ICF International, 2012, Appendix D) however work done by Herr (2000) found no evidence of biologically significant effects of the weevil on native Californian Cirsiums, including *C. fontinale* var. *campylon*.

2.4.1.5 Santa Clara Valley Dudleya

Refer to the *Dudleya setchellii* (Santa Clara Valley Dudleya) 5-Year Review: Summary and Evaluation (U.S. Fish and Wildlife Service, 2013a) for the current status of the species.

2.4.1.6 Fragrant Fritillary

The fragrant fritillary is not currently listed under the Act nor does it have designated critical habitat. Fragrant fritillary, a bulbiferous monocot, is a perennial herb possessing a white flower that grows up to 35 cm in height (Hickman, 1993). A detailed description of the species' physical characteristics can be found in Hickman (1993) and Corelli and Chandik (1995).

Fragrant fritillary is known from 59 extant occurrences throughout its range (California Department of Fish and Game, 2012). It is endemic to western central California, ranging from Sonoma and Solano Counties south to Monterey County (California Department of Fish and Game, 2012). Thirty-five of the known occurrences have population estimates from the 1980s, 1990s, and 2000s. These range from a low of 1 individual up to a high of 4,000 individuals, with a total of 16,383 (California Department of Fish and Game, 2012; ICF International, 2012, Section 4.6.8).

Fragrant fritillary occurs in grasslands, woodland, and coastal scrub up to 1,345 feet (California Department of Fish and Game, 2012; California Native Plant Society, 2010) and in vernal pool areas (California Department of Fish and Game, 2012). The species typically occurs on serpentine soils, although occurrences on heavy clay soils and other soil types have also been reported (California Department of Fish and Game, 2012). The population ecology of fragrant fritillary is largely unknown.

Nine documented occurrences of fragrant fritillary are believed to be extirpated in the state as a whole (California Department of Fish and Game, 2012). Two populations are reported as stable and two are reported as decreasing, but

population trends for the other occurrences are unknown (California Department of Fish and Game, 2012). 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.

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 Department of Fish and Game, 2012).

2.4.1.7 Smooth Lessingia

Smooth lessingia is not currently listed under the Act nor does it have designated critical habitat. A detailed description of the smooth lessingia's physical characteristics can be found in Munz and Keck (1959), Abrams and Ferris (1960), and Lane (1993). Smooth lessingia is an annual herb that grows up to 60 cm tall (ICF International, 2012, Appendix D). It flowers from July through November (California Native Plant Society, 2010).

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 (Skinner and Pavlik, 1994). Occurrences have been documented at elevations ranging from 400 to 1,400 feet (California Native Plant Society, 2010).

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. There are 39 known extant occurrences of smooth lessingia, all **but one occurrence (CNDDB occurrence #24)** are located within the Action Area (California Department of Fish and Game, 2012). Occurrences were reported by SCVWD or Santa Clara County Parks and Recreation (ICF International, 2012, Appendix D).

There are population 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 smaller populations with 100–200 individuals, but on the whole, this species tends to have large populations where it occurs. The total number of individuals from the 22 occurrences with population estimates is 101,629 individuals. Most estimates were documented between 2003 and 2008, although three occurrences were document in 1996, 1999, and 2000 (California Department of Fish and Game, 2012; Hillman pers. comm., as cited in ICF International, 2012, Section 4.6.8).

Most of the smooth lessingia occurrences are located west of Highway 101, with the exception of several occurrences located directly adjacent to Highway 101 to the east. Occurrences are primarily on private land, although there are several occurrences in Santa Teresa County Park and one occurrence each in Calero and Mount Madonna County Parks.

The ecology and demography of smooth lessingia is unknown. Population size appears to vary considerably between occurrence sites. Four populations had fewer than 200 individuals, while three other populations contained tens of thousands of plants (California Department of Fish and Game, 2012). Estimates of population density at two sites were 10-20 plants per square meter and 40–60 plants per square meter (California Department of Fish and Game, 2012).

Past development and recreational pressures have contributed to the declining status of the smooth lessingia (U.S. Fish and Wildlife Service, 1998b). Reported threats to populations of smooth lessingia include cattle grazing, foot traffic (trampling), invasive exotic plant competition, and road and trail maintenance (California Department of Fish and Game, 2012).

2.4.1.8 Metcalf Canyon Jewelflower

Refer to the *Streptanthus albidus* ssp. *albidus* (Metcalf Canyon Jewelflower) 5-Year Review: Summary and Evaluation (U.S. Fish and Wildlife Service, 2013b) for the current status of the species.

2.4.1.9 Most Beautiful Jewelflower

Most beautiful jewelflower is not currently listed under the Act nor does it have designated critical habitat. A detailed description of the species' physical characteristics can be found in Buck *et al*. (1993). The species is an annual herb up to 32 inches tall with fleshy and glaucous stems and leaves. It blooms from March to October (California Native Plant Society, 2010). *Streptanthus albidus* ssp. *peramoenus* is distinguished from the closely related Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*) by its lilac-lavender sepals. *Streptanthus albidus* ssp. *albidus* has greenish white sepals, which are purple-tinged at the base (U.S. Fish and Wildlife Service, 1998b).

Most beautiful jewelflower is endemic to the northern and central Coast Ranges of Contra Costa, Alameda, Santa Clara, Monterey, and San Luis Obispo Counties (California Native Plant Society, 2010). There are a total of 86 extant occurrences documented in the California Natural Diversity Database (CNDDB) (California Department of Fish and Game, 2012). 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 (ICF International, 2012, Section 4.6.8).

Most beautiful jewelflower is almost entirely restricted to serpentinite outcrops or soils derived from serpentinite. 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

(Kruckeberg, 1957) or chaparral habitats transition to oak woodland. It often occurs on serpentine roadcuts and road surfaces.

Very little information about the reproductive biology or demography of most beautiful jewelflower is available (U.S. Fish and Wildlife Service, 1998b). However, the species appears to be insect pollinated. Kruckeberg (1957) reported that members of the *Streptanthus glandulosus* complex, including most beautiful jewelflower, were incapable of self-pollination. He observed bees, butterflies, and beetles visiting the flowers. Bees were observed as the primary floral visitors in other outcrossing *Streptanthus* species (Dieringer, 1991), although flies and butterflies are also known to 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 (Zippin, 1997). The larvae of pierid butterflies commonly eat jewelflower leaves, flowers, and developing fruit. The flowers are also eaten by sap beetles and flea beetles (Shapiro, 1981; Karban and Courtney, 1987; Preston, 1991; and 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, 1981).

Population sizes of most beautiful jewelflower vary from less than fifty to tens of thousands (California Department of Fish and Game, 2012). Details of the demography of the species are unknown (U.S. Fish and Wildlife Service, 1998b).

Potential threats to most beautiful jewelflower include cattle grazing, exotic species invasion (notably yellow star thistle [*Centaurea solstitialis*]), and habitat loss from residential development and road construction (California Department of Fish and Game, 2012).

2.4.2 Environmental Baseline

Mobile sources such as vehicles and large stationary point sources, like the Metcalf Energy Center[29], contribute to N-deposition in the Action Area. N-deposition estimates (from various studies) for the Santa Clara Valley range from 8–20 kg-N/ha/yr (ICF International, 2012, Appendix E). Nitrogen deposition levels are high enough across the Action Area that all serpentine grasslands are at risk, but some areas have higher loads than others. Tulare Hill and the lower slopes of Coyote Ridge, near U.S. 101, have the highest deposition (15–20 kg-N/ha/yr), whereas the ridge top above Kirby Canyon receives 10–15 kg-N/ha/yr (ICF International, Section 4.6.1). The reduced N-deposition

29 Metcalf Energy Center is a 600 megawatt natural gas-fired power plant located at the north end of Coyote Valley, adjacent to Tulare Hill. It has been in operation since 2005.

at the ridge top is a function of its distance from immediate sources (i.e. U.S. 101) and its position above the inversion layer on many mornings. As such, baseline conditions in the Action Area often exceed the critical load of 5-6 kg-N/ha/yr[30] for N-deposition in serpentine grassland, as estimated by Fenn *et al*. (2010).

Different modeling approaches were used in the Plan (see Plan Appendix E) to assess the various contributions to N-deposition affecting the Action Area. The most complete of these methods was the Particulate and Precursor Tagging Methodology (PPTM) tagging approach in the Community Multiscale Air Quality (CMAQ) modeling system. 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. Estimates of baseline deposition based on observations of nitrogen dioxide (NO_2) concentration and CMAQ modeling both estimate total nitrogen deposition to be approximately 6 kg-N/ha/yr, which is consistent with other studies (i.e. Weiss, 2006) (ICF International, 2012, Section 4.5.2).

In the base year, the CMAQ PPTM simulation attributes 30 percent of the total N-deposition to mobile sources within the Study Area[31]. Another 16 percent of the N-deposition was determined to come from stationary sources in the Study Area. Therefore, 46 percent of N-deposition comes from existing development and vehicle traffic generated locally within the Study Area. The remainder of Santa Clara County contributes 17 percent of the N-deposition, while the remaining Bay Area counties account for approximately 11 percent of the deposition. The CMAQ simulation indicates that the remaining 26 percent 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 (ICF International, 2012, Section 4.5.2).

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 percent of the Santa Clara County NO_X emissions, Morgan Hill contributes 3 percent, San Jose contributes 79 percent, and the remainder of Santa Clara County contributes 16 percent (ICF International, 2012, Section 4.5.2 and Appendix E).

2.4.2.1 Bay Checkerspot Butterfly

With the exception of the recent reintroduction attempts at Edgewood Park in San Mateo County, the Action Area constitutes the entire known range of the Bay checkerspot butterfly, thus the environmental baseline for this species is the same as the Status of the Species, discussed in Section 2.4.1.1 above.

30 See Section 2.4.4 of this Opinion for further discussion on critical load.
31 "Study Area" as used in Appendix E of the Plan includes State Park lands.

Critical Habitat

Critical habitat was redesignated for the Bay checkerspot butterfly in 2008 (73 FR 50406). Nine of the 13 units, or 16,601 acres of the designated 18,293 acres (91 percent), fall within the Action Area. Critical habitat in the Action Area stretches from southern San Jose to just south of Morgan Hill. The Action Area contains all of the critical habitat units that are currently known to be occupied by the species[32.]

The 16,601 acres of designated critical habitat for the Bay checkerspot butterfly in the Action 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[33] (ICF International, 2012, Section 4.7.1 and Table 4-9). In the Action Area, an estimated 12 percent of designated critical habitat for Bay checkerspot butterfly is currently protected as Type 1 Open Space (see Plan Table 5-21). However, 38 percent of critical habitat remains outside of any type of open space identified under the Plan (ICF International, 2012, Section 5.4.1).

The factors responsible for the current condition of critical habitat units contained in the Action Area are the same as those previously discussed in Section 2.4.1.1 of this Opinion. The conservation role of critical habitat in the Action Area is crucial to the long term survival of the Bay checkerspot because it contains all of the occupied units of critical habitat. There is only one remaining core area (Coyote Ridge) in the species' current range, and all known extant occurrences of the species are generally located within a 9-mile radius of Coyote Ridge (U.S. Fish and Wildlife Service, 2009). The northern half of Coyote Ridge is contained in Unit 5 (Metcalf) and the southern half of Coyote Ridge is contained in Unit 13 (Kirby).

Because population numbers fluctuate dramatically from one year to the next, based on population dynamics, life history, and weather, maintaining and enhancing occupied critical habitat is critical to the species' recovery. Maintaining and enhancing currently unoccupied critical habitat within the Action Area will also be important so that habitat is available during population booms and reintroductions are possible. Unoccupied portions of critical habitat will also be important in buffering the effects of unusual or unforeseen events that could

32 Bay checkerspot butterflies have been observed at Edgewood Park, in San Mateo County as a result of a 2011 reintroduction attempt. A subsequent reintroduction attempt was conducted in 2012. However, it is too early to determine if these efforts will result in a sustainable population (Weiss and Niederer, 2012).

33 The acreage difference between critical habitat in the Action Area and the Plan's modeled habitat is an artifact of the differing purposes and scopes of critical habitat designation and the Plan. Areas that do not support serpentine soils and vegetation are included in the final critical habitat designation because the Service concluded that they "likely play an important role in dispersal of adult butterflies from one habitat patch to another" (73 FR 50405). The modeled habitat map contained in Appendix D of the Plan was developed using an iterative process of refinement with Bay checkerspot butterfly experts. The Plan's habitat model served as the basis for estimating the Plan's impact limits and conservation commitments (ICF International, 2012, Appendix D).

otherwise drive the species to extinction, such as disease, prolonged extreme weather, and catastrophic fire.

2.4.2.2 Tiburon Indian Paintbrush

Of the 9 extant occurrences of Tiburon Indian paintbrush known within its range (California Department of Fish and Game, 2012), approximately 22 percent (2 occurrences) are located in the Action Area. These occurrences are located on 1/3 of a hectare of land within the Kirby Canyon area. Both occurrences are located along Coyote Ridge and are being monitored and managed by the Kirby Canyon Butterfly Trust. Neither site is currently permanently protected. The southern population, CNDDB occurrence #7, is located on the top of Paintbrush Hill. This is currently functioning as a mitigation site for the Kirby Canyon Landfill and is located on a reserve for Bay checkerspot butterfly conservation (U.S. Fish and Wildlife Service, 1998b). The site ranges from flat to north-northeast aspect at a 20 degree slope. The population decreased from 135 individuals in 2006[34] to 103 individuals in 2009. The occurrence was in fair condition in 2009. The site is disturbed by cattle grazing and feral pig rooting (Niederer, 2009a).

The northern population, CNDDB occurrence #9, is located in North Canyon, on a steep (40 degrees) north-north west-facing slope. It is located on privately owned land that Santa Clara County Waste Management may acquire and protect as a mitigation site for the Kirby Canyon Landfill. At the time this Opinion was being developed, the landfill operator was in the process of finalizing a conservation easement as mitigation for the recent expansion of the Landfill. Approximately 1,100 individuals were observed in 2009, which was statistically very similar to the 2006 sampling. Plants were observed from the drainage to the summit in 2009 and determined to be in excellent condition. In 2009, no threats were noted. Grazing pressure was minimal as a result of the site's steepness and no pig rooting was observed (Niederer, 2009b).

The Plan does not attempt to model habitat for the Tiburon Indian paintbrush because the serpentine soils at the two occurrences in the Action Area appear to be unique from other serpentine soils in the area (ICF International, 2012, Appendix D). The environmental baseline for the purposes of this Opinion is thus limited to site specific data available for both occurrences.

The Kirby Canyon Butterfly Trust is currently engaged in efforts to reduce feral pig-related damage to the southern site, while maintaining cattle grazing, which appears to keep invasive non-native species under control (Weiss pers. comm., as cited in ICF International, 2012, Appendix D). The Trust also plans to collect seed from the two occurrences in the Action Area in the near future. The Creekside Center for Earth Observation will be enhancing CNDDB occurrence #7. Various outplanting techniques (i.e. seeding versus outplanting with different hosts) will be tested (Niederer pers. comm., 2012).

34 2006 was much wetter than the three subsequent years.

2.4.2.3 Coyote Ceanothus

The Action Area constitutes the entire known range of the Coyote ceanothus, thus the environmental baseline for this species is the same as the *Status of the Species* discussed in Section 2.4.1.3 above.

2.4.2.4 Mount Hamilton Thistle

Of the 48 occurrences of Mount Hamilton thistle currently known within its range, approximately 83 percent (40 occurrences) are located in the Action Area, all of which have been documented within the last 20 years (ICF International, 2012, Appendix D). Two of the 40 occurrences in the Action Area are permanently protected (ICF International, 2012, Table 4-6). There are population estimates for all six occurrences that may be affected under the Plan, totaling approximately 9,500 individuals (California Department of Fish and Game, 2012; Hillman pers. comm., as cited in ICF International, 2012, Section 4.6.8).

In the Action Area, the species is only found within the Guadalupe and Coyote watersheds (ICF International, 2012, Appendix D). Occurrences in the Action Area are generally found in two areas: the Santa Teresa Hills and east of Highway 101 in the low hills and the canyons along Coyote Ridge and the Silver Creek Hills. The majority of the occurrences of Mount Hamilton Thistle in the Action Area occur east of Highway 101 (ICF International, 2012, Appendix D, Figure 1). Thirty-one occurrences were reported in the CNDDB. In addition, two occurrences were reported on the United Technologies Corporation property (Marker pers. comm., in ICF International, 2012, Appendix D), 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 (ICF International, 2012, Appendix D).

Due to the programmatic nature of the proposed action, the environmental baseline for the Mount Hamilton thistle described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the site-specific occurrence information summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the Mount Hamilton thistle and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this

methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Primary habitat for the Mount Hamilton thistle within the Action Area is modeled as serpentine seeps or serpentine soils or grasslands within 25 feet of riverine habitat in the Guadalupe and Coyote watersheds (ICF International, 2012, Appendix D). There are 487 acres of primary modeled habitat for Mount Hamilton thistle within the Action Area. A total of 204 acres (42 percent) of modeled habitat are located in Type 1, 2, or 3 Open Space with 55 acres (11 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Table 5-17).

Past development in the Coyote Valley south of San Jose, including the construction and expansion of a solid waste landfill contributed to the declining status of the Mount Hamilton thistle. Recreational activities, such as horseback riding, also contributed to the current baseline of the species in the Action Area (U.S. Fish and Wildlife Service, 1998b).

The European flower-head weevil, *Rhinocyllus conicus*, described in Section 2.4.1.4 of this Opinion is approved by the U.S. Department of Agriculture for control of exotic thistles common in the Action Area, including bull thistle (*Cirsium vulgare*), milk thistle (*Silybum marianum*), and Italian thistle (*Carduus pycnocephalus*). Its effects on Mount Hamilton thistle are unknown but the research cited above suggests that biological control of invasive weeds may be a threat to this rare native taxa.

No conservation actions in the Action Area have directly targeted Mount Hamilton thistle. However, protection of habitat along Coyote Ridge to mitigate effects on the Bay checkerspot butterfly, along with improved livestock management in this area, have indirectly benefited Mount Hamilton thistle.

2.4.2.5 Santa Clara Valley Dudleya

There are a total of 209 known occurrences of Santa Clara Valley dudleya that are presumed to be extant. Only 47 of these have population estimates (ICF International, 2012, Section 5.4.13). Of the extant occurrences in the Action Area, two occur in protected open space. **One hundred sixty one** of the 209 known occurrences are not yet recorded in the CNDDB. The estimated number of individuals known for the species varies greatly due in part to the variation in the methodology for counting the rosettes, which are formed as individual plants spread vegetatively.

Two hundred seven of the known extant occurrences are located in the Action Area. Forty-nine occurrences were reported in the CNDDB (California Department of Fish and Game, 2012), 109 occurrences were observed by United Technologies Corporation (Marker pers. comm.), 48 occurrences were observed by Santa Clara County Parks, and 1 was observed by SCVWD (ICF International, 2012, Appendix D). All but one of the non-CNDDB occurrences are on private

property on Coyote Ridge (Marker pers. comm., as cited in ICF International, 2012, Section 4.6.8), on County Parks parkland, and on SCVWD land. Of the 209 known extant occurrences, two are in the San Martin area (ICF International, 2012, Section 4.6.8).

An unconfirmed occurrence in the Action Area, documented in 2006, is not included as a known occurrence in the preceding counts. The occurrence was reported 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 since been confirmed. Still, this unconfirmed occurrence may be significant, as it was reported further south than any other known occurrence (ICF International, 2012, Appendix D).

Land cover types in the Action 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 (ICF International, 2012, Section 4.6.8).

Insufficient data are available to characterize long-term demographic trends within populations (California Department of Fish and Game, 2012). 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., as cited in ICF International, 2012, Appendix D). Population monitoring is needed to confirm this hypothesis.

The primary threats to Santa Clara Valley dudleya are overgrazing, development, and competition from non-native species (U.S. Fish and Wildlife Service, 1998b; Weiss, 1999; California Department of Fish and Game, 2012). Overcollecting is also a significant threat to Santa Clara Valley dudleya because of its attractiveness, accessibility, and slow growth rate (U.S. Fish and Wildlife Service 1998b). Other threats may include feral pigs, off-road vehicle use, and foot traffic (California Department of Fish and Game, 2012).

Protection of mitigation lands on Coyote Ridge and other sites such as the Valley Christian High School site have preserved some habitat for Santa Clara Valley dudleya.

2.4.2.6 Fragrant Fritillary

Of the 59 extant occurrences of fragrant fritillary currently known within its range, approximately 14 percent (8 occurrences) are located in the Action Area (California Department of Fish and Game, 2012). Four occurrences are located on private land. Three of these (CNDDB occurrences 25–27) are located east of Santa Clara Valley, southeast of Metcalf Canyon and less than a mile south or southeast from Metcalf Vertical Angle Benchmark (VABM), U.S. Geological Survey Morgan Hill quad, while one lies southwest of Metcalf VABM (CNDDB occurrence #54). Two occurrences (CNDDB 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 Jose. The actual occurrence size and age structure of 7 of the 8 extant occurrences of fragrant fritillary in the Action Area are currently unknown.

Due to the programmatic nature of the proposed action, the environmental baseline for the fragrant fritillary described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the site-specific occurrence information summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the fragrant fritillary and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Appendix D of the Plan describes both primary and secondary modeled habitat for the fragrant fritillary. Primary habitat is defined as serpentine bunchgrass grassland between 0 and 1,500 feet elevation on slopes with all degrees of steepness. 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. There are 165,455 acres of fragrant fritillary modeled habitat (primary and secondary) within the Action Area. A total of 42,317 acres (26 percent) of modeled habitat are located on Type 1, 2, or 3 Open Space with 16,371 acres (10 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.14).

In addition to the threats discussed in Section 2.4.1.6 of this Opinion, populations of fragrant fritillary in the Action Area may also be threatened by recreational activities and feral pigs (California Department of Fish and Game, 2012). No conservation actions have been implemented that target the fragrant fritillary in the Action Area.

The current known occurrences in the Action Area represent a relatively small portion of the species range wide (14 percent). Preservation of all of the occurrences in the Action Area does not appear to be critical to the species' survival and recovery needs at this time. The occurrences in the Action Area do not appear to be of particular significance to the species (i.e. there is no data suggesting that they are genetically distinct from other occurrences in the known range, and they do not define the known range extent).

2.4.2.7 Smooth Lessingia

The Action Area encompasses the **majority of the** known range of the smooth lessingia, thus the environmental baseline for this species is the same as the *Status of the Species* discussed in Section 2.4.1.7, as supplemented below.

CNDDB occurrence #24 is the only known extant occurrence of this species that is not contained within the Action Area. It is located in Santa Clara County, just west of Almaden Reservoir. A northwest colony was documented in 2007 and a southeast colony was documented in 2009. Populations were dense and scattered, but a population estimate was not made (California Department of Fish and Game, 2012).

Due to the programmatic nature of the proposed action, the baseline of the smooth lessingia described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the site-specific occurrence information summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the smooth lessingia and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Modeled habitat for the 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 (ICF International, 2012, Appendix D). There are 10,491 acres of primary smooth lessingia modeled habitat within the Action Area. A total of 3,659 acres (35 percent) of modeled habitat are located on Type 1, 2, or 3 Open Space with 1,268 acres (12 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.16).

No conservation actions in the Action Area have directly targeted smooth lessingia (ICF International, 2012, Appendix D).

2.4.2.8 Metcalf Canyon Jewelflower

There are 11 known extant occurrences of Metcalf Canyon jewelflower, 10 of which occur within the Action Area (ICF International, 2012, Table 4-6; California Department of Fish and Game, 2012). Only 4 of the 10 known occurrences have population estimates; 3 of these estimates are from 1989 and 1 is from 2006. They are 27, 40, 1,000, and 5,000, for a total of 6,067 individuals (California Department of Fish and Game, 2012). In addition to the 10 recorded occurrences, there are 68 "jewelflower" occurrences on one private property in the Action Area that have not been identified to species, but are either Metcalf Canyon jewelflowers or most beautiful jewelflowers (ICF International, 2012, Section 4.6.8).

Due to the programmatic nature of the proposed action, the environmental baseline for the Metcalf Canyon jewelflower described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the site-specific occurrence information. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the Metcalf Canyon jewelflower and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Suitable habitat for Metcalf Canyon jewelflower is defined in the Plan's habitat model 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 (ICF International, 2012, Appendix D). There are 8,105 acres of primary modeled habitat for Metcalf Canyon jewelflower within the Action Area. A total of 2,843 acres (35 percent) of modeled habitat are located on Type 1, 2, or 3 Open Space with 984 acres (12 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.17).

Justen Whittall and the Creekside Center for Earth Observation are collaborating to reintroduce the species on Tulare Hill at the Metcalf Energy Center Ecological Preserve, managed by the Silicon Valley Land Conservancy. Whittall has begun preliminary studies on seed germination, propagation techniques, and pollination as well as studies on genetics and taxonomy (Niederer pers. comm., 2012).

2.4.2.9 Most Beautiful Jewelflower

Of the 86 extant occurrences of most beautiful jewelflower currently known within its range (California Department of Fish and Game, 2012; ICF International, 2012, Appendix D), approximately 45 percent (39 occurrences) are located in the Action Area. **Thirty six** of these occurrences are recorded in the CNDDB; the remaining occurrences have been observed on Santa Clara County parks and on or adjacent to SCVWD lands (ICF International, 2012, Appendix D). Only 40 of the 86 known occurrences have population estimates.

Most records in the CNDDB are of high precision and may be accurately located. Two other occurrences are known that are not recorded in the CNDDB; two populations of the dark-flowered form that occur on Mount Hamilton (Mayer *et al*., 1994). 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 are located on Santa Clara County land as well as privately owned land. Two of the occurrences on private land are owned by IBM (California Department of Fish and Game, 2012). The six occurrences that may be affected under the Plan have a total population estimate of 1,076 (California Department of Fish and Game, 2011 and ICF International, 2012, Appendix D). In addition to the 39 recorded occurrences, there are 68 "jewelflower" occurrences on one private property in the Action Area that have not been identified to species, but are either most beautiful jewelflowers or Metcalf Canyon jewelflowers (ICF International, 2012, Section 4.6.8).

Due to the programmatic nature of the proposed action, the environmental baseline for the most beautiful jewelflower described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the site-specific occurrence information summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the most beautiful jewelflower and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Both primary and secondary habitat are modeled for the most beautiful jewelflower, both of which could potentially occur in the Fremont-Livermore Hills and Valleys, Santa Clara Valley, Leeward Hills, Santa Cruz Mountains, Western Diablo Range, and Diablo Range ecoregion subsections. Primary modeled 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. Secondary modeled habitat is defined as non-serpentine rock outcrops between 0 and 3,500 feet elevation on slopes with all degrees of steepness (ICF International, 2012, Appendix D). There are 14,362 acres of most beautiful jewelflower modeled habitat (primary and secondary) within the Action Area. A total of 5,042 acres (35 percent) of modeled habitat are located on Type 1, 2, or 3 Open Space with 1,500 acres (10 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.18).

There are no known conservation actions in the Action Area focused on the most beautiful jewelflower. However, conservation actions focused on other serpentine species may have resulted in ancillary benefits to the species. For example, VTA mitigation lands on Coyote Ridge protects suitable habitat for the most beautiful jewelflower. Also, managed livestock grazing along Coyote Ridge, designed to maintain and improve habitat for the Bay checkerspot butterfly, likely benefits the most beautiful jewelflower by reducing the density of nonnative invasive plants species. The acquisition of Cañada de Oro Open Space Preserve by the Santa Clara Valley Open Space Authority also protects several occurrences of the most beautiful jewelflower (ICF International, 2012, Appendix D).

Nonnative species invasion of serpentine grassland threatens occurrences in the Action Area. Current grazing regimes may threaten some populations in the Action Area west of Highway 101 (U.S. Fish and Wildlife Service, 1998b). Additional threats in the Action Area include rooting by feral pigs and disturbance from landfill operations (ICF International, 2012, Appendix D).

2.4.3 General Effects of the Action on All Covered Species

To minimize repetition in this Opinion, we use a three-tiered approach to describe the effects of the proposed action. Section 2.4.3 of this Opinion represents the broadest level of the effects analysis, as it describes effects anticipated to be common to all Covered Species. The subsequent tier of analysis focuses on effects specific to groups of Covered Species, as described in Section 2.4.4 (serpentine species), Section 2.5.3 (aquatic species), and Section 2.6.3 (avian species). The most focused level of effects analysis is presented on a species-level, as described in Sections 2.4.5, 2.5.4, 2.6.4, 2.7.3, and 2.8.3. Each tier of analysis builds upon the previous tier. We discuss the broadest level of effects first (i.e. mortality, injury, harm, and harassment). Subsequent analysis then focuses on anticipated types of effects that could ultimately result in harm and harassment, such as fragmentation.

2.4.3.1 Mortality, Injury, Harm, and Harassment

All seven categories of Covered Activities could directly or indirectly result in the death or injury of Covered Species and harm[35] and harassment[36] of wildlife Covered Species. Death or injury of Covered Species could result from both temporary and permanent effects. Ground disturbance, particularly the conversion of undeveloped land cover types to developed land cover types, will be the primary direct cause of death or injury of Covered Species, as Covered Species could be crushed, buried, exposed, or otherwise injured within the conversion footprint (i.e. home, office building, park facility, etc.). Similarly, individuals inhabiting areas adjacent to, but outside of, the conversion footprint could also be directly injured or killed as a result of temporary construction-related activities such as staging, stockpiling, and driving. Urban development, rural capital projects, and rural development will result in the majority of ground disturbance and will likely result in the majority of deaths and injuries.

Ground disturbance may result in temporary or permanent effects on Covered Species. The permanent or temporary nature of effects will be dependent upon the intensity, duration, and frequency of each activity. For example, construction and operation of temporary access routes and staging areas for less than one year could temporarily affect dispersal, foraging, and refugia habitat for Covered Species, which could result in harm or harassment. These temporary effects on Covered Species habitat however will be minimal because existing developed areas, such as access roads and parking lots, will be targeted for staging areas. If such areas are not available, highly disturbed ruderal areas will be selected. Furthermore, staging activities will not occur in sensitive land cover types such as stream beds, riparian corridors, or serpentine areas (ICF International, 2012, Section 4.3.2). Another temporary activity that could result in harm and harassment is vegetation removal, which could temporarily degrade or remove sheltering, foraging, and breeding habitat for Covered Species.

Direct mortality, injury, harm, and harassment will also be minimized by the Plan's Conditions, described in Chapter 6. The following avoidance and minimization measures are included for all stream related projects (see Conditions 3, 4, and 5 and Table 6-2) and rural projects (see Conditions 6, 7, and 8), which will minimize take of Covered Species:

- Minimize ground disturbance to the smallest area feasible
- Use existing roads for access and disturbed areas for staging as site constraints allow

35 The term "harm" includes 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).

36 The term "harass" is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which may include, but are not limited to, breeding, feeding, and sheltering (50 CFR §17.3).

- Off-road travel will avoid sensitive communities such as wetlands and known occurrences of covered plants

Development is expected to indirectly result in the death, injury, harm, and harassment of Covered Species by increasing the presence of humans and human commensal species (i.e. dogs, cats, raccoons). Increased human presence could also facilitate other indirect effects such as the spread of disease and non-native invasives (see Sections 2.4.3.3 - 2.4.3.10 below). Most of these anticipated indirect effects will occur along or near the boundary between new urban or rural development and the Reserve System (i.e. edge effect). Covered Species may be harassed by pets, which increase the extent of human influence (Barratt, 1997; Schlesinger *et al*., 2008). The significance of the effects of humans and their pets will vary depending on the individual Covered Species' sensitivity, which will be dependent on a variety of factors such as body mass and size, age, foraging habits, and reproductive strategy. An increased human presence may also indirectly result in increased harm to Covered Species as a result of trampling and littering.

These effects will be greatly minimized because the Reserve will consist of large contiguous blocks of preserved habitat and will be assembled according to assembly principles that buffer urban effects and reduce the urban-reserve interface boundary (ICF International, 2012, Section 5.2.3). Reserve assembly principles will thus minimize the exposure of Covered Species to these indirect edge effects. In recognition of the reduced habitat function of the urban-reserve boundary, any area adjacent to development that is disked, mowed, and/or sprayed with herbicides for fuel management will not be credited toward land acquisition requirements of the Plan (ICF International, 2012, Section 5.3.1). In addition, the Implementing Entity's outreach efforts will reduce the likelihood of harm and harassment by educating private landowners about Covered Species and factors contributing to their declining status (ICF International, 2012, Section 5.3.2).

Several Plan Conditions will further reduce the indirect harm and harassment of Covered Species. For example, in accordance with Condition 1, natural or artificial barriers or other access restrictions may be installed around a new development to protect sensitive land cover types and Covered Species in the Reserve System. Barriers will be designed so they are appropriate for site conditions and resources protected[37] (ICF International, 2012, Section 6.4.1). Condition 2 describes design requirements that will be incorporated into new development at the urban-Reserve System interface. Example design requirements include, locating development as far from the Reserve boundary as possible, placing new roads on the interior of development, designing fencing adjacent to home sites to minimize the risk of pets escaping and entering the

37 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, the following considerations will be taken into account: use for Covered Species movement, potential creation of barriers that would prevent movement critical for a species' life cycle, and potential for encouraging species to use other less favorable crossings (ICF International, 2012, Section 6.4.1).

Reserve, excluding private gates along fences bordering the Reserve, etc. (ICF International, 2012, Section 6.4.1). Furthermore, Condition 9 also prohibits the introduction of domestic[38] or feral animals, including cats, ducks, fish, and reptiles, in the Reserve System (ICF International, 2012, Section 6.4.6).

Operation and maintenance activities (i.e. sediment removal and vegetation clearing) involving the use of heavy equipment could directly injure, kill, harm, or harass Covered Species. In general, the extent of the effect will be small relative to that anticipated for urban and rural development because most operations and maintenance activities will result in infrequent and temporary ground disturbance. Exceptions to this however include Covered Activities like non-routine stream maintenance on Llagas Creek, where overall vegetation in the channel will be reduced by approximately 50 percent in perpetuity (ICF International, 2012, Section 4.3.3).

Maintenance activities could also indirectly affect Covered Species by degrading and removing suitable habitat. The majority of operation and maintenance activities are expected to have minimal permanent or temporary direct effects on Covered Species because the vast majority of these activities will occur within previously disturbed areas or will occur at relatively low frequencies and for short durations of time, allowing habitat to recover and Covered Species' behavior to return to baseline conditions before subsequent operation and maintenance-related disturbance. However, operations and maintenance activities that occur at relatively high frequencies or for long durations of time could be just as detrimental to Covered Species as land conversion.

With the exception of conservation strategy-related Covered Activities, ground disturbing Covered Activities in the rural landscape will result in more Covered Species deaths and injuries than anticipated in the urban landscape. This is true for several reasons. First, rural development tends to occur on larger parcels, thus affecting larger areas. Second, the existing landscape is generally less disturbed relative to urban sites and thus tends to have greater species diversity and richness. Third, rural development tends to occur near or in areas with native vegetation and higher biological values, including areas near or adjacent to the future Reserve System. Conservation strategy-related Covered Activities are the exception to this generalization because they will result in relatively minimal amounts of permanent and temporary ground disturbance and have a net benefit to Covered Species (ICF International, 2012, Tables 4-5 g & h).

The areas targeted for the Reserve System include substantial amounts of high-quality habitat while Covered Activities will primarily occur in areas with low-quality habitat. The Plan's regional avoidance and minimization approach to conservation thus eliminates the need for, in most cases, project-level avoidance and minimization (ICF International, 2012, Section 5.2.2).

38 Domestic animals may be used in the Reserve System for management purposes (i.e. such as livestock for grazing or dogs for livestock control or protection).

In addition to its regional avoidance and minimization approach, the Plan minimizes ground disturbance-related death, injury, harm, and harassment by limiting permanent effects on land cover to 17,975 acres (see Plan Table 4-2) and temporary effects on land cover to 2,219 acres (see Plan Table 4-3) (ICF International, 2012). Effects on Covered Species are further minimized with limits on permanent and temporary effects on modeled habitat (see Plan Table 4-4) and covered plant occurrences (see Plan Tables 4-6 and 5-16) (ICF International, 2012).

Although surveys are required in specific cases, overall, effects 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 that was not anticipated by the Plan, the local agency reviewing or proposing the project must consult the Implementing Entity for advice on species avoidance and minimization measures. The Implementing Entity will also contact the Wildlife Agencies for technical advice (ICF International, 2012, Section 6.8.5). Although the Wildlife Agencies will not be able to request additional mitigation, implementation of measures advised by the Wildlife Agencies that are within the operating conservation strategy, are anticipated to minimize potential adverse effects. Furthermore, nothing precludes the Wildlife Agencies from taking action to avoid or minimize effects themselves (i.e. Wildlife Agencies could choose to salvage important populations if necessary).

Development-related Covered Activities will indirectly increase the amount of vehicle-related fatalities and injuries of Covered Species. The increased volume of traffic associated with new and improved roads will intensify road crossing hazards. The majority of road kills are likely to occur at the urban-Reserve interface. The significance of road kills will vary depending on the Covered Species and their individual speed and activity pattern relative to traffic patterns (Hels and Buchwald, 2001). Although vehicle collision is a growing source of terrestrial vertebrate mortality, some studies suggest that road kills generally[39] have minimal effects on population size (Forman and Alexander, 1998; Spellerberg, 1998). If the population in question is regulated by density-dependent factors (i.e. intraspecific competition), road mortality will not have a very large effect on the population. If however, the population in question is mainly regulated by density-independent factors, such as climactic variability, road mortality will be an additive effect and would be an important population regulating factor (Hels and Buchwald, 2001). Implications on population genetics resulting from barriers that persist over many generations are the most significant effects of roads, not actual road mortalities (Forman and Alexander, 1998).

39 If road mortality increases to a level where reproductive output is too small to reach an area's carrying capacity, populations may become so small that demographic stochastic processes will become important for the long-term persistence of a population (Hels and Buchwald, 2001). Therefore, there are exceptions to this generality for extremely rare species, as suggested by Forman and Alexander (1998).

Conditions in the Plan will greatly minimize the potential for, and thus the significance of, road-related mortality and injury. Condition 2 requires roads for new development at the urban-Reserve interface be placed on the interior of the development (i.e., away from the Reserve boundary), which will reduce exposure. Furthermore, Condition 6 describes design requirements to enhance existing undercrossings (i.e., minimum culvert size and fencing design) and requires all structures constructed for wildlife movement to be monitored at regular intervals, and repaired promptly, to ensure that the structures are in proper condition (ICF International, 2012, Section 6.4.4). Finally, Condition 8 requires replaced and repaired road medians and shoulder barriers located in areas that support natural land cover types to allow wildlife movement[40] (ICF International, 2012, Section 6.4.5).

Certain Covered Activities could have permanent effects on a portion of plant occurrences. If effects resulting from Covered Activities do not threaten or reduce the long-term viability of a plant occurrence, as described in Condition 20 of the Plan (ICF International, 2012, Section 6.6.2), then it will be considered a partial permanent impact on the occurrence. If the effects reduce the long-term viability of a plant occurrence, then it would be considered a permanent effect, and the effects on the occurrence would count toward the maximum number of plant occurrences of that species allowed to be affected under the Plan, as further described in Section 2.4.5 and 2.8.3 of this Opinion (ICF International, 2012, Section 4.4.1).

In the context of covered plants, "potential impacts" and "impact limits" described in the Plan refer in all cases to the reduction of long-term viability. 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 percent 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 percent 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 effects and success (see Condition 20, Chapter 6) (ICF International, 2012, Section 4.4.1).

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 percent over a monitoring period of at least 3 years, unless site-specific conditions otherwise suggest substantial declines in population viability (see Condition 20, Chapter 6) (ICF International, 2012, Section 4.4.1).

40 Exceptions may be made by the Applicants if significant safety concerns or financial constraints arise.

The Plan includes two conditions to minimize direct effects on covered plants. Condition 19 minimizes direct effects on covered plants by creating an option for the Implementing Entity to salvage covered plants that cannot be avoided by Covered Activities. The Implementing Entity will weigh the expected costs and benefits of salvage efforts before acting. Condition 19 describes salvage guidelines. See Section 6.6.2 of the Plan for a detailed description of Condition 19.

Condition 20 requires surveys in accordance with Item 5 of the Plan Application Package (ICF International, 2012, Section 6.8.5) to be conducted to determine whether a covered plant occurs on site. Plant surveys will be required in suitable habitat within a 0.25-mile (1,320 feet) radius of a known occurrence to ensure that all occurrences are accounted for and tracked during Plan implementation (ICF International, 2012, Sections 5.3.1 and 6.6.2). If a covered plant occurs on site, Condition 20 requires that the occurrence be described in the application package according to the guidelines in Section 5.3.1 of the Plan (ICF International, 2012). 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. If a covered plant occurrence is located during a survey on the project site, the local jurisdiction will obtain the opinion of a qualified biologist[41] regarding the projected long-term viability of the 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 (ICF International; 2012; Sections 6.6.2).

Condition 20 details avoidance and minimization measures to be implemented if a covered plant is found on a project site. In summary, these measures confine Covered Activities to the minimum area necessary, establish setback buffers around covered plants, and require monitoring (and if possible maintaining)[42] covered plant populations that may only be disturbed or partially affected by Covered Activities. See Section 6.6.2 of the Plan for a detailed description of Condition 20.

41 "Qualified biologists" are those biologists who have the experience, education, and training necessary to perform the tasks described in the Plan accurately and in an unbiased fashion. Training must be in the field to which the task is related. If the task has the potential to result in take of Covered Species, the biologist must be approved by the Implementing Entity and Wildlife Agencies prior to conducting such tasks. See Section 6.8.5 of the Plan for details on the process that will be implemented to identify qualified biologists.

42 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 an additional population in the Reserve System to offset this partial impact (ICF International, 2012, Section 6.6.2).

Although land cover mapping is not required for operations and maintenance activities conducted by Applicants, except where serpentine land cover will be affected, land cover mapping is required for all private applicants and Participating Special Entity projects. Applicants must still implement all applicable Conditions, including plant surveys. As such, some projects that include operations and maintenance Covered Activities may require land cover mapping to determine applicable Conditions. If no land cover mapping is conducted, Applicants will rely on the most recent land cover map developed by the Implementing Entity to quantify effects (ICF International, 2012, Section 6.8.3). All applicable wildlife and plant surveys must be conducted prior to implementation of covered operations or maintenance activities until Covered Species have not been detected at the site for three consecutive years. Applicable surveys will once again be required if operations and maintenance activities cease for three or more consecutive years (ICF International, 2012, Section 6.8.5).

The Plan's primary means of mitigating unavoidable direct and indirect effects, including the death, injury, harm, and harassment of Covered Species, is the preservation and management of a 46,496 to 46,920-acre Reserve System (ICF International, 2012, Executive Summary). Table 5-17 of the Plan describes minimum modeled habitat acquisition requirements in terms of newly acquired lands and existing open space lands incorporated into the Reserve System (ICF International, 2012). The Reserve System will be assembled in accordance with the reserve design criteria described in Section 5.2.3 of the Plan and will meet specific acreage requirements for each Conservation Analysis Zone (CAZ), as described in Table 5-18 of the Plan (ICF International, 2012). Habitat enhancement, restoration, and creation will further mitigate unavoidable deaths and injuries as these actions will improve habitat for Covered Species currently occupying marginal habitat or will create colonization opportunities for Covered Species currently residing in adjacent areas. In either case, improved habitat conditions are conducive to species fitness and fecundity because they enhance breeding, sheltering, and feeding opportunities for future generations.

Explicit species occupancy requirements are described in the Plan for all plants (ICF International, 2012, Table 5-16) and for six wildlife Covered Species[43] (ICF International, 2012, Section 5.3.1), to further demonstrate that the Reserve System is adequately mitigating the unavoidable death, injury, harm, and harassment of Covered Species.

Plant occurrences must be protected in the Reserve System prior to effects (ICF International, 2012, Section 4.4.1). Permanent effects to plant occurrences (i.e. reduction or loss of long-term viability of an occurrence) will be offset by the acquisition of occurrences of the same species that is at least equivalent in size[44]

43 Occupancy requirements were not developed for some covered wildlife species due to their cryptic nature, low site fidelity, or rarity in the Action Area (i.e. least Bell's vireo, San Joaquin kit fox, tricolored blackbirds).
44 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 occurrence size known during the development of this Opinion.

and of the same or better "condition" than the affected occurrence. 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 described in Section 5.3.1 of the Plan (ICF International, 2012).

The number of plant occurrences that must be acquired prior to effects will be in accordance with the Plan's species-specific acquisition ratios (see Plan Table 5-16) (ICF International, 2012). For example, although the Plan proposes to preserve 55 occurrences of Santa Clara dudleya if additional occurrences were not discovered during the permit term, 4 occurrences of equal or greater size and equivalent or better condition must be acquired prior to each effect. In other words, all 55 occurrences of Santa Clara dudleya do not need to be acquired prior to the first effect. For compliance purposes, mitigation and conservation will be based on known occurrences. If the Implementing Entity is unable to protect the necessary plant occurrences, project proponents will be required to protect the covered plant occurrences in order to receive coverage under the Plan (ICF International, 2012, Section 5.3.1).

When practicable, all lands protecting covered plant occurrences will be connected to existing protected areas or 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 under the Plan (i.e., all other options have been exhausted). A 40-acre minimum was established because it is a common parcel size in the Action Area (1/16 of a section) and because this is the estimated minimum size needed to properly manage a site in the Action Area. Because land acquired for the Reserve System must be linked to other Plan reserves or existing public lands whenever possible, few, if any, isolated, 40-acre reserves are anticipated (ICF International, Section 5.3.1).

For the purposes of the Plan, created plant occurrences will not be used to mitigate adverse effects but rather to contribute to recovery. The only exception to this rule is the Coyote Ceanothus (ICF International, 2012, Sections 4.4.1 and 5.4.11).

Furthermore, the Plan will also establish a permanent conservation seed bank for each covered plant species in the National Collection of Endangered Plants operated by the Center for Plant Conservation. Seeds will be deposited at a local custodial institution (i.e., a botanic garden) designated by the Center for Plant Conservation. 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. Seed banking is identified in the *Recovery Plan for Serpentine Soil Species of the San*

Francisco Bay Area (U.S. Fish and Wildlife Service, 1998b) as a high priority recovery effort for covered serpentine plants and is applicable to all plants covered under the Plan, as it guards against extinction of populations from chance catastrophic events and provides potential material for enhancement efforts in existing populations, repatriations, and/or introductions to new sites (U.S. Fish and Wildlife Service, 1998b).

The Plan's Stay-Ahead Provision will ensure that rough proportionality is maintained between effects on Covered Species and mitigation and conservation (ICF International, 2012, Section 8.6.1). With the exception of the Coyote ceanothus, created plant occurrences will not count toward the Stay-Ahead provision (ICF International, 2012, Section 5.3.1). To further ensure that the Implementing Entity makes steady progress towards the final land acquisition targets, the Implementing Entity will work with the Wildlife Agencies to conduct a formal and complete review of progress toward building the Reserve System in Year 20 of implementation (ICF International, 2012, Section 5.3.1).

Death, injury, harm, and harassment resulting from the implementation of the conservation strategy will be minimal. Overall, the long-term benefits gained through conservation actions, monitoring, and limited recreation will far exceed the effects of the incidental take that may occur. For example, prescribed burns may directly injure or kill some Covered Species (i.e. Bay checkerspot larvae) and could temporarily result in reduced cover and forage. However, prescribed burns will be conducted under very controlled conditions[45] to minimize the extent of incidental take and will provide long-term net benefits to grassland Covered Species by reducing nonnative invasive plant cover that degrades habitat. Proper implementation of management techniques and appropriate changes made through the adaptive management process described in Chapter 7 of the Plan will adequately minimize the potential for adverse effects.

The creation of the Reserve System will create new recreational opportunities that may result in the death, injury, harm, or harassment of Covered Species. Recreationists may inadvertently trample slow moving or stationary Covered Species that are sometimes difficult to detect (i.e. Bay checkerspot larvae, Santa Clara Valley dudleya, etc.). Dogs accompanying recreationists could also kill or injure Covered Species. Furthermore, recreationists in natural areas may affect Covered Species by disrupting foraging and social behavior (Skagen *et al*., 1991; Kaiser and Fritzell, 1984; Burger and Gochfeld, 1998), disrupting parent-offspring bonds (Oldfield, 1988) and pair bonds, and increasing predation at nest sites (Strang, 1980; Safina and Burger, 1983). Recreation-related harassment could also cause Covered Species to avoid or abandon otherwise suitable habitat (Taylor and Knight, 2003).

45 Reserve unit management plans will describe reserve-specific management strategies for maintaining, and when necessary, improving existing habitat conditions for Covered Species and will address prescribed burns when necessary to meet Plan goals and objectives (ICF International, 2012, Section 5.2.5).

The likelihood of recreation-related effects on Covered Species will be greatly minimized because the amount, extent, and type of recreation permissible in the Reserve System will be limited by the recreation component of each reserve management plan, as further described in Condition 9 of the Plan. Reserve management plans will be submitted to the Wildlife Agencies for review and approval during Plan implementation. Recreation plans will describe acceptable forms of recreation, identify sites that contain suitable or occupied habitat for Covered Species, describe a framework for enforcement of recreational restrictions, and describe triggers for use restrictions or closures (ICF International, 2012, Section 6.4.6). 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 (ICF International, 2012, Section 4.3.7). As indicated in Condition 9, off-trail activities and other active recreation not specifically listed as approved activities in Condition 9 will be prohibited. Recreational uses will be allowed only during daylight hours and designated times of the year unless authorized through a use permit (i.e., backpacking). 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 a leash (ICF International, 2012, Section 6.4.6). The Implementing Entity will track recreation in the Reserve System and use monitoring data to adaptively manage the Reserve (ICF International, 2012, Section 7.3.1). Overall, controlled public access to the Reserve System will result in long term benefits for Covered Species, as it will connect people with nature and foster an appreciation of Covered Species and the natural communities that support them. These long term benefits greatly outweigh the minor adverse effects that may occur through increased recreation in the Reserve System.

2.4.3.2 Plant Habitat Loss and Degradation

Effects resulting from the loss and degradation of covered plant habitat will be analogous to harm and harassment of covered wildlife species, previously described in Section 2.4.3.1 of this Opinion. In addition to mitigation measures previously discussed for wildlife Covered Species, the Plan minimizes indirect effects on covered plants by requiring all plant occurrences protected under to the Plan to include a 500-foot buffer from 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. The 500-foot buffer may be reduced under specific circumstances where, based on documented site conditions, plant occurrences are protected from adverse land uses by other 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. Buffers surrounding protected plants will also expand as plant occurrences expand. In other words, occurrence expansion will not result in a reduced buffer (ICF International, 2012, Section 5.3.1).

2.4.3.3 Habitat Fragmentation

Habitat fragmentation is defined as discontinuity in the spatial distribution of resources and conditions present in an area that affects occupancy, reproduction, or survival of a specific species (Franklin *et al*., 2002) and is an anticipated indirect effect of the Plan. Development-related Covered Activities will be the most significant source of habitat fragmentation. However, operation and maintenance-related Covered Activities that occur at a frequency and/or duration that effectively removes habitat value are expected to have fragmenting effects similar to development. Development (i.e. subdivisions, ranchettes, and roads) will create barriers for Covered Species dispersal and subsequently reduce gene flow.

Habitat fragments are smaller than the whole and thus have diminished resources to sustain viable populations of Covered Species (Franklin *et al*., 2002). Covered Species that can move between fragments may use more than one fragment, but there are inherent risks associated with migrations between fragments, including but not limited to, predation, competition, vehicle strikes, and desiccation. Less mobile Covered Species may be restricted to a single fragment, which may not contain the full suite of resources needed to meet the annual life history requirements of an individual. Small and/or isolated fragments typically support small populations of flora and fauna and are thus more vulnerable to stochastic events and extirpation. Unoccupied fragments of habitat that are separated from a source population by a barrier are less likely to be repopulated, which could result in the constriction of a Covered Species' distribution and range. While the relative footprint of development may be lower in rural areas relative to urban areas, the impact of fragmentation is higher in the rural setting because dispersed patterns of development maximize the individual influence of each home (Lenth *et al*., 2006). For these reasons, fragmentation could render Covered Species habitat less suitable or unsuitable for breeding, feeding, or sheltering in the Action Area.

Existing land use policies in the Action Area will substantially limit the footprint and extent of rural development, which may reduce the effects of fragmentation on Covered Species. The majority of the areas intended to be incorporated into the Reserve System (See Figure 5-7 of the Plan) are large land holdings classified as "Hillside" or "Ranchland" land uses under the County General Plan. In these areas, the maximum development density allowed is 1 residence per 20 to 160 acres. Subdivision of these sites seldom occurs, and this pattern is not expected to change during the permit term due to the physical challenges of development in these areas. Existing County policies require most Hillside subdivisions to cluster future development and preserve a minimum of 90 percent of the site as open space. County policies and regulations also require that grading be minimized in Hillsides and Ranchlands, which often results in clustered development (ICF International, 2012, Section 4.3.6). A study conducted by Odell and Knight concluded that houses have an associated zone of influence and that clustered

development result in an overlap of these zones of influence, thus minimizing the amount of an affected area by rural development (Odell and Knight, 2001).

The ecological benefits of these existing land use policies alone however, will not necessarily significantly minimize the effects of fragmentation, as suggested by a more recent study conducted by Lenth *et al*. (2006), which found that wildlife species composition in clustered housing developments was more similar to that of dispersed housing developments than that of undeveloped areas, potentially because clustered and dispersed housing developments are characterized by high densities of human-commensal species and low densities of species that are sensitive to development (Maestas *et al*., 2003).

Regardless of existing land use polices, the Plan will minimize the effects of fragmentation that are likely to result from development-related Covered Activities. Reserve System assembly principles described in the Plan will minimize the adverse effects of fragmentation by requiring the Implementing Entity to maximize size efficiently, preserve the highest-quality communities, preserve connectivity, and consider full ecological diversity within communities (ICF International, 2012, Section 5.2.3). An important measure of the Reserve System's success will be the degree to which it maintains or improves opportunities for movement and genetic exchange of native organisms, as stated in Goal 2 of the Plan (ICF International, 2012, Table 5-1a). Section 5.3.2 of the Plan describes conservation actions that will be carried out to achieve Goal 2. For example, the Implementing Entity will institute a data collection program to better understand how wildlife (both umbrella species and Covered Species) move within and through the Action Area and will initiate a feasibility study focused on three potential corridors (ICF International, 2012). Section 7.3.1 of the Plan describes the monitoring framework that will be used to assess and monitor landscape linkages. This data will be used to deduce the level of connectivity maintained and enhanced for Covered Species.

Plan Conditions will further minimize the effects of fragmentation. Condition 6 for example, requires the implementation of transportation design and construction practices described in Plan Table 6-3, including enhancing existing undercrossings and incorporating wildlife passage in road and rail barrier designs, which will benefit terrestrial Covered Species. Transportation project design requirements include implementation of minimum culvert size, installation of grating that allows ambient lighting in undercrossings, and installation of fencing to direct animals to undercrossings (ICF International, 2012, Section 6.4.4 and Table 6-3). Furthermore, the Implementing Entity will coordinate with road operators to remove fences, replace culverts, and install free span bridges to allow wildlife, including Covered Species, to move freely under and over roadways (LM-1, LM-2, LM-3). To increase the probability that wildlife, including Covered Species, will use these crossings, fencing or other features will be installed to direct the movement of targeted species (LM-4). Finally, road operators will be required to remove or perforate median barriers, where allowable and safe (LM-5).

Condition 7 describes rural development design and construction requirements, including minimization measures to address site hydrology, vineyards, and private rural roads. Condition 7 would minimize habitat fragmentation because it requires the minimization of ground disturbance to the smallest area possible and use of existing roads for access (ICF International, 2012, Section 6.4.4). Finally, Condition 8 requires that all maintenance or repair of road medians or shoulder barriers in areas that support natural land cover types not reduce the ability of wildlife, including Covered Species, to move through or over them, within safety limits. Replacement or repair of road medians will be designed to allow Covered Species to move past these structures (ICF International, 2012, Section 6.4.5).

Furthermore, the Wildlife Agencies will have review and approval over highway, roadway, interchange upgrades, and mass transit projects occurring outside the planning limit of urban growth or in any in-stream area to ensure relevant conditions of the Plan are incorporated into project design (ICF International, 2012, Section 8.7.3). The Implementing Entity's education and outreach efforts will further reduce the effects of fragmentation by raising public awareness of reserve management goals and how the public can support them. Outreach efforts will include educating private landowners about land uses that facilitate wildlife passage for the benefit of Covered Species (ICF International, 2012, Section 5.3.2).

The Reserve System will contain approximately 40 miles of dirt roads and 12.5 miles of paved roads (ICF International, 2012, Table 4-5g). Adverse effects of these roads are expected to be minimal because they represent a very small portion of the total Reserve acreage. Furthermore, traffic volume and speeds will be minimal on these roads. This small network of roads will be necessary for the Implementing Entity to maximize the benefits of the Reserve System by providing necessary access for management and monitoring activities.

2.4.3.4 Disease

Outbreaks of novel and emergent pathogens in wildlife are likely as long as humans continue to alter the natural environment (Dobson and Foufopoulos, 2001). The introduction and spread of disease that affects Covered Species or predominant species (i.e. sudden oak death) are anticipated direct and indirect effects of the Plan. Each category of Covered Activities has a relatively equivalent potential for spreading disease, as each directly or indirectly involves the transportation of humans, equipment, animals, and plants, all of which could serve as disease vectors. For example, development, operations and maintenance, and Reserve System management activities may inadvertently spread chytrid fungus if equipment is not properly cleaned between work sites. Furthermore, conservation and minimization actions may inadvertently result in the spread of disease if infected individuals are introduced into uninfected populations. The level of risk associated with each intended translocation will be dependent upon the Covered Species involved, the quantity and quality of introduction sites, and the translocation method.

Although the potential for Covered Activities to spread disease cannot be avoided completely, the Plan includes measures that will reduce the likely spread and introduction of disease. For example, reserve unit management plans will establish mobilization and demobilization areas to minimize the spread of diseases (ICF International, 2012, Section 5.3.2). Furthermore, the Implementing Entity will maintain a watchlist of dangerous diseases in the Action Area (ICF International, 2012, Section 7.3.1), and the monitoring program will identify and map existing diseases in the Reserve System so that new diseases can be identified quickly and controlled or eradicated through the adaptive management process (ICF International, 2012, Sections 7.3.1 and 10.2.1). The presence of disease will also be accounted for in the Reserve System land acquisition process (ICF International, 2012, Section 5.3.1). Reserve System assembly principles and public outreach efforts will further reduce the likelihood that disease will affect the long term viability of Covered Species. Condition 2, which describes design requirements to control access to the Reserve System, will have the ancillary benefit of controlling the transmission of disease because it will reduce the risk of disease transmission and exposure. Additional review and approval of the Wildlife Agencies will reduce the potential spread and introduction of disease associated with translocations (ICF International, 2012, Section 8.7).

Despite the implementation of minimization measures, existing diseases will likely spread and new diseases will likely occur during the permit term. Subsequently, diseases are identified as a Changed Circumstance in the Plan, for which the Applicants will fund remedial measures up to a defined upper limit. The Applicants will fund and carry out remedial measures for infestations of new diseases affecting up to 25 percent of a predominant natural community (in acres) or occupied Covered Species habitat within the Reserve System in any given year[46]. It will also fund and carry out remedial measures for the spread of diseases existing on up to 25 percent above current conditions within the Reserve System in any given year. If a disease spreads beyond these thresholds, it would be considered a catastrophic event beyond the Plan scope and remedial actions to address it would not be required of the Implementing Entity (ICF International, 2012, Section 10.2.1). In summary although the spread of diseases is likely, the implementation of the Plan's conservation strategy, Conditions, and remedial measures will reduce their effect such that the long term viability of Covered Species is not compromised.

2.4.3.5 Nonnative Invasives

The introduction and spread of nonnative invasives are anticipated direct and indirect effects of the Plan. Nonnative animals and plants alter ecosystem dynamics by disrupting ecological processes and degrading habitat quality. Invasive species could prey on or compete with Covered Species. Ecosystem-level changes occur when invading species differ substantially from natives in

46 The Implementing Entity will monitor current levels of disease relative to the current composition of the Reserve System each monitoring year.

resource acquisition and utilization, alter the trophic structure, or alter the disturbance regime of an invaded area (i.e. fire frequency changes as a result of plant invasions) (Vitousek, 1990).

Each category of Covered Activities could result in the spread or introduction nonnative invasives, as they each directly or indirectly involve the transport of humans, equipment, animals, and plants. For example, reproductive parts of nonnative plants could be inadvertently transported by maintenance equipment (i.e. vehicles, lawn mowers) or vehicles traveling on roads created and/or maintained under the Plan (Spellerberg, 1998).

The most significant effects of non-native invasion are likely to occur in the rural landscape, because as previously stated, rural areas are in general, less disturbed and thus have higher habitat quality and species richness relative to urban areas. Development is likely to indirectly result in an increase in nonnative and human-commensal plant and animal species (i.e. dogs and cats), especially in the rural landscape (Maestas *et al*., 2003; Odell and Knight, 2001). In the rural setting, nonnatives have been known to alter the composition of plant and wildlife communities up to 590 feet away from individual home sites (Odell and Knight, 2001).

Covered Activities associated with the implementation of the conservation strategy are anticipated to have relatively minimal effects on Covered Species because relative to development and operations and maintenance activities, conservation actions will require less temporary and permanent ground disturbance. Although monitoring and translocation activities may inadvertently spread non-native species, minimal adverse effects are anticipated as these activities will be closely coordinated with the Wildlife Agencies and carried out by qualified biologists (ICF International, 2012, Section 8.7.3).

Proper implementation of the conservation strategy will greatly reduce the potential of nonnative invasions. Per Objective 3.3 of the Plan, the Applicants will eradicate or reduce non-native invasive plant and animal species to enhance Covered Species habitat within the Reserve System (ICF International, 2012, Table 5-1a). Table 5-1a of the Plan describes conservation actions that will be implemented to achieve this objective. For example, nonnative pigs will be eradicated or reduced in the Reserve System through trapping, hunting, or other control methods; nonnative predators (i.e., bullfrogs, fish, cats, etc.) will be eradicated or reduced in the Reserve System through habitat manipulation, trapping, electroshocking, or other methods; and nonnative invasive plants will be reduced through grazing, mowing, and hand pulling (ICF International, 2012). Furthermore, conservation easements within the Reserve System will prohibit the planting, introduction, or dispersal of nonnative plants or animal species (ICF International, 2012, Appendix H) and the monitoring program for each reserve unit will identify and map existing nonnative invasive species in the Reserve System so that new invasions are identified quickly and controlled or eradicated through the adaptive management process (ICF International, 2012, Sections 7.3.1 and 10.2.1). The Implementing Entity will also educate private landowners about

the detrimental effects of nonnatives by emphasizing the importance of not planting invasive species or moving invasive animals such as bullfrogs (ICF International, 2012, Section 5.3.2). Finally, 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 (ICF International, 2012, Section 5.2.5).

Conditions in the Plan will significantly reduce the potential for, and therefore the significance of, nonnative species-related effects. For example, Condition 2 requires non-invasive plants in urban-reserve interface landscaping and encourages the use of native plants (ICF International, 2012, Section 6.4.1). Furthermore, Conditions 3, 4, 5, 7, 8, and 12 require fiber rolls used for erosion control to be free of noxious weeds (ICF International, 2012, Section 6.4.4 and Table 6-2). These Conditions also require seed mixtures applied for erosion control and revegetation to be free of invasive nonnative species and composed of native species or sterile nonnative species. Conditions 5 and 6 also require invasive plant species be disposed of in a manner that prevents further invasion (ICF International, 2012, Section 6.4.4 and Table 6-2), and Condition 7 prohibits invasive plants in rural development sites (ICF International, 2012, Section 6.4.4). Condition 8 also requires mowing equipment to be thoroughly cleaned before use in rural areas so they are free of noxious weeds (ICF International, 2012, Section 6.4.5). Finally, to reduce the effects on nonnative animals, Condition 9 prohibits the introduction of exotic non-naturalized species to the Reserve System (ICF International, 2012, Section 6.4.6).

Despite the implementation of minimization measures described above, existing nonnative invasives will likely spread and new nonnative invasives will likely be introduced during the permit term. Subsequently, nonnative invasive species are identified as a Changed Circumstance in the Plan, for which the Applicants will fund remedial measures up to a defined upper limit. The Applicants will fund and carry out remedial measures for infestations of new nonnative invasive species affecting up to 25 percent of a predominant natural community (in acres) or occupied Covered Species habitat within the Reserve System in any given year[47]. It will also fund and carry out remedial measures to address the spread of nonnative invasives existing on up to 25 percent above current conditions within the Reserve System in any given year. If a nonnative invasive species spread beyond these thresholds, it would be considered a catastrophic event beyond the Plan scope and remedial actions to address it would not be required of the Implementing Entity (ICF International, 2012, Section 10.2.1). In summary although the spread of nonnative invasives is likely, the implementation of the Plan's conservation strategy, Conditions, and remedial measures will reduce their effect such that the long term viability of Covered Species is not compromised.

47 The Implementing Entity will monitor current levels of disease and nonnatives relative to the current composition of the Reserve System each monitoring year.

2.4.3.6 Noise

Noise levels could increase directly as a result of Covered Activities (i.e. noise associated with construction) or indirectly (i.e. noise associated with recreationists, dogs, traffic, aircrafts, etc.). New or altered sources of noise could interfere with breeding (Reijnen *et al*., 1995), social interactions (Bowles, 1995), prey and predator detection (Bowles, 1995), foraging behavior (Burger and Gochfeld, 1998; Bowles, 1995), and migration (Bowles, 1995). Covered Species responses to noise will likely vary depending on multiple factors, including, but not limited to season, reproductive strategy, ambient noise, and habituation. Attraction and habituation to noise could have negative effects on Covered Species. For example, predators are often attracted to anthropogenic noise sources, as humans are often associated with food (Stirling, 1988) and thus, sources of noise could create a sink for some Covered Species. Habituation to noise could also reduce a Covered Species' natural defense responses and thus make them vulnerable to collection, injury, or death. For example, animals that habituate to traffic noise are more likely to be stuck by vehicles (Bowles, 1995).

All categories of Covered Activities could result in increased noise; however, increased noise levels directly resulting from construction-related activities are not anticipated to be a significant source of take. With a few exceptions[48], noise resulting directly from construction-related Covered Activities will be temporary in nature, thus not having long-term or significant effects on Covered Species. Increased noise levels indirectly resulting from development and directly resulting from operation-related Covered Activities are likely to be the most significant sources of noise as they will represent new long-term sources of noise. New residential and commercial development will indirectly increase ambient noise levels, the effects of which will be most significant along the urban-reserve boundary and within the rural landscape for reasons previously discussed.

Traffic noise is likely important to the ecological effect of road avoidance[49] (Forman and Alexander, 1998) as it has been correlated with reduced densities of some species (Reijnen *et al*., 1995; Forman *et al*., 2002). The effects of traffic noise are especially acute at the fringe, and outside of, urban areas (Forman *et al*., 2002). Noise from vehicle traffic could disrupt nesting birds and typical movement patterns of terrestrial animals. Increased air traffic, an indirect result of the South County Airport expansion, will increase noise in the Action Area.

Despite the potential effects associated with noise, most of the effects of noise disturbance are mild enough that they may never be manifested through changes in population size or population growth (Bowles, 1995). Nonetheless, Plan Conditions will minimize the effects of noise. For example, Condition 7 requires rural development project proponents to adhere to all applicable local planning

48 Some construction activities may occur over an extended amount of time (i.e. dam retrofit activities) and thus, could result in more significant noise-related effects relative to short term construction projects.
49 Visual disturbance, pollutants, and predation are other potential causes of road avoidance.

ordinances, including noise ordinances. County noise ordinances restrict construction and demolition to 7:00 PM to 7:00 AM on weekdays and Saturdays, with no construction on Sundays (County of Santa Clara *et al*., 2012, Section 15.1.1), which will reduce Covered Species exposure to increased levels of noise.

A minor increase in recreation-related noise is anticipated in the Reserve System. Recreational uses in the Reserve System will be designed to minimize impacts on biological resources and will adhere to the requirements and guidelines described in Condition 9, which among other things state that recreation will only be allowed where it is compatible with the biological goals and objectives of the Plan (ICF International, 2012, Section 6.4.6). Condition 9 also prohibits the use of motorized vehicles or boats within the Reserve System, except for use by the reserve manager staff or with the prior approval of the reserve manager (i.e. contractors implementing Plan conservation actions) (ICF International, 2012, Section 6.4.6).

2.4.3.7 Lighting

New sources of light in formerly unpopulated areas could affect the ability of some Covered Species, especially birds and many species of insects (potential prey items for Covered Species), to navigate at night. Light in natural environments influence numerous ecological processes directly and indirectly (Bird *et al*., 2004). For example, ambient light entrains circadian rhythms, influences the ability of nocturnal predators to detect and capture prey (Buchanan, 1993), and alters the risk environment for prey (Ringelberg, 1999). Behavioral changes associated with illumination are likely antipredator responses because the perceived risk of predation increases with increasing light in some species (Lima and Dill, 1990) and could in turn affect a species' ability to acquire needed resources (Bird *et al*., 2004). Lights also attract some species of birds and insects that forage and migrate at night, resulting in mortality from collisions with structures in the vicinity of lights (Le Corre *et al*., 2002).

Similar to noise, discussed above, lighting directly resulting from construction related activities is not anticipated to be a significant source of take of Covered Species. With few exceptions, lighting resulting directly from construction-related Covered Activities will be temporary in nature and thus will not have long-term effects on Covered Species. Increased lighting indirectly resulting from development and directly resulting from operation and maintenance Covered Activities are likely to result in the most significant effects on Covered Species as they will represent new long term sources of light. New residential and commercial development will indirectly result in an increase in ambient lighting because there will be more homes, buildings, and streets, many of which will be illuminated at night.

Although some construction, such as dam retrofit activities, may need to occur at night, the majority of construction and demolition activities are anticipated to comply with existing County noise ordinances, described above. County noise ordinances will indirectly minimize lighting effects on Covered Species by

reducing nighttime construction, which will reduce the need for construction-related lighting.

Plan Conditions will minimize lighting effects after build out so that they are insignificant. Condition 2 of the Plan requires low intensity outdoor lighting that will utilize full cutoff fixtures to reduce light pollution of the surrounding natural areas developed adjacent to the Reserve System. Use of high-intensity lighting (i.e., recreation facilities, commercial parking lots) near the Reserve System will be avoided or, if necessary, placed as low to the ground as possible and directed away from the reserves. Public facilities such as ballparks and fields that require high-intensity night lighting will be sited at least 0.5 mile[50] from the Reserve System boundary to minimize light pollution (ICF International, 2012, Section 6.4.1). Similarly, Condition 7 requires low intensity lighting with full cutoff fixtures for outdoor lighting in rural areas (ICF International, 2012, Section 6.4.4). Finally, Condition 9 requires recreational activities in the Reserve System to occur during daylight hours (ICF International, 2012, Section 6.4.6), which will eliminate the need for artificial lighting in the Reserve System. Proper implementation of these Conditions will make it difficult to meaningfully measure, detect, or evaluate lighting-related effects resulting from the proposed action.

2.4.3.8 Dust

All ground disturbing Covered Activities are likely to directly increase dust levels in the vicinity of construction and maintenance work areas. The only notable indirect source of dust anticipated from Covered Activities is increased vehicle traffic on dirt roads in the rural portions of the Action Area, including the Reserve System. Dust generated by vehicle traffic on dirt roads increases progressively with traffic speed and volume during the dry season. Deposition is largely determined by wind speed and direction (Ndibalema *et al*., 2008). Dust-related effects are anticipated to be most intense near roads and are anticipated to decline exponentially with increasing distance from the road margin (Spatt and Miller, 1981).

The effects of dust pollution on wildlife have rarely been documented (Ndibalema *et al*., 2008). However, Walker and Everett found that the addition of dust from gravel roads had a localized but profound effect on vegetation, soil, and wildlife (1987). Much more research has been conducted on dust-related effects on vegetation. In general, long-term effects of heavy dust accumulation may decrease plant productivity and growth (Spatt and Miller, 1981). Several morphological factors contribute to plant susceptibility to dust-related effects including growth form (i.e. mat or prostrate), protective covering (i.e. stem cortex or leaf cuticle), and leaf and branch formation (i.e. intricate branching or closely spaced leaves tend to trap dust) (Walker and Everett, 1987). Furthermore,

50 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 (i.e. hills block line of site).

evergreen plants may experience greater cumulative effects from dust, relative to deciduous plants, because they retain their leaves from year to year (Auerbach *et al*., 1997).

Physical effects of dust on plants may include cell destruction and blocked stomata that can lead to reduced photosynthesis, respiration, and transpiration (Spellerberg, 1998; Auerbach *et al*., 1997). Studies suggest that dust cover on leaves increase leaf temperature by increasing absorption of infrared radiation, which purportedly increases respiration and lowers net photosynthesis and productivity within certain temperature ranges (Eller, 1977; Spatt and Miller, 1981; Ricks and Williams, 1974). Dust may also absorb water through noncutinized leaf surfaces, increasing evaporation, and a dust coating may physically restrict gas exchange and attenuate photosynthetically active light, all reducing production (Spatt and Miller, 1981).

Studies suggest that particulate matter precludes stomata from closing at night (Singh *et al*., 1988), which could increase plant uptake of pollutants and susceptibility to fungal disease (Ricks and Williams, 1974; Saunders, 1971). Sulphur dioxide induces visible injury to leaves and leads to reduction in chlorophyll (Agrawal and Agrawal, 1991), inhibition of metabolic processes, and suppression of growth and yield of plants (Singh *et al*., 1988). Rick and Williams (1974) found that dusting of stomata decreases nightly diffusion resistance and increases sulphur dioxide uptake significantly. High concentrations of sulfur dioxide can produce acute injury in the form of foliar necrosis (Singh *et al*., 1988), even after relatively short exposure duration. Chronic injury could result from long-term exposure to much lower concentrations of the gas and is essentially cumulative in nature, resulting in reduced growth and yield and increased senescence (Agrawal and Agrawal, 1991). Additional studies are necessary to better understand the effects of dust on both wildlife and plant species, as study results could have been confounded by other road-related effects such as inhibition of ground water movement and the leaching of nutrients (Walker and Everett, 1987; Spatt and Miller, 1981; Tamm and Troedsson, 1955).

It is reasonable to assume that dust generated by ground disturbing activities will have similar effects as dust generated by dirt road use. However, dust-related effects associated with construction and maintenance are anticipated to be less significant because ground disturbance will be a temporary source of dust, whereas frequently traveled dirt roads constitute a chronic new source of dust. For the most part, dust-related effects resulting from ground disturbing Covered Activities are anticipated to be temporary because wind and precipitation are expected to remove dust from surrounding vegetation. In addition, the ground disturbing activities themselves will be temporary in nature.

Dust-related effects will be insignificant with the implementation of Plan Conditions. Condition 6 for example, requires active transportation construction sites in the rural portion of the Action Area to be watered regularly, when warranted, to minimize the effect of dust on adjacent vegetation and wildlife habitat (ICF International, 2012, Section 6.4.4). In addition, Condition 7 will

minimize dust generation from rural private roads by requiring the minimization of ground disturbance, maintenance of as much vegetation as possible, and revegetation of all temporarily disturbed soils (ICF International, 2012, Section 6.4.4). Furthermore, dust generated from rural road maintenance will be significantly reduced with avoidance and minimization measures required by Condition 8, as described in Table 6-4 of the Plan. For example, work and staging areas will be set up to minimize the area of soil that will be disturbed, and bare soil adjacent to stream channels will be mulched or revegetated (ICF International, 2012, Table 6-4).

The effects of vehicle-related dust generation in the Reserve System will be discountable with the implementation of Condition 9, which indicates that no motorized vehicles will be allowed in the Reserve System, except for use by the reserve management staff or with the prior approval of the reserve manager. Furthermore, the extent of dirt roads in the Reserve System will be insignificant relative to the total Reserve System size (see Plan Tables 4-5 g & h).

Dirt roads may be constructed by the Applicants or private landowners to access their property. These new dirt roads will be a chronic source of dust. Covered plants species may be adversely affected by this new chronic source of dust. Unavoidable indirect effects in the rural portion of the Action Area will be mitigated through the acquisition, enhancement, and management of modeled habitat, as shown in Table 5-17 of the Plan (ICF International, 2012) as these conservation actions will improve habitat for covered plants currently occupying marginal habitat or will create colonization opportunities for covered plants currently residing in adjacent areas.

2.4.3.9 Fire

All Covered Activities could indirectly increase the potential for wildfire because human intrusion is inherent with each. The potential for wildlife is greatest where high fuel loads share a common boundary with rural and suburban areas, which will be created or expanded under the Plan. Increased risk of fire is often associated with roads (i.e., accidents and cigarette butts).

Periodic fires could improve habitat for Covered Species that inhabit natural community types that evolved with fire, including grasslands, chaparral/northern coastal scrub, oak woodlands, and conifer woodlands. Fire frequency and intensity will influence community regeneration, composition, and extent. In some cases, periodic fire could reduce non-native invasive plant cover, allowing native plant species (including Covered Species' host plants) to emerge. To ensure that fire-dependent natural community processes occur, and indirect benefits are afforded to Covered Species, minimum suppression techniques and prescribed burning will be implemented as part of the conservation strategy (ICF International, 2012, Section 10.2.1).

Conversely, large, intense, and/or frequent fires could adversely affect Covered Species. Wildfires could directly injure or kill Covered Species. Furthermore,

frequent, intense fires caused by high fuel loads and increased encroachment by woody species could indirectly result in habitat type conversion, increasing the extent of certain natural communities, such as grassland, at the expense of others, such as chaparral or oak woodlands (ICF International, 2012, Section 10.2.1). These habitat type conversions could remove suitable habitat for Covered Species and subsequently reduce population size and distribution. Wildfires could also indirectly result in landslides and adversely affect water quality and hydrology if they remove significant amounts of ground cover and old growth.

The implementation of Condition 10 will minimize the likelihood of large, intense wildfires occurring by requiring all applicable Covered Activities to remove brush, flammable vegetation, or combustible growth within at least 30 feet and up to 100 feet of occupied dwellings or structures (ICF International, 2012, Section 6.4.6). Furthermore, reserve unit management plans will include fire management and protection measures that will minimize the likelihood of abnormally frequent fire. Preventative actions will include creation or redesign of fuel breaks to limit the spread of fire, consideration of the reintroduction of low-intensity prescribed fires to encourage fire-adapted plants and discourage non-fire-adapted invasive plants, cooperation with local fire agencies to improve fire-suppression preparedness and develop strategies to protect habitat during fire response, and incorporation of public-awareness programs into reserve unit management plans (i.e. public outreach to neighboring lands to minimize fire risk) (ICF International, 2012, Section 10.2.1).

Fire suppression efforts could both directly and indirectly affect Covered Species. Covered species may be directly affected because fire retardants may kill or injure Covered Species, emergency vehicles may crush Covered Species, and occupied breeding ponds may be disturbed or drained. Potential indirect effects of fire suppression efforts include landslides and altered hydrology resulting from firebreak creation and off-road vehicle use.

The likelihood of adverse effects on Covered Species resulting from fire suppression will be greatly reduced because fire management and protection measures will be described in each reserve unit management plan (ICF International, 2012, Sections 5.2.5 and 10.2.1). In order to ensure 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 responsible for Reserve System lands. The operating agreement will ensure that the fire management components are implemented, minimum impact suppression tactics are utilized, and post-fire restoration is carried out (ICF International, 2012, Section 5.3.2). The Implementing Entity will hire staff with expertise in controlled burns and firefighting using these techniques. Staff with this expertise will also help to ensure clear and frequent communication with Cal Fire. Staff with this expertise will also help to ensure immediate assessment and possible responses following wildfires in the Reserve System (ICF International, 2012, Section 5.3.2).

Despite Plan minimization measures, wildfires are still likely to have adverse effects on Covered Species during the permit term. Subsequently, fire is identified as a Changed Circumstance in the Plan, for which the Plan will fund remedial measures up to a defined upper limit. The Applicants will fund and carry out remedial measures for a single fire burning 2,235-7,599 acres in the Reserve System and for any number of fires of any size[51] that impact enhancement, restoration, or creation projects. The Applicants will also fund and carry out remedial measures for any number of fires, regardless of size, that occur in the same area of the Reserve System at the frequencies identified in Table 10-1 of the Plan and any number of non-catastrophic fires, of any size, that impact restoration or creation projects (ICF International, 2012, Section 10.2.1 and Table 10-1).

2.4.3.10 Capture and Collection

Most direct take in the form of capture and collection will result from monitoring activities in the Reserve System. Certain monitoring activities may require the handling of Covered Species (i.e. placement of tags, acquisition of blood samples, etc.), which may inadvertently result in the death or injury of Covered Species. Monitoring may constitute harassment if it creates the likelihood of injury that significantly disrupts normal breeding, foraging, or sheltering behavior. The anticipated incidence of monitoring-related death, injury, and harassment however, is very low because individuals carrying out monitoring activities will be qualified biologists, as defined in Section 6.8.5 of the Plan. The extent of potential deaths and injuries will be further minimized because the Implementing Entity will monitor a representative sample of Covered Species and their associated habitats, reducing the number of individuals that will be exposed to monitoring activities. Monitoring described in Chapter 7 of the Plan will result in a net benefit to Covered Species, as effectiveness monitoring data will inform the adaptive management process. Adaptive management will be critical to successfully implement the Plan's conservation strategy.

Furthermore, Covered Species will be collected during translocation efforts[52] and may be incidentally injured or killed during the collection process, in transit, or after release. The likelihood of death or injury in these situations however are minimal because translocation activities will be conducted by qualified biologists and only after approval by the Wildlife Agencies (ICF International, 2012, Section 8.7.3). The extent of these potential losses will be minimized through the adaptive management process. Risks associated with translocation (as previously discussed under *Disease* and *Nonnative Invasives*), will likely limit the amount of Wildlife Agency-approved translocation attempts, which will reduce the need for translocation related-collection. The benefits gained by expanding species

51 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).
52 Indirect effects of translocation are further discussed in this Opinion under *Disease* (Section 2.4.3.4) and *Nonnative Invasives* (Section 2.4.3.5).

distribution and/or salvaging a plant occurrence that would otherwise be removed by Covered Activities would outweigh potential adverse effects to a few individuals during an otherwise successful translocation attempt.

The Reserve System will also create more recreational opportunities for the public than are currently available, which may indirectly result in the illegal collection of Covered Species. Condition 9 will reduce the potential for this effect by prohibiting collection of native species within the Reserve System. Furthermore, the recreation plan for each reserve unit will outline a framework for enforcing recreational restrictions (see Plan Section 6.4.6), and the effects of recreational use on biological resources will be monitored and managed adaptively to reduce or eliminate these potential effects (ICF International, 2012, Section 7.3.1).

Illegal capture and collection of Covered Species may also increase as an indirect effect of development-related Covered Activities and increased human presence. Conditions 1 and 2, previously described in Section 2.4.3.1 above, will minimize the potential for these effects.

2.4.4 General Effects of the Action on Serpentine Species

Covered Activities will have both direct and indirect effects on serpentine land cover types that support covered serpentine species. The Action Area represents a significant portion of, and in some cases the entire range of, covered serpentine species. Serpentine land cover types are particularly sensitive to indirect effects related to N-deposition. Subsequently, covered serpentine species are anticipated to be exposed to and affected by similar effects. To minimize repetition, anticipated effects common to all covered serpentine species are discussed here, in Section 2.4.4. General effects of the Action on all Covered Species, previously described in Section 2.4.3 above, are not repeated. Effects specific to each covered serpentine species that are in addition to those described in this section, are described below, in Section 2.4.5.

Mortality, Injury, Harm, and Harassment: The Plan minimizes the direct and indirect death, injury, harm, and harassment of covered serpentine wildlife species by limiting effects on serpentine communities. A maximum of 550 acres (5.3 percent of the total in the Action Area) of serpentine bunchgrass grassland and 22 acres (8.5 percent of the total in the Action Area) of serpentine rock outcrop may be permanently affected by Covered Activities. A maximum of 91 acres (0.9 percent of the total in the Action Area) of serpentine bunchgrass grassland and 2 acres (0.6 percent of the total in the Action Area) of serpentine rock outcrop may be temporarily affected (ICF International, 2012, Tables 4-2 and 4-3).

Direct and indirect effects on covered serpentine species' habitat will be greatly minimized through the implementation of Condition 13, which requires projects in developed areas to preserve larger patches of serpentine. It also requires projects to limit effects to the smallest patches feasible and to the edges of serpentine patches, regardless of their size. Furthermore, under Condition 13, landscaping will not be planted on serpentine areas except as needed to reduce fire hazards, consistent with County fire

hazard reduction regulations. Plantings will not include species that are known or suspected to invade serpentine communities or cross-pollinate with endemic serpentine plant species or other native plants. On undeveloped sites, Condition 13 requires that the project area and construction staging area avoid or minimize effects on serpentine on site (ICF International, 2012, Section 6.5).

In addition, Condition 13 describes the following minimization measures that will be implemented when effects on serpentine land cover types cannot be avoided:

- Survey serpentine vegetation to inventory Covered Species and evaluate habitat quality.
- For portions of the development area that are in Bay checkerspot butterfly habitat units identified in Appendix D of the Plan, survey for larval host plants. 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 Covered Species or highest-quality serpentine habitat as feasible. Utilize applicable buffers as identified in Chapter 6 of the Plan.
- If covered plants cannot be avoided, notify the Implementing Entity of the construction schedule so that plant salvage can be considered and potentially implemented (see Condition 19).

To mitigate for the loss of up to 550 acres of serpentine grassland, the Plan requires the acquisition of 4,000 acres of serpentine grassland. Table 5-19 of the Plan describes serpentine grassland acquisition requirements within specific Conservation Analysis Zones. Of the 4,000 acres of serpentine grassland to be preserved under the Plan, a minimum of 2,900 acres will be located on Coyote Ridge (ICF International, 2012, Section 5.4.1 and Table 5-19). Successful implementation of the Plan's conservation strategy, in combination with existing Type 1 Open Space, would result in the protection of 70 percent of the core habitat[53] on Coyote Ridge, extending from the north end of Coyote Ridge south to Anderson Dam (including the Pigeon Point unit) (ICF International, 2012, Section 5.4.1).

Preservation of occurrences is the primary way the Plan will mitigate unavoidable effects to covered serpentine plants. Because the majority of covered plants species are addressed in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b), the Plan's conservation strategy was developed to be consistent with the Recovery Plan[54]. The Recovery Plan discusses the number of populations that should be fully protected and managed before downlisting and/or delisting is considered and in many cases recommends where those populations

53 This is core habitat for the Bay checkerspot butterfly, as defined by the Plan. However, protection and management of this core area will also result in the protection and management of occupied and suitable habitat for other covered serpentine species.

54 General Recovery Plan recommendations (i.e. buffer, seed banking etc.) were applied to the Plan's conservation strategy for the Loma Prieta hoita, which is not addressed in the Recovery Plan.

should be protected within the species' range[55]. The Recovery Plan recommends that protected populations should be secured with a 500-foot buffer, contain a minimum of 2,000 plants, and be monitored under a standardized program. Furthermore, the Recovery Plan's recovery strategy for covered plant species also recommends research, management, seed banking, and public outreach. All of these recommendations, unless otherwise noted in this Opinion, have been incorporated into the conservation strategy for each covered plant species.

Plant Habitat Loss and Degradation: Effects resulting from the loss and degradation of covered plant habitat will be analogous to harm and harassment of Covered Wildlife Species, previously described under *Mortality, Injury, Harm, and Harassment*.

Nitrogen Deposition: One of the primary threats to all covered serpentine species in the Action Area continues to be nitrogen deposition and inadequate management to minimize its effects. N-deposition is a complex process by which reactive chemical species of nitrogen such as NO_X, NH_3, and their reaction products are deposited onto surfaces and enter ecosystems as fertilizer. Industrial point sources and nonpoint sources emit nitrogen compounds (both NO_x and NH_3) into the air. Although most emissions are initially introduced in the atmosphere as NO and NO_2, chemical processes in the atmosphere rapidly convert these emissions into other forms. Nitric acid (HNO_3) is of particular concern among these conversion products because it deposits much more rapidly than other species of N.

Urban and rural development Covered Activities will indirectly increase air pollutant emissions by increasing passenger and commercial vehicle trips. New industrial and nonindustrial point sources[56] will also incrementally increase air pollution. Effects on covered serpentine species habitat resulting from Covered Activities are most likely to occur at the bottom of slopes, where N-deposition is highest (and therefore habitat quality is lowest).

Serpentine soils are extremely nitrogen-poor, and plants native to these soils are adapted to this condition. Nitrogen compounds are deposited on soils and vegetation from the air under both wet (during rainfall) and dry conditions. This deposition artificially fertilizes serpentine soils, creating better conditions for non-native plant species. Non-native annual grasses grow rapidly, enabling them to out-compete native species such as *Plantago erecta*, the host plant for the Bay checkerspot butterfly, and serpentine plants covered under the Plan, for water, nutrients, light, and germination sites. An increased concentration of non-native plants results in the accumulation of a thick carpet of vegetative material commonly referred to as "thatch." Dense thatch inhibits the growth of native forbs (Huenneke *et al*., 1990). Italian ryegrass is the major invasive grass in degraded sites in the Action Area. The displacement of serpentine endemics, and

55 For non-listed covered plants addressed in the Recovery Plan, the Recovery Plan identifies the number of populations recommended for long-term survival.

56 This Opinion does not analyze the effects of new major point sources of N-deposition (i.e., new power plant, large diesel generator, or other facilities) that could adversely affect covered serpentine species (ICF International, 2012, Section 8.7.3).

subsequent decline in Bay checkerspot butterflies, has been well documented (Weiss, 1999). In the absence of grazing, increased growth of annual grasses and thatch build-up lead to decreased cover of Bay checkerspot butterfly larval host plants, adult butterfly nectar sources, and all native forb species over the course of one to three years (Weiss *et al*., 2007). This habitat shift has been observed on Silver Creek Hills, Santa Teresa Hills, and Kirby Canyon Landfill (Weiss *et al*., 2007).

Until recently, little was known regarding the thresholds at which various ecosystems in California are affected by chronic N-deposition (Weiss, 2006). Fenn *et al*. (2010) estimated the N-deposition critical load for grasslands based on local scale deposition in the environs of Highway 280, adjacent to Edgewood Park, to be 5-6 kg-N/ha/yr. That is, 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 (Fenn *et al*., 2010). Proportional impacts resulting from increased deposition are anticipated to be lower in high pollution zones, where effects may already be acute and are anticipated to be higher in low pollution areas (Weiss, 2006; Fenn *et al*., 2010).

Appendix E of the Plan (ICF International, 2012), analyzes N-deposition using several modeling approaches. The analysis was done to quantify the expected increases in N-deposition in Santa Clara County as a result of urban and rural growth covered by the Plan. Gaussian models were used to estimate N contributions from individual roadways and to assess the increase in deposition due to increased traffic. CMAQ was used to simulate more complex nitrogen transport processes. The PPTM source apportionment technique was used to estimate N contributors on a broader scale.

Based on the CMAQ modeling conducted for the Plan, total N-deposition in the Bay checkerspot butterfly habitat areas, which are often suitable for covered serpentine plant species, could increase to 8 kg-N/ha/yr in 2035[57] and almost 10 kg-N/ha/y in 2060[58]. Gaussian modeling indicates that contributions to N-deposition from major roadways could increase by almost a factor of two by 2030 and by more than a factor of four by 2060. 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 (ICF International, 2012, Appendix E).

According to ICF's modeling, contribution of mobile source emissions in the Action Area are anticipated to increase by approximately 0.6 kg-N/ha/yr in 2035 over the base year and by another 0.5 kg-N/ha/yr in 2060. The San Jose contribution to N-deposition in the Study Area is estimated to be 38 percent in 2035. Gaussian modeling of major roadways predicts an increase in N-deposition of approximately 0.25 kg-N/ha/yr in 2030 over the base year (a 4 percent increase in total deposition). The increase in 2060 relative to 2030 could be from 0.4 kg-N/ha/yr to more than 1 kg-N/ha/yr, depending on location (a 7 percent to 17 percent increase in total deposition) (ICF International, 2012, Appendix

57Projections were made for 2035 because it was the farthest population growth projection in the Action Area and Bay Area available from the Association of Bay Area Governments projected at the time the analysis was conducted.

58 Projections were made for 2060 because it was the estimated end of the permit term when the analysis was conducted.

E). Of the 17 percent contribution to nitrogen deposition noted for the remainder of Santa Clara County, Gilroy is expected to make up approximately 1.5 percent (9 percent of 17 percent) and Morgan Hill to make up approximately 2.7 percent (16 percent of 17 percent) (ICF International, 2012, Section 4.5.2 and Appendix E).

The Service considers ICF's N-deposition analysis (2012, Appendix E) to be the best scientific information available at this time for the Action Area, recognizing that there are inherent limitations and uncertainties associated with the simulations used in the analysis. For example, the representation of physical and chemical processes in the models may include unknown errors or shortcomings. Rates of N-deposition are dependent on the location of N sources; amount and chemical form of N they emit; and meteorological conditions (i.e., prevailing wind direction, precipitation), topography, and vegetation structure. The location, amount, and type of N emissions in the Action Area in the future are difficult to predict because of the complex combination of additional point and mobile emission sources that will result from Plan Covered Activities. An important example is the uncertainty of additional automobile emissions, which are anticipated to be the primary source of new N-deposition in the Action Area. Although vehicular emissions may decrease over time, as technology and emissions standards improve, the amount of this reduction is difficult to estimate because technological improvements are uncertain and may have unexpected effects. For example, although the introduction of three-way catalytic converters in automobiles reduced overall emissions of NO_X, it increased emissions of NH_3, which has a higher depositional velocity and shorter transport range than NO_X (CH2MHill, 2004).

Furthermore, the CMAQ modeling used in ICF's analysis has a comparatively short time period. However, this time period is fairly representative of the average conditions in the Action Area. Use of a longer time period would not likely significantly alter the relative contributions of N sources. The modeling analyses rely on established models that have been reviewed by the scientific community and evaluated in numerous applications in the past. In addition, the models rely on estimates of emissions, meteorological simulations, and limited sets of meteorological measurements as input data. Recognizing these uncertainties and limitations, the model results were not used in an absolute sense to determine N-deposition but rather, used in a relative sense to assess the portion of the N-deposition that is attributable to various categories of sources and the relative increase in N-deposition that might be expected due to growth (ICF International, 2012, Appendix E).

Finally, the effects of climate change on the assumed critical load of 5-6 kg-N/ha/yr is uncertain. If climate change results in more severe droughts interspersed with increased frequencies of extreme precipitation events in California, it is likely to have a strong influence on the dynamics of N accumulation and N fluxes, which in turn will affect critical load values. It is unclear how climate change will affect plant N availability and the critical load for effects on plants (Fenn *et al*., 2010).

Management of grassland communities in the face of continued deposition above the critical load will be essential to maintain native biodiversity and sustain covered serpentine species. Exotic annual grasses will never be completely removed in such stressed systems; therefore, the key to sustaining these ecosystems rely on reducing

annual grass cover and thatch accumulation so that native forbs and rare serpentine plant species can coexist at sufficient densities to support species like the Bay checkerspot butterfly. In the south bay, annual grasses have been effectively controlled through moderate levels of cattle grazing (Fenn *et al*., 2010). By consuming large amounts of grass forage, grazers such as cattle, cycle and redistribute nutrients (Weiss, 1999), disturb the soil surface (clearing germination sites for native vegetation), and export some N as animal biomass (Fenn *et al*., 2010). Based on site-specific conditions, selective mowing and prescribed fire also effectively reduce the effects of N accumulation (Fenn *et al*., 2010).

Although Covered Activities will indirectly increase N-deposition in the Action Area and favor the growth of nonnative annual grasses that will compete with covered serpentine plants and serpentine host plants for the Bay checkerspot butterfly, the Plan will result in regional management in perpetuity that would not otherwise occur without the Plan. Both habitat protection and management are critical to the recovery of covered serpentine species. Weiss demonstrated that it is 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 though managed grazing (Weiss pers. comm., as cited in ICF International, 2012). In the Action Area, Weiss and Wright (2006) demonstrated that grazing reduces cover of invasive plants and increases habitat for dwarf plantain, the Bay checkerspot butterfly's host plant.

Goal 4 of the Plan is to "maintain and enhance grassland communities that benefit covered species and promote native biodiversity." The following Plan objectives will be implemented to achieve Goal 4 (ICF International, 2012, Table 5-1b):

- Objective 4.3a: Reduce cover and biomass of non-native plants
- Objective 4.3b: Decrease nitrogen deposition in serpentine grasslands to reduce non-native, invasive plant growth
- Objective 4.3c: Increase the diversity of native plants within the Reserve System

Specific conservation actions and associated monitoring actions that will be implemented to achieve these objectives are also outlined in Table 5-1b of the Plan and further described in Chapter 5 and Chapter 7.

Furthermore, reserve unit management plans will be prepared by the Implementing Entity for each reserve unit. These management plans will describe reserve-specific management strategies for maintaining, and when necessary, improving existing habitat conditions for Covered Species. Reserve unit management plans will describe reserve-specific vegetation management objectives to reduce the abundance and distribution of invasive plants and increase or maintain the abundance and distribution of covered plants and compatible native plants. Each reserve unit management plan will identify the types of management actions and the implementation schedule required to achieve these objectives. Anticipated methods for managing vegetation include, but are not limited to, livestock grazing, prescribed burning, mechanical mowing, hand removal, application of

biological control agents, and application of herbicides[59] (ICF International, 2012, Section 5.2.5). This approach is consistent with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b), which emphasizes the importance of the development and implementation of management plans for serpentine species. As such, the indirect effects of N-deposition will be adequately minimized through the Plan's conservation strategy and monitoring and adaptive management program.

2.4.5 Species-Specific Effects of the Action

The species-level effects described below build on Section 2.4.3, *General Effects of the Action on All Covered Species*, and Section 2.4.4, *General Effects of the Action on Serpentine Species*. Effects previously described in these two sections of the Opinion are not repeated below.

Eight of the nine serpentine species discussed below are plants. The plant effects analysis that follows 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 CNDDB. In addition, population sizes reported in one year may not accurately represent long-term averages. Most of the plants 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 for tracking effects, land acquisition, and adaptive management.

The 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 (ICF International, 2012, Section 9.4.3). As such, this Opinion evaluates the conservation strategy of the Plan as a whole. Although the Plan distinguishes the number of plant occurrences that will be protected for mitigation from recovery, we considered the aggregate protection when conducting our jeopardy analysis. We preserved the Plan's distinction between mitigation and recovery in this Opinion however, because the mitigation ratios are relevant to the timing of plant preservation relative to effects. The mitigation ratios specify the number of plant occurrences that must be preserved prior to effects. Due to the experimental and unpredictable nature of plant creation, creation efforts are only considered for recovery purposes in this Opinion, with the exception of the Coyote ceanothus (see Section 2.4.5.3 of this Opinion).

59 There may be a need to apply herbicides on a large scale (i.e., to control yellow star-thistle). Use of herbicides is not covered under the section 10(a)(1)(B) permit (ICF International, 2012 Section 5.2.5).

2.4.5.1 Bay Checkerspot Butterfly

Mortality, Injury, Harm, and Harassment: Most, but not all, serpentine bunchgrass grassland is considered Bay checkerspot butterfly habitat (see Plan Appendix D). As such, Covered Activities that remove or degrade serpentine grassland land cover types are potentially detrimental to the Bay checkerspot butterfly. The majority of Plan effects on the Bay checkerspot butterfly are anticipated from expansion of urban areas and rural residential development. For example, suburban and rural residential development on Coyote Ridge could directly injure or kill individuals and degrade or remove habitat. In addition, changes in land use or management of serpentine grasslands could also adversely affect the Bay checkerspot butterfly (ICF International, 2012, Section 4.6.1).

For the purposes of the Plan, 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, 1998b). 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" in the Plan. For habitat units defined as "occupied," the species is known to occupy the patch at least in some years. Sites that historically supported individuals but are currently unoccupied and likely no longer suitable, are defined as "historic." If the site has not been surveyed thoroughly or has not been surveyed in the last ten years, the Plan identifies the unit as "unknown." Otherwise suitable patches of serpentine grassland within the dispersal distance of known populations are identified as "potential" habitat units if land use management practices, such as livestock grazing, could improve conditions for the species (ICF International, 2012, Section 4.6.1). The Plan identifies 22 Bay checkerspot habitat units. Table 5-7 of the Plan provides a crosswalk between the Plan's Bay checkerspot habitat units and the sites referenced in the Recovery Plan.

Direct effects on the Bay checkerspot butterfly in the forms of death, injury, harm, and harassment are likely to occur in 12 of the 22 Bay checkerspot butterfly habitat units identified in Table 5-7 of the Plan. These effects will be distributed across core occupied habitat, satellite occupied habitat, satellite potential habitat, satellite habitat with occupancy unknown, and satellite habitat with historic occurrences in the Action Area (ICF International, 2012, Section 4.6.1 and Table 5-7).

All effects on Bay checkerspot butterfly core and satellite habitat units are expected to be small except for the Kirby Landfill site and the Pound Site. Effects on core or satellite habitat units are expected to be less than 10-20 acres each due the limitations on land use development in the County and San Jose (the two jurisdictions where this habitat occurs) and the requirement to minimize effects on serpentine bunchgrass grassland, in conformance with Condition 13 (previously

described in Section 2.4.4 of this Opinion and discussed further below) (ICF International, 2012, Section 4.6.1).

The Kirby Landfill expansion will remove up to 80 acres (11 percent) of Bay checkerspot habitat in the Kirby/East Hills core habitat unit. Habitat that will be lost to landfill Covered Activities have 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 the species, 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 (Weiss pers. comm., as cited in ICF International, 2012, Section 4.6.1). The loss of these 80 acres represents far less than 11 percent 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 because the habitat that will be affected is of low quality, and the Plan will result in extensive protection and management of high quality habitat along Coyote Ridge. In addition, approximately 44 percent of this unit is already permanently protected (ICF International, 2012, Section 4.6.1).

Similarly, 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 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 (ICF International, 2012, Section 4.6.1).

Effects on historic/unoccupied Bay checkerspot butterfly habitat units are expected on Communications Hill. The Communications Hill 1 and Communications Hill 2 units support 230 acres and 25 acres of habitat for the species respectively, all of which is expected to be lost as a result of urban development. Although these sites were historically occupied, they no longer support the species because of habitat loss, degradation, and isolation (ICF International, 2012, Section 4.6.1).

The Plan minimizes adverse effects on the Bay checkerspot butterfly by limiting Covered Activity-related impacts on modeled "occupied" or "potential" habitat to 300 acres (3 percent) of permanent effects and 54 acres (less than 1 percent) of temporary effects (see Plan Table 4-4), all of which is also serpentine bunchgrass grassland[60]. Effects on modeled habitat mapped as "historic/unoccupied" and

60 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 (ICF International, 201, Section 4.6.1).

"occupancy unknown" are not subject to this cap because these units (ICF International, 2012, Section 4.6.1):

- 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).

Therefore, the loss of serpentine bunchgrass grassland on Communications Hill, which contains 2 historic/unoccupied habitat units, will not count toward the Plan's 300-acre modeled primary habitat impact cap for the Bay checkerspot butterfly; however, these effects will count toward the Plan's 550-acre serpentine bunchgrass grassland impact cap (ICF International, 2012, Section 4.6.1).

Effects on the remaining 17 habitat units may have more significance to the species' long term viability because they are occupied by the species and are at higher risk because a significant portion of many of these units are currently unprotected. The likelihood for adverse effects impairing the species' ability to survive and recover in the wild however, are low for the following reasons:

- **UTC, Kirby/East Hills, Pigeon Point, Silver Creek Hills Central, Metcalf North Ridge, Metcalf, Hale/Falcon Crest, and Kalana Avenues (1-4):** These habitat units are located in the Coyote-4, Coyote-5, or Coyote-6 CAZs, all of which contain "high" priority areas for acquisition (see Plan Figure 5-7). Five hundred eighty eight acres (44 percent) of the Kirby East Hills habitat unit and 96 acres (6 percent) of the UTC habitat unit are currently protected as Type 1 Open Space (ICF International, 2012, Table 5-7). The Plan requires a minimum acquisition of 100 acres of serpentine grassland in Coyote-4 (76 percent of the serpentine grassland in Coyote-4), 1,900 acres of serpentine grassland in Coyote-5 (72 percent of the serpentine grassland in Coyote-5), and 900 acres of serpentine grassland in Coyote-6 (52 percent of the serpentine grassland in Coyote-6) (ICF International, 2012, Table 5-19). Coyote-5 and Coyote-6 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 Action Area. The Plan's land acquisition requirements include the protection of either the Kalana 1 habitat unit or Kalana 2, 3, and 4 habitat units and the acquisition of at least 75 percent of the currently unprotected portions of the Hale and Falcon Crest habitat units within Coyote-5 and Llagas-3 (ICF

International, 2012, Section 5.3.1). This level of acquisition combined with the Plan's impact limits make it unlikely that Covered Activity-related effects would impair the function of these habitat units for the Bay checkerspot butterfly.

- **Canada Garcia:** Twenty three acres (13 percent) of this habitat unit is currently protected as Type 1 Open Space (ICF International, 2012, Table 5-7). The Canada Garcia habitat unit is located in CAZ Llagas-2, which is designated a "moderate" acquisition priority under the Plan (ICF International, 2012, Figure, 5-7). The Plan requires the acquisition of a minimum of 200 acres of serpentine grassland in Llagas-2, which represents 67 percent of the total serpentine grassland in the CAZ (ICF International, 2012, Table 5-19). This level of acquisition combined with the current level of protection on the site, make it unlikely that Covered Activity-related effects would impair the function of this habitat unit.

- **Tulare Hill:** One hundred-forty four acres of Tulare Hill (43 percent) is currently protected as Type 1 Open Space (ICF International, 2012, Table 5-7). As such, the relative threat to this unit is lower than that of other habitat units that currently have relatively little to no protection. Tulare Hill is located in CAZ Guadalupe-3. Of the 980 acres of serpentine grassland located in CAZs Guadalupe-1 and Guadalupe-3 combined, the Applicants must preserve a minimum of 500 acres (51 percent of the serpentine in these 2 CAZs) (ICF International, 2012, Table 5-19). Threats to this unit are also potentially reduced because the Applicants will acquire and manage land to ensure occupancy of at least three of the six (50 percent) satellite habitat units identified in the Recovery Plan[61] (U.S. Fish and Wildlife Service, 1998b), which includes Tulare Hill (ICF International, 2012, Section 5.3.1). Finally, Tulare Hill is located in one of three focal areas that will be evaluated in a corridor feasibility study conducted during Plan implementation (ICF International, 2012, Section 5.3.2). In summary, Covered Activity- related effects are unlikely to impair the function of this habitat unit because of the current level of protection on Tulare Hill, the Plan's occupancy requirements, and the corridor component of the conservation strategy.

- **Santa Teresa Main, Santa Teresa North, Coyote-Bear Ranch County Park, and Calero:** Although none of the Santa Teresa Main, Santa Teresa North, Coyote-Bear Ranch County Park, or Calero habitat units are currently protected as Type 1 Open Space (ICF

61 The six sites are W. Hills of Santa Clara Valley, Tulare Hill, Santa Teresa Hills, Calero, Communication Hill, or North of Llagas Avenue. 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".

International, 2012, Table 5-7), a significant portion of these units will be incorporated into the Reserve System (ICF International, 2012, Table 5-5). The Applicants may enroll up to 12,291 acres of existing County Park lands into the Reserve System. As shown in Figure 5-4 and Table 5-5 of the Plan, approximately[62] 1,690 acres of Calero County Park (38 percent of the park), 825 acres of Coyote-Bear Ranch County Park (18 percent of the park), and 877 acres of Santa Teresa County Park (53 percent of the park) are proposed for inclusion in the Reserve System (ICF International, 2012). Portions of these parks were specifically chosen for incorporation into the Reserve System because of enhancement opportunities for covered serpentine species, including the Bay checkerspot butterfly. Furthermore, Plan occupancy requirements, in satellite populations are likely to be met in the Santa Teresa Hills and Calero satellite units. The enrollment of County Park lands, combined with the Plan's occupancy requirements, make it unlikely that Covered Activity-related effects would impair the function of these habitat units.

- **Pound Site:** As indicated in Table 5-7 of the Plan, the Pound Site is not targeted for inclusion in the Reserve System (ICF International, 2012). None of this unit is currently protected as Type 1 Open Space (ICF International, 2012, Table 5-7). However, the Plan limits effects on the Pound Site core habitat unit to 13 percent of the unprotected portion (everything except Type 1 Open Space). The proposed development in the Pound Site would occur in lower quality habitat in and near developed sites and on dry, south-facing slopes (ICF International, 2012, Section 4.6.1), which on their own, are less likely to sustain viable populations of Bay checkerspot butterflies. Limitations on the amount, and location, of effects on the Pound site make it unlikely that Covered Activity-related effects would impair the function of this habitat unit for the species. Furthermore, portions of the site that are suitable habitat may be targeted for conservation to support connectivity to the Tulare Hill habitat unit (ICF International, 2012, Table 5-7).

- **Silver Creek Hills North #1 and #2:** As indicated in Table 5-7 of the Plan, the Silver Creek Hills North #1 and #2 core units are not targeted for inclusion in the Reserve System (ICF International, 2012). However, the threat of development is low in Silver Creek Hills North #1 because 90 percent of the unit (345 acres) is already protected in Type 1 Open Space. Twenty five percent (25 percent) of Silver Creek Hills North #2 (103 acres) is currently protected in Type 1 Open Space (ICF International, 2012, Table 5-7). Furthermore, extensive acquisition is required on Coyote Ridge (70 percent of core Bay

62 Minor deviations in park-specific enrollment may occur as the estimates were provided based on air photo and land cover mapping.

checkerspot butterfly habitat) from Silver Creek south to Anderson Reservoir (ICF International, 2012, Sections 5.3.3 and 5.4.1). Protection of the linkage between the Silver Creek and Metcalf populations (LAND-9, LAND-L4) is critical for the species and will be necessary to meet the biological goals and objectives for this species (ICF International, 2012, Section 5.4.1). The Implementing Entity is also required to acquire and manage enough habitat to ensure each of the four core habitat units identified in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b) is occupied by the Bay checkerspot butterfly, which includes Silver Creek Hills (divided into Silver Creek Hills North #1 and #2 and Silver Creek Hill Central in the Plan) (ICF International, 2012, Section 5.3.1). Therefore, it is unlikely that Covered Activity-related effects would impair the function of these habitat units.

Effects on Bay checkerspot butterfly habitat is further limited to 3 percent 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 of the Plan), with the exception of the proposed activities on the Kirby/East Hills core habitat unit, which were previously described. Therefore, effects to Bay checkerspot butterfly modeled habitat are limited in total amount (up to 4 percent of total modeled habitat) and in geographic scope (no more than 3 percent 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) (ICF International, 2012, Section 5.4.1).

Implementation of Condition 13 of the Plan will further minimize the potential for death, injury, harm, and harassment. Condition 13 requires surveys for larval host plants within mapped Bay checkerspot butterfly habitat. If larval host plants are found, reconnaissance-level surveys for adult butterflies during the peak of the flight period will be conducted to determine species presence or absence (ICF International, 2012, Section 6.5).

As previously indicated in Section 2.4.3.1 of this Opinion, vehicle-related deaths and injuries are expected to increase as a direct and indirect result of Covered Activities. Vehicular strikes will have the greatest effect on adult butterflies dispersing between habitat patches. Vehicle strikes are most likely to occur on the following existing roads, due to their relative location to Bay checkerspot butterfly populations, road configuration, and traffic patterns:

- U.S. 101
- Metcalf Road
- Silver Creek Valley Road
- Monterey Highway
- Santa Teresa Boulevard
- Dirt ranch roads in or adjacent to Bay checkerspot butterfly habitat

- Roads in residential developments adjacent to Bay checkerspot butterfly habitat (i.e., Silver Creek Hills, residential areas along Basking Ridge Avenue).

Although likely to occur, vehicular strikes will not be a significant detriment to the species' long-term viability with the successful implementation of the conservation strategy. As stated in Goal 11 of the Plan, these lands will be managed to "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"(ICF International, 2012, Table 5-1c). It is likely that Goal 11 will be achieved, given that the Plan requires the preservation and management of Bay checkerspot butterfly habitat, ensures that all core habitat units will be occupied, and ensures that 50 percent of satellite habitat units will be occupied. Therefore, the number of individuals lost from increased vehicle strikes will be minimal, relative to the increased population, number of populations, and distribution of populations achieved with the successful implementation of the Plan.

Unavoidable direct and indirect effects will be mitigated through the preservation, enhancement, and management of modeled Bay checkerspot butterfly habitat. The Plan will acquire 3,800 acres of modeled primary Bay checkerspot butterfly habitat and preserve an additional 754 acres of modeled primary Bay checkerspot butterfly habitat through the incorporation of existing open space into the Reserve System (ICF International, 2012, Table 5-17). These acquisitions and additions will increase the proportion of protected modeled habitat in the Action Area to approximately 68 percent in Type 1 Open Space and 78 percent in Type 1, 2, or 3 Open Space (ICF International, 2012, Section 5.4.14). Table 5-19 of the Plan describes the required distribution of serpentine grassland acquired in the Action Area according to Conservation Analysis Zones (ICF International, 2012).

Extensive land acquisition will occur in all four of the core habitat areas, as defined in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b): Kirby, Metcalf, San Felipe, and Silver Creek Hills. The primary focus of land acquisition will be Coyote Ridge. The Plan will also protect secondary sites deemed essential for the recovery of the species, including the following (ICF International, 2012, Section 5.4.1):

- Santa Teresa Hills: A "potential core area" and "stepping stone" in the Recovery Plan. Approximately 877 acres (53 percent) of Santa Teresa County Park are proposed for incorporation into the Reserve System and will be managed to improve habitat for this species; most of this area supports serpentine bunchgrass grassland (over 670 acres).
- 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 percent of the currently unprotected portions of Hale/Falcon Crest, Kalana Avenue, and Canada Garcia sites.

In addition, the Implementing Entity will protect at least 4,000 acres of serpentine bunchgrass grassland, 3,800 acres of which will include modeled habitat for the Bay checkerspot butterfly. The conservation strategy for the Bay checkerspot butterfly, in combination with existing Type 1 Open Space, will result in the protection of 70 percent 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 butterflies. Of the 4,000 acres of serpentine grassland to be preserved, a minimum of 2,900 acres will be located on Coyote Ridge (LAND-L5) (ICF International, 2012, Section 5.4.1 and Table 5-19).

To ensure that the loss of individual Bay checkerspot butterflies is adequately mitigated, the Plan requires that occupancy be demonstrated in both core and satellite habitat units. The occupancy requirement must 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 the Bay checkerspot butterfly to ensure occupancy of each of the four core habitat units (Kirby, Metcalf, San Felipe, and Silver Creek Hills) identified in Figure 5-A of the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b). Occupancy in these four core habitat units will be demonstrated at least four out of every ten consecutive years[63] of the permit term (ICF International, 2012, Section 5.3.1).

The Implementing Entity will also acquire and manage land to ensure occupancy of at least three of the six (50 percent)[64] satellite habitat units identified in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b) (W. Hills of Santa Clara Valley, Tulare Hill, Santa Teresa Hills, Calero, Communication Hill[65], or North of Llagas Avenue) 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 (ICF International, 2012, Section 5.3.1).

The Plan's conservation strategy for the Bay checkerspot is consistent with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b). The Recovery Plan prioritizes 8,674 acres of then-unprotected habitat (i.e., not "fully or partially protected park lands") within

63 This occurrence frequency is based on population data reported for the Kirby, Metcalf, and Silver Creek core habitat units, which are fairly robust (i.e. Kirby population data dates back to 1991).
64 Occupancy is less certain in satellite habitat units because of their smaller size 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. For these reasons, occupancy of a total of 50percent of satellite habitat units must only be demonstrated once by Year 45.
65 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.

specific portions of the Action Area that "are considered essential to the recovery" of the species (U.S. Fish and Wildlife Service, 1998b). The 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. These prioritizations for protection were based on habitat mapping that occurred prior to the development of the Plan. The mapping of Bay checkerspot habitat for the Plan resulted in a new, more accurate, estimate of unprotected habitat in the Action Area that total 7,285 acres (total habitat modeled minus habitat in Type 1 Open Space) (see Plan Table 5-7 and Appendix D).

The recovery strategy contained in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b) indicates that habitat protection will be essential for recovery. The Recovery Plan recommends that the following factors be considered when protecting habitat, all of which are integrated into the Plan's conservation strategy for the species:

- Habitat size and quality, including diversity
- Location in relation to other habitat patches and to core populations
- Presence, current or historic, of the Bay checkerspot butterfly
- Ease and cost of protection

All of the areas targeted for acquisition under the Plan are consistent with the areas identified as essential to the recovery of the species in the Recovery Plan. Furthermore, the Recovery Plan indicates that habitat restoration and management will be needed on many Bay checkerspot habitat areas and that appropriate grazing management should ensure that habitats are neither overgrazed nor overgrown. Management is a critical component to the Plan's conservation strategy in general. In particular, the Plan emphasizes the importance of managing serpentine land cover types in light of the ongoing cumulative effects of nitrogen deposition. All acquired lands will be enhanced and managed under the Plan.

Furthermore, the Recovery Plan also emphasizes the importance of monitoring and adaptive management. As previously indicated in Section 2.1.8 of this Opinion, the Plan includes a multi-leveled monitoring plan (landscape-level, natural community-level, and species-level). The Bay checkerspot butterfly will be monitored on an annual basis and will be adaptively managed. The Recovery Plan identifies vegetation management, air pollution, habitat restoration, artificial rearing, and role of nectar sources as important subjects for future research. Vegetation management techniques have been the subject of many studies since the finalization of the Recovery Plan (i.e. Weiss and Wright, 2006; Weiss, 2006). Vegetation management and restoration techniques will continue to be tested and refined during the permit term, in accordance with Chapter 7 of the Plan. As indicated in Section 2.4.4 of this Opinion, the Applicants conducted extensive air quality modeling (see Plan Appendix E) during the preparation of this Plan to determine the baseline amounts of nitrogen deposition in the Action Area as well as to make relative projections of future nitrogen deposition. Artificial rearing

and the role of nectar resources may be the subject of future studies during the permit term if they are deemed necessary to achieve the conservation strategy for the species.

Habitat Fragmentation: The Plan will result in the protection of occupied and potential Bay checkerspot habitat and will protect critical linkages. Protection of landscape linkages 6 and 8 (see Plan Table 5-9 and Figure 5-8) will directly benefit the Bay checkerspot butterfly. Protection of the linkage between the Silver Creek and Metcalf populations 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 of the Plan (ICF International, 2012, Section 5.4.1). Table 5-1a of the Plan identifies conservation actions to ensure connectivity of Bay checkerspot butterfly habitat on Coyote Ridge, the largest remaining contiguous piece of habitat for the species, and thus critical to the species' recovery. LAND-L5 requires the acquisition of 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. LAND-L10 specifically requires the acquisition of grassland along Coyote Ridge to protect the connection between Silver Creek and Kirby Canyon (ICF International, 2012, Table 5-1a).

Although Bay checkerspot butterflies from core populations are expected to colonize previously unoccupied areas or areas that historically supported the species, it may become necessary to translocate individuals if it becomes apparent that natural dispersal is not occurring. Translocation is an important action identified in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b) as a tool to establish and reestablish populations. If it becomes apparent that natural dispersal is not occurring despite adequate site management, the Implementing Entity may propose translocation efforts. 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 levels. In such cases, Bay checkerspot butterflies (eggs, larvae, and/or adults) may be translocated from core populations into suitable but unoccupied sites to reestablish populations (ICF International, 2012, Section 5.4.1).

As indicated in Section 2.4.3.1 of this Opinion, the likelihood of death or injury of Bay checkerspot butterflies as a result of translocation activities are minimal. Harrison *et al*. (1991) examined the effects of scientific collection of the Bay checkerspot butterfly in two populations on Jasper Ridge and concluded that the effects of sampling were statistically undetectable in comparison to variation in population size due to environmental factors; however, they did note that sampling appeared to increase the chances of extinction (as high as 15 percent) of 2 of the 3 populations at Jasper Ridge. The potential for take and adverse effects on population viability associated with translocation are however, low because all translocation events will be coordinated with, and approved by, the Wildlife Agencies and will be carried out on an experimental basis (ICF International, 2012, Section 5.4.1).

Critical Habitat

Continued urban and rural growth on the east side of Coyote Creek in and near the Silver Creek Hills will result in the loss of critical habitat. Any conversion of habitat would also result in a complete loss of primary constituent elements, were they to be present on site. An increase in vehicles on local highways, as well as highways throughout the San Francisco Bay Area, will result in increased nitrogen deposition, which will indirectly degrade 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., prescribed fire) used to enhance these sites. Public access to Plan reserves may further affect critical habitat units by facilitating the transfer of invasive plants into areas that were previously inaccessible or by increasing the likelihood of the public treading on individuals and host plants.

Despite these potential effects, the function of each critical habitat unit is expected to be maintained for the species. The Plan targets the acquisition of most of the core habitat areas identified in this Plan, which largely overlap critical habitat (ICF International, 2012, Tables 5-7 and 5-21). Grazing will be a key management tool used within the Reserve System, and it is expected that careful grazing management will successfully rehabilitate degraded serpentine areas and protect existing habitat from the stressors of nitrogen deposition. Furthermore, within the Reserve System, trails and recreational use will only be allowed if they are consistent with the biological goals and objectives of the Plan. As such, the potential for effects associated with recreation will be significantly reduced. Protection and management of critical habitat will thus protect the function of the primary constituent elements of Bay checkerspot butterfly critical habitat units within the Reserve System (ICF International, 2012, Section 4.7.1).

The Plan minimizes effects to Bay checkerspot critical habitat by limiting the total amount of permanent effects on critical habitat to less than 550 acres (3 percent of critical habitat in the Action Area) and the total amount of temporary effects on critical habitat to 86 acres (less than 1 percent of critical habitat in the Action Area) (ICF International, 2012, Table 4-9).

Due to the programmatic nature of the Plan, effects on critical habitat could not be identified to the unit level; however, effects on Bay checkerspot butterfly habitat is limited to 3 percent of the unprotected portion (everything except Type 1 Open Space) of any core or satellite habitat unit targeted for conservation (ICF International, 2012, Table 5-7) with the exception of the Kirby/East Hills core unit, which has a 11 percent allowance (80 acres) (Gaffney pers. comm., 2012c). There are more core habitat units identified in the Plan than critical habitat units, but core habitat largely overlaps critical habitat units. The caps on development for each core habitat unit are intended to ensure that core habitat will continue to function as habitat for the species (ICF International, 2012, Section 4.7.1). Therefore, it is expected that limits on core habitat development will also ensure

that units of critical habitat continue to function and maintain their conservation role for the Bay checkerspot butterfly.

As indicated in Section 8.10.2 of the Plan, the Wildlife Agencies may request information from the Implementing Entity to verify compliance with the Plan and the Wildlife Agencies' decision documents (ICF International, 2012). As such, during implementation, the Service will request that the Implementing Entity report effects on critical habitat by unit, so that we can verify that destruction and adverse modification of critical habitat is avoided.

Unavoidable effects on critical habitat will be mitigated through the acquisition of critical habitat. The Plan will protect an estimated 9,627 acres of critical habitat in the Reserve System, which represents 58 percent of all critical habitat within the Action Area (ICF International, 2012, Table 5-21). When added to the currently protected portions of critical habitat, approximately 70 percent of Bay checkerspot critical habitat in the Action Area will be preserved as Type 1 Open Space upon successful implementation of the Plan (ICF International, 2012, Section 5.4.1 and Table 5-21).

Due to the programmatic nature of the Plan and the fact that the Reserve System will be assembled through acquisition from willing sellers (ICF International, 2012, Section 5.2.3), the Applicants could not at this time commit to the acres of critical habitat that would be protected in total or by individual unit (i.e. Table 5-21 of the Plan provides estimated acreages of critical habitat within the Reserve System). However, the minimization measures and conservation actions previously described in this section of the Opinion will ensure that primary constituent elements essential to the conservation of the species will continue to function, even after all impacts under the Plan occur. Furthermore, the Reserve design and assembly principles described in Section 5.2.3 of the Plan include maximizing size efficiently, preserving irreplaceable and threatened resources, preserving the highest-quality communities, and preserving connectivity (ICF International, 2012), all of which are factors taken into consideration when the Service designates critical habitat. Thus, it is likely that the Reserve System will contain significant portions of designated critical habitat. The Plan's conservation strategy and goals for this species could not be accomplished unless the functionality of critical habitat was maintained and in many cases, improved from the baseline condition.

Successful implementation of the Plan will likely result in the protection of at least 48 percent of each of the **8** critical habitat units expected to be protected in the Reserve System[66]. 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

66 Critical habitat units 9a and 9b are referred to a single unit in this Plan. Reference to percent protected includes existing Type 1 Open Space at the time of permit issuance in addition to critical habitat preserved during the permit term.

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. Protection of sites will be prioritized according to threat, occupancy history and 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 (ICF International, 2012, Section 5.4.1). Anticipated acquisitions by critical habitat unit are summarized below (ICF International, 2012, Table 5-21):

- 5-Metcalf: 2,580 acres (57 percent)
- 6-Tulare Hill: 169 acres (49 percent)
- 7- Santa Teresa Hills: 2,135 acres (65 percent)
- 8-Calero Reservoir: 1,336 acres (87 percent)
- 9a-Kalana: 103 acres (61 percent)
- 10-Hale: 434 acres (86 percent)
- 11-Bear Ranch: 274 acres (97 percent)
- 13-Kirby: 2,596 acres (48 percent)

No conservation for critical habitat Units 9b and 12 is anticipated under the 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 Jose. It also borders a portion of the Coyote Valley Greenbelt. This area is unincorporated and is characterized by the Ranchland/Woodland land use type, which allows a maximum development density of 1 dwelling unit per 20 acres. No water or transportation projects are planned for this site. While it is possible that this unit could be affected by rural development, due to the location of the site (outside urban areas), development density requirements, and the small size of the unit (only 56 acres), this unit is not expected to experience much development (ICF International, 2012, Section 4.7.1). Therefore, the functionality of this critical habitat unit will likely be maintained.

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. Approximately 52 percent of Unit 12 is currently protected as Type 1 Open Space. While it is possible that this unit could be affected by rural development Plan, due to the location of the site (outside urban areas) and development density requirements, this unit is not expected to experience much development (ICF International, 2012, Section 4.7.1). Therefore, the functionality of this critical habitat unit will likely be maintained.

2.4.5.2 Tiburon Indian Paintbrush

Mortality and Injury: The Plan will not threaten or reduce the long-term viability of the two known occurrences of Tiburon Indian paintbrush in the Action Area.

Effects from management activities to the one occurrence currently under temporary easement, consistent with the conservation strategy of the Plan, are the only effects allowed to the species in the Action Area (ICF International, 2012, Section 5.4.10). Management actions that may temporarily affect this species include prescribed burning and livestock grazing. These management actions however, will result in a net benefit to the species and adverse effects will be both temporary and minor in nature.

No additional effects are allowed on the species, even if more occurrences are discovered during the permit term (ICF International, 2012; Section 4.6.10, Table 4-6, and Table 5-16). Condition 20 of the Plan requires surveys for Tiburon Indian paintbrush in serpentine bunchgrass grassland and serpentine rock outcrop, thus further minimizing the likelihood of adverse effects on new occurrences that may be discovered during the permit term (ICF International, 2012, Section 6.6.2)

The Applicants will mitigate unavoidable direct and indirect effects to the 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 to at least 2,000 individuals (ICF International, 2012, Section 5.4.10 and Table 5-16). This approach is consistent with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b), which describes a recovery strategy that focuses on protecting and managing extant populations. The targeted occurrence size under the Plan is consistent with the targeted population size identified in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b) for the recovery of the species. 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 (ICF International, 2012, Section 5.4.10).

The two known occurrences of Tiburon Indian paintbrush in the Action Area will be permanently protected upon successful implementation of the Plan. According to the Recovery Plan, prior to considering delisting, 10 populations throughout the range should be protected, 2 of which should occur in Santa Clara County (U.S. Fish and Wildlife Service, 1998b). The North Canyon occurrence is anticipated to be permanently protected with a conservation easement by the landfill operator. 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 (ICF International, 2012, Section 5.4.10). Therefore, successful implementation of the Plan, inclusive of all conservation actions for the

species, would facilitate the recovery of the Tiburon Indian paintbrush by fulfilling the Recovery Plan's recommendations within the Santa Clara County portion of the species' range.

Plant Habitat Loss and Degradation: A habitat model was not developed for Tiburon Indian paintbrush because the serpentine soils at the two Santa Clara occurrences appear to be unique from other serpentine soils in the area (ICF International, 2012, Appendix D). The Plan minimizes the effects of Covered Activities on the Tiburon Indian paintbrush by limiting effects on potential habitat during the permit term. All serpentine bunchgrass grassland in the Action Area is considered potential habitat for this species. No more than 550 acres (5.5 percent of the total in the Action Area) of serpentine bunchgrass land cover type may be affected under the Plan (ICF International, 2012, Table 4-2). No more than 91 acres (0.9 percent) of temporary effects on serpentine bunchgrass grassland is anticipated (ICF International, 2012, Section 4.6.8 and Table 4-3).

The Applicants will mitigate unavoidable direct and indirect effects to suitable Tiburon Indian paintbrush habitat by preserving a minimum of 4,000 acres of serpentine bunchgrass grassland and 120 acres of serpentine rock outcrop land cover types (ICF International, 2012, Table 5-11).

2.4.5.3 Coyote Ceanothus

Mortality and Injury: All three known occurrences of Coyote ceanothus are located within the Action Area. The largest known occurrences is located northwest and southwest of Anderson Dam. It is mostly contained 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 affected by covered seismic retrofit activities and/or major maintenance of Anderson Dam (ICF International, 2012, Section 4.6.8). The Plan will not threaten or reduce the long-term viability of the three known occurrences of Coyote ceanothus. No more than 3,650 individuals of the Anderson Dam occurrence or 5 percent, whichever is less, will be affected under the Plan. 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 (ICF International, 2012, Section 5.4.11 and Tables 4-6 and 5-16).

Adverse effects to the other two Coyote ceanothus occurrences are not covered under the Plan. However, minor and temporary effects associated with management of these occurrences, if they are incorporated into the Reserve System, would be covered 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 (ICF International, 2012, Section 4.6.8 and Table 5-16). Condition 20 of the Plan requires surveys for Coyote ceanothus in bunchgrass grassland, mixed serpentine chaparral, and northern coastal scrub and Diablan sage scrub with serpentine soils, thus further minimizing the likelihood of adverse

effects on new occurrences that may be discovered during the permit term (ICF International, 2012, Section 6.6.2)

The Applicants will mitigate unavoidable effects by protecting a total of five occurrences in the Action Area (see Plan Table 5-16). Included in the five occurrences protected will be the three known extant occurrences. This approach is consistent with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b), which describes a recovery strategy that focuses on protecting and managing extant populations. 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.

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 (i.e., 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 a Covered Activity, the creation may occur later in the permit term but no later than by Year 40[67]. 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 effects or prior to Year 40), population creation could occur on suitable sites outside of the Reserve System if the site meets the Plan's 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

67 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 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 involve 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 cuttings.

Within five years of the effects 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 in 2016. Project implementation may need to occur sooner than anticipated due to public safety concerns. If the effects of the project on Coyote ceanothus are greater than what was evaluated in the Plan, additional mitigation may be required to offset the additional effects. This may also require a Plan amendment as described in Section 10.3 of the Plan (ICF International, 2012, Section 5.4.11).

Because of the challenges of protecting one occurrence early in the permit term, SCVWD has taken the following steps to facilitate occurrence creation:

- Communicated with Pepperdine University, which is conducting a genetic (microsatellite) study to determine population structure
- Communicated 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 SCVWD on Coyote Ridge
- Collected and stored seed from the Anderson Dam occurrences

SCVWD will prepare a draft occurrence creation plan. Key components of the creation plan will 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

SCVWD also completed the *Anderson Dam Seismic Retrofit Mitigation Project Operations Project Plan* (2013), which identifies the following key budget milestones, some of which reinforce components of the creation plan listed above:

- Complete pilot nursery project by December 2013
- Complete field studies by September 2013
- Summarize results of field investigations and research studies into draft report by October 2013
- Transplant seedlings into test plots and monitor annually (November 2013-July 2017)
- Finalize selection of suitable introduction site for successful propagation by July 2017
- Complete final Population Design and Implementation Plan by September 2017
- Establish new population by 2018

The conservation strategy for this species is consistent with the Recovery Plan's (U.S. Fish and Wildlife Service, 1998b), downlisting recommendations because successful implementation of the Plan would result in the protection, management, and monitoring of the known populations of Coyote ceanothus. However, the total number of Coyote ceanothus occurrences protected by the Plan deviates from the Recovery Plan's delisting recommendations, which is eight. The Plan's deviation from the Recovery Plan's delisting recommendations is warranted for several reasons. First, there have only been three populations of this species ever discovered[68], even prior to extensive development of the Santa Clara Valley. Second, the characteristics of existing populations suggest that finding five new occurrences is highly unlikely. Finally, the Applicants assessed the potential for creation of new occurrences by examining soil types, proximity to known populations, and other features of habitat suitability and determined that creation of two occurrences was feasible but no more (ICF International, 2012, Section 5.4.11).

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).

68 The Recovery Plan considers the Anderson Dam population as two separate occurrences, consistent with data in the CNDDB (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 is underway to determine the population structure of this species.

Targeted studies will be used to inform the target occurrence size of managed occurrences. A preliminary goal of 5,000 individuals per occurrence will be implemented as recommended in the *Ceanothus ferrisiae (Coyote ceanothus) 5-Year Review: Summary and Evaluation* (U.S. Fish and Wildlife Service, 2011a). 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 mechanical 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 likely benefit from fire management.

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 five years of the Anderson Dam seismic retrofit. Subsequent burns may be conducted during the permit term, as appropriate, through the adaptive management process described in Chapter 7 of the Plan. Prescribed burns will promote regeneration and improve stand health. A qualified biologist will oversee the prescribed burn.

Plant Habitat Loss and Degradation: A habitat model was not developed for this species because of its extremely limited range and the uncertainty in its localized habitat requirements (ICF International, 2012, Appendix D). However, all serpentine bunchgrass grassland and mixed serpentine chaparral in the Action Area are considered potential habitat for this species. The Plan minimizes effects to potential Coyote ceanothus habitat by limiting effects in these land cover types. The maximum allowable permanent effect on serpentine bunchgrass grassland is 550 acres (5.3 percent of the total in the Action Area) (see Plan Table 4-2). The maximum allowable temporary effect on serpentine bunchgrass grassland is 91 acres (less than 1 percent) (See Plan Table 4-3). In addition, no more than 131 acres of mixed serpentine chaparral (3.5 percent of the total in the Action Area) will be permanently affected and no more than 30 acres (less than 1 percent of the total in the Action Area) will be temporarily affected (See Plan Tables 4-2 and 4-3) (ICF International, 2012, Section 4.6.8).

The Applicants will mitigate unavoidable direct and indirect effects to potential Coyote ceanothus habitat by preserving a minimum of 700 acres of mixed serpentine chaparral and 4,000 acres of serpentine bunchgrass grassland land cover types (ICF International, 2012, Table 5-11).

2.4.5.4 Mount Hamilton Thistle

Mortality and Injury: The Plan minimizes direct effects on the Mount Hamilton thistle by limiting the number of occurrences whereby long-term viability is threatened or reduced by Covered Activities (ICF International, 2012, Section

4.6.8 and Table 5-16). For the purposes of this Opinion, we refer to these occurrences as "lost." If no additional occurrences of Mount Hamilton thistle are found during the permit term, no more than 6 occurrences (15 percent of the total known in the Action Area or 13 percent of the total known in the entire range) may be lost as a result of Covered Activities (ICF International, 2012, Table 4-6).

Effects on known occurrences will occur within the planning limit of urban growth. CNDDB occurrences 22, 43, 44, and 51 will likely be amongst those affected (Gaffney pers. comm., 2012a). In addition, two occurrences will be affected by SCVWD canal reconstruction and one adjacent to Anderson Dam will likely be affected by seismic retrofit activities. The six affected occurrences are all located east of U.S. 101. There are population estimates for all six potentially affected occurrences, totaling approximately 9,500 individuals. It is expected that at least one of the affected occurrences of Mount Hamilton thistle will qualify as a partial impact (as defined in Condition 20 of the Plan) and therefore would not count toward the Plan's impact cap for the species (ICF International, 2012, Section 4.6.8).

In addition, it is possible that newly discovered occurrences of this species could be affected by Covered Activities. A maximum of two additional new occurrences (i.e., occurrences not yet known) may be affected by Covered Activities if additional occurrences are protected in accordance with Table 1 below and Section 5.3.1 of the Plan, subheading *Incorporating Covered Plant Species*. For each additional occurrence affected, occurrences of equivalent or better condition must be protected within the Reserve System (ICF International, 2012, Section 4.6.8). If additional occurrences are found during the permit term, effects may increase as described in Table 1 below, as long as new occurrences are found and protected in the Reserve System before the effects occur (ICF International, 2012, Section 4.4.1) at a 3:1 mitigation ratio. Condition 20 of the Plan requires surveys for Mount Hamilton thistle in serpentine seeps, which will assist in detecting new occurrences in the Action Area (ICF International, 2012, Section 6.6.2).

Table 1[1]: Mount Hamilton Thistle Occurrences, Plan Impact Limits, and Conservation Requirements

Occurrences in the Action Area During Plan Implementation[2]		Occurrence Impacts and Conservation				Total Occurrences Protected in Reserve System	
Additional Occurrences Found (Relative to Baseline)	Total in Action Area	Total Maximum Permanently Affected[3]	Protected per Mitigation Ratio (3:1)	Protection to Contribute to Recovery[4]	Total Protected in Reserve System[5]	Acquired	Allowable Creation in Lieu of New Occurrence Acquisition[6]
0	40	6	18	4	22	22	-
6	46	7	21		25	25	-
12	52	8	24		28	28	-

[1]Adapted from Table 5-16 (ICF International, 2012)

[2] These columns represent the minimum number of occurrences that must be known in the Action Area before impacts described in the subsequent column can occur. The first row accounts for the occurrences known at the time of permit issuance. Subsequent rows account for additional occurrences found during the permit term. New plant occurrences found in the expanded burrowing owl study are do not count.

[3] Occurrences are considered permanently affected if a qualified biologist determines that occurrence viability will be threatened or reduced as a result of Covered Activities (ICF International, 2012; Section 6.6.2, Condition 20).

[4] Recovery actions will occur regardless of the level of impact.

[5] The first row in this column represents the minimum requirement of acquisition and creation regardless of the number of occurrences affected under the Plan.

[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 the Coyote Ceanothus (ICF International, 2012, Section 4.6.8). For occurrence preservation, priority will always be given to acquisition, however, if acquisition is infeasible, creation is allowed as stipulated in Section 5.4 of the Plan. The decision to focus conservation efforts on occurrence creation will be made jointly with the Wildlife Agencies. Creation will be completed by Year 40, and acquisition will be completed by Year 45.

Regardless of the level of effect, 22 known occurrences in the Action Area will be acquired and incorporated into the Reserve System (LAND-P6). 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 (ICF International, 2012, Section 5.4.12).

As described in Chapter 4 of the Plan, the Plan's 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 affected. In other words, a minimum of 21 occurrences will be acquired and protected in the Reserve System before a 7th occurrence is affected and a minimum of 24 occurrences will be acquired and protected in the Reserve System before an 8th occurrence is affected. "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 effects, while the remaining 4 occurrences will be acquired for recovery purposes only and thus acquisition timing of these 4 occurrences are not linked to effects. When accounting for the 2 occurrences that are currently protected in the Action Area (ICF International, 2012, Table 4-6), 24-30 occurrences will be protected in the Action Area after the Plan is fully implemented.

This approach is consistent with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b), which describes a recovery strategy that focuses on protecting and managing extant populations. The Recovery Plan recommends preservation of 13 occurrences (55 percent of 23 total occurrences recommended for the long-term conservation of the species) in the "San Jose area" and 8 occurrences (35 percent of 23 total occurrences recommended for the long-term conservation of the species) in "northeastern Santa Clara County and northwestern Stanislaus Counties" (U.S. Fish and Wildlife Service, 1998b), totaling 21 occurrences. Therefore, successful implementation of the Plan, inclusive of all conservation actions for the species, would facilitate the recovery of the Mount Hamilton thistle by exceeding the Recovery Plan's recommendations within the Santa Clara County portion of the species' range.

At the time the Recovery Plan was written, known occurrences of Mount Hamilton thistle were distributed nearly evenly on the east and west side of U.S. 101 and thus, to ensure the long-term conservation of the species, the Recovery Plan recommends that protected populations in the San Jose area be distributed approximately half to the east and half to the west of Highway 101. The Recovery Plan states however, that if additional surveys indicate the actual distribution of populations is different, targets for protection should be changed to be consistent with the new information (U.S. Fish and Wildlife Service, 1998b). Many more occurrences of Mount Hamilton thistle have been documented since the Recovery Plan was finalized, most of which are located in serpentines areas in and around Coyote Ridge on the east side of U.S. 101. Based on this new information, the Plan's conservation strategy focuses its acquisition efforts for the Mount Hamilton thistle on the east side of U.S. 101. Janell Hillman, a species expert, agrees with this approach (J. Hillman pers. comm., as cited in ICF International, 2012, Section 5.4.12). Acquisition will also be targeted 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 (ICF International, 2012, Section 5.4.12).

To successfully manage existing occurrences of Mount 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 (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) (ICF International, 2012, Section 5.4.12). The Recovery Plan (U.S. Fish and Wildlife Service, 1998b) identifies this type of research as high priority recovery activities for the species.

Furthermore, 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 in isolated points rather than in a network of drainages (Hillman pers. comm., as cited in ICF International, 2012, Section 5.4.12). 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 (ICF International, 2012, Section 5.4.12).

Plant Habitat Loss and Degradation: In addition to the occurrence-level effects allowed under the Plan, no more than 26 acres of Mount Hamilton thistle modeled primary habitat will be permanently affected and no more than an additional 4 acres of modeled primary habitat will be temporarily affected (ICF International, 2012, Table 4-4).

In addition to the mitigation of plant occurrences described in Table 1 above, the Applicants will mitigate unavoidable direct and indirect effects to Mount Hamilton thistle modeled habitat by preserving a minimum of 210 acres of modeled primary habitat, 60 acres of which could be existing open space that is protected and managed in accordance with the Plan. These acquisitions and additions will increase the proportion of protected modeled habitat in the Action Area to about 54 percent in Type 1 Open Space and 73 percent in Type 1, 2, or 3 Open Space (ICF International, 2012, Table 5-17). Mount Hamilton thistle is also expected to benefit from acquisition and enhancement of grassland natural communities under the Plan, as these land cover types include the serpentine seeps and streams that serve as primary habitat and may contain known or undiscovered occurrences.

Because Mount Hamilton thistle only occurs along creeks and drainages, the hydrologic systems that maintain these features are critical to the survival of this species. Therefore, the Implementing Entity will also manage and maintain the hydrologic systems (i.e., springs, streams, ponds) that support Mount Hamilton thistle (ICF International, 2012, Section 5.4.12).

Nitrogen Deposition: Mount Hamilton thistle is a perennial that dominates serpentine seeps and persists in both grazed and ungrazed drainages. Annual grasses do not readily invade the active stream channels and the species thrives in a variety of grazing regimes. Therefore, Mount Hamilton thistle does not appear to be as sensitive to N-deposition as other covered serpentine plant species.

2.4.5.5 Santa Clara Valley Dudleya

Mortality and Injury: The Plan minimizes direct effects on the Santa Clara dudleya by limiting the number of occurrences whereby long-term viability is threatened or reduced by Covered Activities (ICF International, 2012, Section 4.4.1 and Table 5-16). For the purposes of this Opinion, we refer to these occurrences as "lost." If no additional occurrences of Santa Clara dudleya are

found during the permit term, no more than 11 occurrences (5 percent of the total known in the Action Area[69]) may be lost as a result of Covered Activities (ICF International, 2012, Table 4-6). Among those likely to be lost include CNDDB occurrences 7, 8, 12, 24, 28, 38, 53, 54, 55, and 56 along with one occurrence documented by SCVWD that is not recorded in the CNDDB (Gaffney pers. comm., 2012a). These effects are anticipated to occur from urban development within the planning limit of urban growth, SCVWD canal reconstruction, and dam and reservoir maintenance and dam seismic safety retrofits in the vicinity of Almaden Dam and Coyote Reservoir (ICF International, 2012, Section 4.6.8).

There are population estimates for 10 of the 11 occurrences anticipated to be affected. These estimates, based on observations between 1992 and 2008, range from 10 to 1,800 plants per occurrence. The total for all 11 occurrences is 3,700 individuals (California Natural Diversity Database 2012; J. Hillman pers. comm., as cited in ICF International, 2012, Section 4.6.8). Forty-seven occurrences documented in the CNDDB (2012) (those affected by Covered Activities and those not) have population estimates that total approximately 72,500. Therefore, if all 11 occurrences were affected by Covered Activities, far less than 5 percent of the known individuals of Santa Clara Valley dudleya would be affected. This is likely a large overestimate of effects because most of the occurrences in the CNDDB do not have population estimates; the database could therefore include occurrences with very large populations. Actual effects are likely less than 1 percent. Furthermore, new occurrences of this species are discovered frequently so it is highly likely that more occurrences will be discovered during Plan implementation (ICF International, 2012, Section 4.6.8).

In addition, it is possible that newly discovered occurrences of this species could be affected by Covered Activities. A maximum of three additional new occurrences (i.e., occurrences not yet known) may be affected by Covered Activities if additional occurrences are protected in accordance with Table 2 below and Section 5.3.1 of the Plan, subheading *Incorporating Covered Plant Species*. For each additional occurrence affected, occurrences of equivalent or better condition must be protected within the Reserve System (ICF International, 2012, Section 4.6.8). If additional occurrences are found during the permit term, effects may increase as described in Table 2 below as long as new occurrences are found and protected in the Reserve System before the effects occur (ICF International, 2012, Section 4.4.1), at a 4:1 mitigation ratio. Condition 20 of the Plan requires surveys for Santa Clara Valley dudleya in serpentine rock outcrop, which will assist in detecting new occurrences in the Action Area (ICF International, 2012, Section 6.6.2).

69 This is also approximately 5 percent of the known occurrence in the entire range, since most of the known occurrences are located in the Action Area.

Table 2[1]: Santa Clara Dudleya Occurrences, Plan Impact Limits, and Conservation Requirements

Occurrences in the Action Area During Plan Implementation[2]		Occurrence Impacts and Conservation				Total Occurrences Protected in Reserve System	
Additional Occurrences Found (Relative to Baseline)	Total in Action Area	Total Maximum Permanently Affected[3]	Protected per Mitigation Ratio (4:1)	Protection to Contribute to Recovery[4]	Total Protected in Reserve System[5]	Acquired	Allowable Creation in Lieu of New Occurrence Acquisition[6]
0	207	11	44	11	55	55	-
6	213	12	48		59	59	-
12	219	13	52		63	63	-
18	225	14	56		67	67	-

[1]Adapted from Table 5-16 (ICF International, 2012)

[2] These columns represent the minimum number of occurrences that must be known in the Action Area before impacts described in the subsequent column can occur. The first row accounts for the occurrences known at the time of permit issuance. Subsequent rows account for additional occurrences found during the permit term. New plant occurrences found in the expanded burrowing owl study are do not count.

[3] Occurrences are considered permanently affected if a qualified biologist determines that occurrence viability will be threatened or reduced as a result of Covered Activities (ICF International, 2012; Section 6.6.2, Condition 20).

[4] Recovery actions will occur regardless of the level of impact.

[5] The first row in this column represents the minimum requirement of acquisition and creation regardless of the number of occurrences affected under the Plan.

[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 for the Coyote Ceanothus (ICF International, 2012, Section 4.6.8). For occurrence preservation, priority will always be given to acquisition, however, if acquisition is infeasible, creation is allowed as stipulated in Section 5.4 of the Plan. The decision to focus conservation efforts on occurrence creation will be made jointly with the Wildlife Agencies. Creation will be completed by Year 40, and acquisition will be completed by Year 45.

Regardless of the level of effect, lands that support 55 extant occurrences of Santa Clara Valley dudleya will be acquired (through acquisition or conservation easement). In accordance with the Recovery Plan (U.S. Fish and Wildlife Service, 1998b), occurrences will be distributed throughout the range of the species. The Implementing Entity will stratify protection and acquire sites in the Action Area on both sides of Coyote Valley to ensure geographic diversity amongst protected occurrences. The majority of the known occurrences will be acquired along Coyote Ridge in the Coyote-4, 5, and 6 Conservation Analysis Zones. In addition, 4 occurrences are anticipated to be protected in the Santa Teresa Hills and Tulare Hill, 2 west of Calero County Park, and 1 north of Morgan Hill. Incorporation of portions of Santa Teresa, Calero, Anderson Lake, and Almaden Quicksilver County Parks into the Reserve System (see Plan Table 5-5) will protect 11 of the 55 occurrences (ICF International, 2012, Section 5.4.13).

As described in Chapter 4 of the Plan, the Plan's 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 affected. In other words, a minimum of 48 occurrences will be acquired and protected in the Reserve System before a 12th occurrence is affected, a minimum of 52 occurrences will be acquired and protected in the Reserve System before a 13th

occurrence is affected, and a minimum of 56 occurrences will be acquired and protected in the Reserve System before a 14th occurrence is affected. "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 effects, while the remaining 11 occurrences will be acquired for recovery purposes only and thus acquisition timing of these 11 occurrences are not linked to effects. When accounting for the 2 occurrences that are currently protected in the Action Area (ICF International, 2012, Table 4-6), 57-69 occurrences will be protected in the Action Area after the Plan is fully implemented.

This approach is consistent with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b), which describes a recovery strategy that focuses on protecting and managing extant populations. The Recovery Plan recommends the protection and management of 20 populations of Santa Clara dudleya before the Service considers downlisting and recommends the protection and management of 30 populations before the Service considers delisting. Therefore, successful implementation of the Plan, inclusive of all conservation actions for the species, would facilitate the recovery of the Santa Clara dudleya by exceeding the Recovery Plan's delisting recommendations.

The Recovery Plan (U.S. Fish and Wildlife Service, 1998b) also recommends the protection of one occurrence in the San Martin Area. There are only two known 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 was in the process of being protected by a conservation easement for mitigation associated with the Corde Valle Golf Course during the development of this Opinion. 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 Action Area. This could include either the southwest or southeast portion of the Action Area. Therefore, the Implementing Entity will not focus on acquiring occurrences in the San Martin area (ICF International, 2012, Section 5.4.13). This approach is consistent with the Recovery Plan, which recommends the protection of occurrences throughout the range of the species (north, central, and south).

To successfully manage existing occurrences of Santa Clara Valley dudleya, targeted studies will be conducted to determine the biological definition of a "population" for this species 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 (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) (ICF International, 2012, Section 5.4.13). These studies are consistent with research activities recommended in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b) for the species.

The Santa Clara dudleya is the only covered plant species where an occurrence is not defined as a group of individuals that is separated by at least 0.25 mile from other groups of individuals of the same species or subspecies[70]. For the purposes of the Plan, a distinct occurrence of Santa Clara dudleya is defined as a group of individuals on a rock outcrop. These rock outcrops often occur less than 0.25 mile from each other (ICF International, 2012, Section 5.3.1). 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 occurrence will be implemented, as recommended in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b). 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 (ICF International, Section 5.4.13).

Plant Habitat Loss and Degradation: A habitat model for Santa Clara Valley dudleya could not be developed because of its highly specialized and localized habitat requirements (ICF International, 2012, Appendix D). As previously described in Section 2.4.4 of this Opinion, the Plan however, minimizes direct and indirect effects on the Santa Clara dudleya by limiting the amount of effects on serpentine bunchgrass grassland and serpentine rock outcrop land cover types, all of which are suitable habitat for the species. A maximum of 550 acres (5.3 percent of the total in the Action Area) of serpentine bunchgrass grassland and 22 acres (8.5 percent of the total in the Action Area) of serpentine rock outcrop will be permanently affected. A maximum of 91 acres (less than 1 percent of the total in the Action Area) of serpentine bunchgrass grassland and 2 acres (0.6 percent of the total in the Action Area) of serpentine rock outcrop will be temporarily affected (ICF International, 2012, Section 4.6.8 and Table 4-2).

Up to **8.5 percent** of serpentine rock outcrop in the Action Area, the primary habitat for Santa Clara dudleya, will be permanently affected by Covered Activities. However, this proportion is likely an overestimate of effects 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 effects are likely to be much less than **8.5 percent** of available habitat (ICF International, 2012, Section 4.6.8 and Table 4-2).

70 For all other covered plant species, this definition of an "occurrence" was used to be consistent with how plants are tracked by the CNDDB and to facilitate compliance monitoring.

In addition to the mitigation of plant occurrences described in Table 2 above, the Applicants will mitigate unavoidable direct and indirect effects to suitable Santa Clara dudleya habitat by preserving a minimum of 4,000 acres of serpentine bunchgrass grassland and 120 acres of serpentine rock outcrop land cover types (ICF International, 2012, Table 5-11). Furthermore, Santa Clara Valley dudleya is expected to benefit from the acquisition and enhancement of grasslands (see Section 5.3.3 of the Plan) and oak woodlands that include serpentine rock outcrops (ICF International, 2012, Section 5.4.13).

2.4.5.6 Fragrant Fritillary

Mortality and Injury: The Plan minimizes direct effects on the fragrant fritillary by limiting the number of occurrences whereby long-term viability is threatened or reduced by Covered Activities (ICF International, 2012, Section 4.4.1 and Table 5-16). For the purposes of this Opinion, we refer to these occurrences as "lost." If no additional occurrences of fragrant fritillary are found during the permit term, no more than 1 occurrence (13 percent of the total known in the Action Area or 2 percent of the total known in the entire range) may be lost as a result of Covered Activities (ICF International, 2012, Table 4-6). The occurrence to be lost is likely CNNDB occurrence # 32 (Gaffney pers. comm., 2012a). This occurrence is located within the planning limit of urban growth and may be affected by urban development. The occurrence contained eight individuals during a 2000 survey (ICF International, 2012, Section 4.6.8).

In addition, it is possible that newly discovered occurrences of this species could be affected by Covered Activities. A maximum of two additional new occurrences (i.e., occurrences not yet known) may be affected by Covered Activities if additional occurrences are protected in accordance with Table 3 below and Section 5.3.1 of the Plan, subheading *Incorporating Covered Plant Species*. For each additional occurrence affected, occurrences of equivalent or better condition must be protected within the Reserve System (ICF International, 2012, Section 4.6.8). If additional occurrences are found during the permit term, effects may increase as described in Table 3 below as long as new occurrences are found and protected in the Reserve System before the effects occur (ICF International, 2012, Section 4.4.1), at a 3:1 mitigation ratio. Condition 20 of the Plan requires surveys for fragrant fritillary in serpentine bunchgrass grassland, which will assist in detecting new occurrences in the Action Area (ICF International, 2012, Section 6.6.2).

Table 3[1]: Fragrant Fritillary Occurrences, Plan Impact Limits, and Conservation Requirements

Occurrences in the Action Area During Plan Implementation[2]		Occurrence Impacts and Conservation				Total Occurrences Protected in Reserve System	
Additional Occurrences Found (Relative to Baseline)	Total in Action Area	Total Maximum Permanently Affected[3]	Protected per Mitigation Ratio (3:1)	Protection to Contribute to Recovery[4]	Total Protected in Reserve System[5]	Acquired	Allowable Creation in Lieu of New Occurrence Acquisition[6]
0	8	1	3	1	4	4	-
5	13	2	6		7	7	-
10	18	3	9		10	10	-

[1]Adapted from Table 5-16 (ICF International, 2012)

[2] These columns represent the minimum number of occurrences that must be known in the Action Area before impacts described in the subsequent column can occur. The first row accounts for the occurrences known at the time of permit issuance. Subsequent rows account for additional occurrences found during the permit term. New plant occurrences found in the expanded burrowing owl study are do not count.

[3] Occurrences are considered permanently affected if a qualified biologist determines that occurrence viability will be threatened or reduced as a result of Covered Activities (ICF International, 2012; Section 6.6.2, Condition 20).

[4] Recovery actions will occur regardless of the level of impact.

[5] The first row in this column represents the minimum requirement of acquisition and creation regardless of the number of occurrences affected under the Plan.

[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 for the Coyote Ceanothus (ICF International, 2012, Section 4.6.8). For occurrence preservation, priority will always be given to acquisition, however, if acquisition is infeasible, creation is allowed as stipulated in Section 5.4 of the Plan. The decision to focus conservation efforts on occurrence creation will be made jointly with the Wildlife Agencies. Creation will be completed by Year 40, and acquisition will be completed by Year 45.

Regardless of the level of effect, 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. 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 (see Plan Table 5-5). The fourth occurrence will be located in the Santa Cruz Range (ICF International, 2012, Section 5.4.14).

As described in Chapter 4 of the Plan, the Plan's 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 affected. In other words, a minimum of 6 occurrences will be acquired and protected in the Reserve System before a 2nd occurrence is affected and a minimum of 9 occurrences will be acquired and protected in the Reserve System before a 3rd occurrence is affected. "Minimums" are referenced here because the Implementing Entity will protect 4 occurrences, regardless of effects. The timing of acquisition of 3 of the 4 occurrences are linked to effects, while the remaining 1 occurrence will be acquired for recovery purposes only and thus acquisition timing of this 1 occurrence is not linked to effects.

Plant Habitat Loss and Degradation: Dam and reservoir maintenance could result in small permanent and temporary effects on modeled fragrant fritillary habitat (ICF International, 2012, Section 4.6.8). To minimize direct effects, no

more than 550 acres of fragrant fritillary modeled primary habitat and 2,729 acres of modeled secondary habitat will be permanently affected by Covered Activities (ICF International, 2012, Table 4-4). No more than an additional 59 acres of modeled primary habitat and 655 acres of modeled secondary habitat will be temporarily affected (ICF International, 2012, Table 4-4).

In addition to the mitigation of plant occurrences described in Table 3 above, the Applicants will mitigate unavoidable direct and indirect effects to fragrant fritillary habitat by preserving modeled habitat. 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 (ICF International, 2012, Table 5-17). These acquisitions and additions will increase the proportion of protected modeled habitat in the Action Area to approximately 26 percent in Type 1 Open Space and 39 percent in Type 1, 2, or 3 Open Space. Land acquisition that would protect primary and secondary modeled habitat would occur in almost all Conservation Analysis Zones in the Action Area in which land acquisition is targeted (ICF International, 2012, Section 5.4.14).

Furthermore, fragrant fritillary is expected to benefit from the 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 Plan Section 5.3.3), chaparral and coastal scrub (see Plan Section 5.3.4), oak and conifer woodlands (see Plan Section 5.3.5), and seasonal wetlands (see Plan Section 5.3.7) (ICF International, 2012, Section 5.4.14).

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 focus on seed germination and transplantation techniques. 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) (ICF International, 2012, Section 5.4.14).

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 (ICF International, 2012, Section 5.4.14).

2.4.5.7 Smooth Lessingia

Mortality and Injury: The Plan minimizes direct effects on the smooth lessingia by limiting the number of occurrences whereby long-term viability is threatened or reduced by Covered Activities (ICF International, 2012, Section 4.4.1 and Table 5-16). For the purposes of this Opinion, we refer to these occurrences as "lost." If no additional occurrences of smooth lessingia are found during the

permit term, no more than 6 occurrences (15 percent of the total known in the Action Area[71]) may be lost as a result of Covered Activities (ICF International, 2012, Table 4-6). Among those likely to be lost include CNDDB occurrences 6 and 34, along with 4 other occurrences documented by the SCVWD but not recorded in the CNDDB (Gaffney pers. comm., 2012a).

Effects from Covered Activities may occur from SCVWD canal reconstruction; dam seismic safety retrofits; or dam maintenance activities at Almaden Dam, Anderson Dam, Calero Main Dam, and Chesbro Dam if no additional occurrences are discovered. Dam retrofit and maintenance activities will affect an estimated **9,605** individual plants (30 at Almaden Dam, 3,600 at Chesbro Dam, 175 at Calero Main Dam, and 5,800 near Anderson Dam), based on 2006 surveys conducted by SCVWD (Gaffney pers. comm., 2012b). Canal reconstruction is estimated to affect approximately 6,500 individuals, according to surveys conducted by SCVWD in 2008 (ICF International, 2012, Section 4.6.8).

In addition, it is possible that newly discovered occurrences of this species could be affected by Covered Activities. A maximum of three additional new occurrences (i.e., occurrences not yet known) may be affected by Covered Activities if additional occurrences are protected in accordance with Table 4 below and Section 5.3.1 of the Plan, subheading *Incorporating Covered Plant Species*. For each additional occurrence affected, occurrences of equivalent or better condition must be protected within the Reserve System (ICF International, 2012, Section 4.6.8). If additional occurrences are found during the permit term, impacts may increase as described in in Table 4 below as long as new occurrences are found and protected in the Reserve System before the effects occur (ICF International, 2012, Section 4.4.1), at a 2:1 mitigation ratio. Condition 20 of the Plan requires surveys for smooth lessingia in serpentine bunchgrass grassland and serpentine rock outcrop, which will assist in detecting new occurrences in the Action Area (ICF International, 2012, Section 6.6.2).

71 The Action Area represents the majority of the known range of this species; therefore, the relative impact to known occurrences throughout the range is also approximately 15 percent.

Table 4[1]: Smooth Lessingia Occurrences, Plan Impact Limits, and Conservation Requirements

Occurrences in the Action Area During Plan Implementation[2]		Occurrence Impacts and Conservation				Total Occurrences Protected in Reserve System	
Additional Occurrences Found (Relative to Baseline)	Total in Action Area[3]	Total Maximum Permanently Affected[4]	Protected per Mitigation Ratio (2:1)	Protection to Contribute to Recovery[5]	Total Protected in Reserve System[6]	Acquired	Allowable Creation in Lieu of New Occurrence Acquisition[7]
0	**38**	6	12	12	24	12	12
7	**45**	7	14		26	14	
10	**48**	8	16		28	16	
13	**51**	9	18		30	18	

[1] Adapted from Table 5-16 (ICF International, 2012)
[2] These columns represent the minimum number of occurrences that must be known in the Action Area before impacts described in the subsequent column can occur. The first row accounts for the occurrences known at the time of permit issuance. Subsequent rows account for additional occurrences found during the permit term. New plant occurrences found in the expanded burrowing owl study are do not count.
[3] CNDDB occurrence #24 was inadvertently included in the total count of occurrences located within the Action Area in the Final Plan. However, the occurrence is actually located just outside of the Action Area, west of Guadalupe Reservoir. Therefore, there are currently 38 known extant occurrences of smooth lessingia within the Action Area (Gaffney pers. comm, 2012d).
[4] Occurrences are considered permanently affected if a qualified biologist determines that occurrence viability will be threatened or reduced as a result of Covered Activities (ICF International, 2012; Section 6.6.2, Condition 20).
[5] Recovery actions will occur regardless of the level of impact.
[6] The first row in this column represents the minimum requirement of acquisition and creation regardless of the number of occurrences affected under the Plan.
[7] 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 for the Coyote Ceanothus (ICF International, 2012, Section 4.6.8). For occurrence preservation, priority will always be given to acquisition, however, if acquisition is infeasible, creation is allowed as stipulated in Section 5.4 of the Plan. The decision to focus conservation efforts on occurrence creation will be made jointly with the Wildlife Agencies. Creation will be completed by Year 40, and acquisition will be completed by Year 45.

Regardless of the level of effect, five known occurrences will be acquired through the incorporation of portions of Santa Teresa and Calero County Parks into the Reserve System (see Plan Table 5-5 and Figure 5-4). The Implementing Entity will also acquire seven additional natural occurrences of smooth lessingia (LAND-P7) regardless of effects (ICF International, 2012, Section 5.4.16). Only two of the occurrences that are anticipated to be protected have size estimates, which total 1,815 individuals. The seven additional new occurrences that would be acquired through 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 (see Plan Table 5-16) (ICF International, 2012, Section 5.4.16).

As described in Chapter 4 of the Plan, the Plan's 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 (See Plan Table 5-16). A minimum of two occurrences have to be acquired prior to any newly discovered occurrence being affected. In other words, a minimum of 14 occurrences will be protected in the Reserve System before a 7th occurrence is affected, a minimum of 16 occurrences will be protected in the Reserve System before an 8th occurrence is affected, and a minimum of 18 occurrences will be protected in the Reserve System before a 9th

occurrence is affected. "Minimums" are referenced here because the Implementing Entity will protect 24 occurrences, regardless of effects. The timing of acquisition of 12 of the 24 occurrences are linked to effects, while the remaining 12 occurrences will be acquired to contribute to recovery and can be acquired at any time before Year 45.

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 (ICF International, 2012, Section 5.4.16).

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 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 (ICF International, 2012, Section 5.4.16).

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. Suitable propagation and/or planting techniques will be researched and identified to create new occurrences of smooth lessingia from existing occurrences. 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). When accounting for the 3 occurrences that are currently protected in the Action Area (ICF International, 2012, Table 4-6), 27-33 occurrences will be protected in the Action Area after the Plan is fully implemented.

This approach is consistent with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b), which describes a recovery strategy that focuses on protecting and managing extant populations. Regardless of the level of effect, the Applicants 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 extant occurrences. The Recovery Plan recommends that 10 populations be fully protected and managed to ensure the long-term conservation of the smooth lessingia. Therefore, successful implementation of the Plan, inclusive of all conservation actions for the species, would exceed the Recovery Plan's recommendations for the smooth lessingia's recovery.

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 (U.S. Fish and Wildlife Service, 1998b). 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 (ICF International, 2012, Section 5.4.16).

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 (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) (ICF International, 2012, Section 5.4.16). These studies are consistent with research activities recommended in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b).

Plant Habitat Loss and Degradation: In addition to the occurrence-level effects allowed under the Plan, a maximum of 550 acres (5 percent of the total in the Action Area) of modeled primary habitat will be permanently affected, and a maximum of 68 acres (less than 1 percent of the total in the Action Area) will be temporarily affected by Covered Activities (ICF International, 2012, Table 4-4).

In addition to the mitigation of plant occurrences described in Table 4 above, the Applicants will mitigate unavoidable direct and indirect effects to smooth lessingia habitat by preserving modeled habitat. The Plan will acquire a minimum of 4,000 acres of modeled habitat. In addition, 1,100 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 Action Area to approximately 61 percent as Type 1 Open Space and 73 percent as Type 1, 2 or 3 Open Space (ICF International, 2012, Table 5-17). Furthermore, smooth lessingia is also 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 of the Plan, *Grassland Conservation and Management*) (ICF International, 2012, Section 5.4.16).

2.4.5.8 Metcalf Canyon Jewelflower

Mortality and Injury: The Plan minimizes direct effects on the Metcalf Canyon jewelflower by limiting the number of occurrences whereby long-term viability is threatened or reduced by Covered Activities (ICF International, 2012, Section 4.4.1 and Table 5-16). For the purposes of this Opinion, we refer to these occurrences as "lost." No more than 2 occurrences (20 percent of known occurrences in the Action Area or 18 percent of the total known in the entire range) may be lost during the permit term as a result of Covered Activities. One of these occurrences that are likely to be lost is CNDDB occurrence #12 (Gaffney pers. comm., 2012a). CNDDB occurrences 4 and 8 are expected to be affected

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. Effects on these occurrences are expected to be "partial impacts" as defined in Condition 20 of the Plan (ICF International, 2012, Section 4.6.8).

No additional effects are allowed to this species, even if more occurrences are protected during the permit term (ICF International, 2012, Section 4.6.8). Condition 20 of the Plan requires surveys for Metcalf Canyon jewelflower in serpentine bunchgrass grassland, serpentine rock outcrop, and northern coastal scrub and Diablan sage scrub with serpentine soils, thus further minimizing the likelihood of adverse effects on new occurrences that may be discovered during the permit term (ICF International, 2012, Section 6.6.2)

Regardless of the level of effect, at least three known extant occurrences of Metcalf Canyon jewelflower will be acquired. Acquisition of the three known occurrence must occur prior to the first effect. The Implementing Entity will also identify and protect an additional 10 new occurrences to contribute to species recovery by Year 45. 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, 9 will be created, etc.). Creation is only considered as a conservation action, not mitigation (ICF International, 2012, Section 5.4.17). 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 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 (ICF International, 2012, Section 5.4.17).

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b) recommends that 9 natural occurrences of Metcalf Canyon jewelflower be protected and managed prior to the Service considering downlisting and recommends 18 populations be protected and managed prior to the Service considering delisting. The Plan's conservation strategy for the species deviates slightly from the Recovery Plan recommendations. These deviations are warranted, as they are based on the best available scientific data. At the time the Recovery Plan was written, there were 13 known extant occurrences of Metcalf Canyon jewelflower in the Action Area, whereas there are currently only 10 known extant occurrences. Several of these occurrences are located on private lands that are highly parcelized and urbanized, making them impractical targets for conservation.

When accounting for the 1 occurrence that is currently protected in the Action Area (ICF International, 2012, Table 4-6), 4 occurrences will be protected in the Action Area prior to the first effect to the species or by Year 45 of the Plan, whichever comes first. A total of 14 occurrences, a minimum of 4 of which will be natural occurrences, will be permanently protected upon the successful implementation of the Plan (ICF International, 2012, Table 4-6 and Table 5-16). The Plan will protect the highest quality natural occurrences.

Furthermore, there are 68 "jewelflower" occurrences that have yet to be identified to subspecies-level on one private property; they could be either Metcalf Canyon jewelflowers or most beautiful jewelflowers. Some of these occurrences are likely to be Metcalf Canyon jewelflowers. This property will be acquired and included in the Reserve System. This acquisition will mitigate the likely overall effect of Covered Activities on this species (ICF International, 2012, Sections 4.6.8 and 5.4.17). Acquisition of these or other natural occurrences would be prioritized to meet the requirement to acquire or create ten occurrences to contribute to the species' recovery (ICF International, 2012, Section 5.4.17). Given the proposed effect on the species, the number and location of known natural occurrences to date, the number of known occurrences that have not been identified to subspecies-level, and the rigorous criteria that will be adhered to in the creation of new occurrences, we believe the Plan's conservation strategy is consistent with the intent of the Recovery Plan.

Furthermore, the Recovery Plan (U.S. Fish and Wildlife Service, 1998b) recommends that protected populations be distributed throughout the range of the species, including at least 25 percent west of U.S. 101 and 75 percent 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 the 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 (ICF International, 2012, Section 5.4.17).

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 propagation and 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 (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, 2011); preliminary results indicate that successful occurrence creation is feasible. In addition, field surveys suggest that sites for 10 occurrences should be available (J. Whittall pers. comm., as cited in ICF International, 2012, Section 5.4.17; Whittall, 2011).

Plant Habitat Loss and Degradation: In addition to the occurrence-level effects allowed under the Plan, no more than 550 acres (7 percent of the total in the Action Area) of Metcalf Canyon jewelflower modeled primary habitat will be permanently affected and no more than an additional 62 acres (less than 1 percent of the total in the Action Area) of modeled primary habitat will be temporarily affected (ICF International, 2012, Table 4-4).

In addition to the mitigation of plant occurrences, the Applicants will mitigate unavoidable direct and indirect effects to suitable Metcalf Canyon jewelflower habitat by preserving a minimum of 3,200 acres of modeled habitat. 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 Action Area to approximately 64 percent as Type 1 Open Space and 75 percent as Type 1, 2, or 3 Open Space (ICF International, 2012, Section 5.4.17).

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. 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. Furthermore, 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 (ICF International, 2012, Section 5.4.17).

2.4.5.9 Most Beautiful Jewelflower

Mortality and Injury: The Plan minimizes direct effects on the most beautiful jewelflower by limiting the number of occurrences whereby long-term viability is threatened or reduced by Covered Activities (ICF International, 2012, Section 4.4.1 and Table 5-16). For the purposes of this Opinion, we refer to these occurrences as "lost." If no additional occurrences of most beautiful jewelflower are found during the permit term, no more than 6 occurrences (15 percent of the total known in the Action Area or 7 percent of the total known in the entire range) may be lost as a result of Covered Activities (ICF International, 2012, Table 4-6). The occurrences likely to be lost include CNDDB occurrence #24 along with 5 other occurrences documented by SCVWD but that are not recorded in the CNDDB (Gaffney pers. comm., 2012a).

One of the affected occurrences 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 affected by seismic retrofit and/or dam maintenance activities during the permit term. The 6 occurrences that are anticipated to be affected have a total population estimate of 1,076

individuals. Therefore, anticipated effects on 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 subspecies, but are either most beautiful jewelflowers or Metcalf Canyon jewelflowers. This property will be acquired and included in the Reserve System. This acquisition will mitigate the likely overall effect of Covered Activities on this species (ICF International, 2012, Sections 4.6.8 and 5.4.18).

In addition, it is possible that newly discovered occurrences of this species could be affected by Covered Activities. A maximum of two additional new occurrences (i.e., occurrences not yet known) may be affected by Covered Activities if additional occurrences are protected in accordance with Table 5 below and Section 5.3.1 of the Plan, subheading *Incorporating Covered Plant Species*. For each additional occurrence affected, occurrences of equivalent or better condition must be protected within the Reserve System (ICF International, 2012, Section 4.6.8). If additional occurrences are found during the permit term, impacts may increase as described in Table 5 below as long as new occurrences are found and protected in the Reserve System before the effects occur (ICF International, 2012, Section 4.4.1), at a 2:1 mitigation ratio. Condition 20 of the Plan requires surveys for most beautiful jewelflower in serpentine bunchgrass grassland, serpentine rock outcrop, mixed serpentine chaparral, and northern coastal scrub and Diablan sage scrub with serpentine soils, which will assist in detecting new occurrences in the Action Area (ICF International, 2012, Section 6.6.2).

Table 5[1]: Most Beautiful Jewelflower Occurrences, Plan Impact Limits, and Conservation Requirements

Occurrences in the Action Area During Plan Implementation[2]		Occurrence Impacts and Conservation				Total Occurrences Protected in Reserve System	
Additional Occurrences Found (Relative to Baseline)	Total in Action Area	Total Maximum Permanently Affected[3]	Protected per Mitigation Ratio (2:1)	Protection to Contribute to Recovery[4]	Total Protected in Reserve System[5]	Acquired	Allowable Creation in Lieu of New Occurrence Acquisition[6]
0	39	6	12	5	17	17	-
4	43	7	14		19	19	-
8	47	8	16		21	21	-

[1] Adapted from Table 5-16 (ICF International, 2012)

[2] These columns represent the minimum number of occurrences that must be known in the Action Area before impacts described in the subsequent column can occur. The first row accounts for the occurrences known at the time of permit issuance. Subsequent rows account for additional occurrences found during the permit term. New plant occurrences found in the expanded burrowing owl study are do not count.

[3] Occurrences are considered permanently affected if a qualified biologist determines that occurrence viability will be threatened or reduced as a result of Covered Activities (ICF International, 2012; Section 6.6.2, Condition 20).

[4] Recovery actions will occur regardless of the level of impact.

[5] The first row in this column represents the minimum requirement of acquisition and creation regardless of the number of occurrences affected under the Plan.

[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 for the Coyote Ceanothus (ICF International, 2012, Section 4.6.8). For occurrence preservation, priority will always be given to acquisition, however, if acquisition is infeasible, creation is allowed as stipulated in Section 5.4 of the Plan. The decision to focus conservation efforts on occurrence creation will be made jointly with the Wildlife Agencies. Creation will be completed by Year 40, and acquisition will be completed by Year 45.

Regardless of the level of effect, the Applicants 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 Action Area (ICF International, 2012, Section 5.4.18 and Table 5-16). This includes acquisition of nine known occurrences for the Reserve System and the addition of eight known occurrences when portions of Almaden Quicksilver, Calero, and Santa Teresa County Parks are added to the Reserve System (ICF International, 2012, Section 5.4.18).

As described in Chapter 4 of the Plan, the Plan's 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 affected. In other words, a minimum of 14 occurrences will be acquired and protected in the Reserve System before the 7th occurrence is affected, and a minimum of 16 occurrences will be acquired and protected in the Reserve System before the 8th occurrence is affected. "Minimums" are referenced here because the Implementing Entity will protect 17 occurrences, regardless of effects. The timing of acquisition of 12 of the 17 occurrences are linked to effects, while the remaining 5 occurrences will be acquired for recovery purposes only and thus acquisition timing of these 5 occurrences are not linked to effects. When accounting for the 3 occurrences that are currently protected in the Action Area (ICF International, 2012, Table 4-6), 20-24 occurrences will be protected in the Action Area after the Plan is fully implemented.

This approach is consistent with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service, 1998b), which describes a recovery strategy that focuses on protecting and managing extant populations. The Recovery Plan recommends that a total of 22 populations be fully protected and managed within the species' range to ensure the long-term conservation of the most beautiful jewelflower. Two of the six management areas identified in the Recovery Plan are located in the Action Area: (1) "the Morgan Hill area northward" and (2) "south of Morgan Hill." To be consistent with the distribution of the species known at the time the Recovery Plan was finalized, the Recovery Plan recommends that 50 percent (11 occurrences) of the protected populations be in the Morgan Hill area northward management area. Focal areas for preservation identified in the Recovery Plan are the Santa Teresa Hills, Calero County Park and Almaden Quicksilver County Park west of U.S. 101, and the Kirby Canyon area east of U.S. 101, (U.S. Fish and Wildlife Service, 1998b). Therefore, successful implementation of the Plan, inclusive of all conservation actions for the species, would facilitate the recovery of the most beautiful jewelflower by exceeding the Recovery Plan's recommendations within the Santa Clara County portion of the species' range.

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). These studies are consistent with research activities recommended in the Recovery Plan (U.S. Fish and Wildlife Service, 1998b).

Plant Habitat Loss and Degradation: In addition to the occurrence-level effects allowed under the Plan, a maximum of 550 acres (4 percent of the total in the Action Area) of primary modeled habitat will be permanently affected by Covered Activities, and a maximum of 92 acres (less than 1 percent of the total in the Action Area) of primary modeled habitat will be temporarily affected (see Plan Table 4-4). No secondary habitat is anticipated to be affected. Dam and reservoir maintenance and dam seismic safety retrofits could result in permanent and temporary effects on habitat in the vicinity of the Coyote, Almaden, and Anderson Dams (ICF International, 2012, Section 4.6.8).

In addition to the mitigation of plant occurrences described in Table 5 above, the Applicants will mitigate unavoidable direct and indirect effects to most beautiful jewelflower habitat by preserving 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 additions will increase the proportion of protected modeled habitat in the Action Area to approximately 50 percent as Type 1 Open Space and 63 percent as Type 1, 2, or 3 Open Space (see Plan 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 Action Area in the Santa Cruz Mountain foothills. Target areas include Coyote Ridge near Metcalf Canyon (ICF International, 2012, Section 5.4.18). Furthermore, 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 and chaparral and coastal scrub (ICF International, 2012, Section 5.4.18).

2.4.6 Cumulative Effects

As described in Section 1 of this Opinion, the Plan was developed in response to a biological opinion issued by the Service in 2001 to address the indirect and cumulative effects of several large-scale development and infrastructure projects in Santa Clara County. Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered in this Opinion because they will require separate consultation pursuant to section 7 of the Act. Many of the projects that are reasonably certain to occur in the Action Area will require future Federal actions and separate consultations under the Act and are thus not considered in this Opinion's cumulative effects analysis. Examples of these projects include the SCVWD's Three Creeks HCP, Pacific Gas and Electric Company's Bay Area Operations and Maintenance Habitat Conservation Plan, the California High-Speed Train System, and the SCVWD's Stream Maintenance Program. The remaining non-Federal actions that may occur in the Action Area are considered too speculative to evaluate at this point in time because there

is no evidence of State or local approvals (i.e. permits, grants), obligation of venture capital, or initiation of contracts. Examples of these types of projects include rural development in the areas not subject to the Plan (see Plan Figure 2-5) and expansion beyond the City of Gilroy's current planning limit of urban growth. Subsequently, we are unable to analyze the cumulative effects of specific projects in the Action Area at this time.

2.4.6.1 Climate Change

Climate change is likely to have cumulative effects in the Action Area. 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 of individual models. Individual simulations suggest that there could be up to a 10 to 20 percent decrease in total annual precipitation (Luers *et al*., 2006).

There is an international scientific consensus that most of the warming observed has been caused by human activities (Intergovernmental Panel on Climate Change, 2001, 2007; Adger *et al*,. 2007), and that it is "very likely" that it is largely due to manmade emissions of carbon dioxide and other greenhouse gases (Adger *et al*., 2007). Ongoing climate change likely threatens Covered Species and the resources necessary for their survival.

In general, the following ecological responses to climate change are possible during the permit term. A detailed discussion of potential effects is available in Appendix F of the Plan.

- **Phenological changes resulting in phenological mismatches**. Timing of seasonal events, such as migration, flowering, and egg laying, may shift (Walther *et al*., 2002; Forister and Shapiro, 2003; Root *et al*., 2003). 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 that already have restricted ranges (i.e., Bay checkerspot butterfly, Mount Hamilton thistle) are particularly vulnerable 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).

- **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 types and plant species (Lenihan *et al*., 2003).

- **Changes in species abundance**. The number or density of individuals found in a particular location may change in response to changes in resource availability associated with changes in precipitation (Walther *et al*., 2002; Lenihan *et al*,. 2003; Millar *et al*., 2006; Pounds *et al*., 2006).

The Bay checkerspot butterfly in particular, is very susceptible to the anticipated effects of climate change, since the species' life history is closely linked to its host plant's development, which in turn is temperature and rainfall dependent (U.S. Fish and Wildlife Service, 2009). Murphy and Weiss (1992) modeled the effects of four broad climate change scenarios on the Bay checkerspot butterfly in the San Francisco Bay area. In this study, three out of the four scenarios modeled (warmer/drier, cooler/drier, and colder/wetter) was determined to have negative effects on the Bay checkerspot butterfly. Seasonal rains that are too early or too late could cause asynchrony between larvae and host plant development (i.e., host plants would senescence prior to larvae entering diapause). Similarly, changes in temperature could shift the development period of the Bay checkerspot butterfly so that it is out of sync with its host plants.

Another concern regarding climate change is the amount and frequency of rain events, drought, and heat waves. Bell *et al*. (2004) projects that the frequency, number, and length of heat events will increase and the amount of rainfall will decrease throughout most of California. Hayhoe *et al*. (2004) suggests that by the end of the century, the length, frequency, and severity of extreme droughts will increase in three out of four scenarios. Because synchronicity of Bay checkerspot larvae and host plant senescence is poor in drought years (Murphy and Weiss, 1988), increased frequency and duration of drought would likely result in higher larval mortality.

The Plan's multi-level conservation strategy and monitoring and adaptive management program will minimize the potential threats of climate change by incorporating landscape-level, natural community-level, and species-level goals and objectives. The conservation strategy focuses on protecting and enhancing a range of natural communities, habitat types, and environmental gradients (i.e. altitude, aspect, slope), as the availability of resources and habitat types in the Action Area change in response to climate change.

Implementing conservation actions that protect a variety of landscapes over a large scale will provide flexibility for shifts in the range and distribution of species and their habitats due to climate change. Land-acquisition will target properties that provide connectivity to allow for northward and upslope movement, maintain and restore habitat linkages, and reduce 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. As a result, some species and natural communities in the Action Area are anticipated to "move" in response to climate change, allowing for shifts in range and distribution.

At the natural community-level, conservation actions were developed to address natural communities primarily through the enhancement, restoration, and management of land cover types. 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 overall Covered Species habitat quality and controlling invasive species and disease.

At the species-level, conservation 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. .

In addition to conservation actions, monitoring actions described in Chapter 7 of the Plan 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 integrity of landscape linkages. Community-level monitoring will, in turn, detect changes in the composition and function of natural communities, predator or prey populations, invasive species, and other important habitat factors for Covered Species. Finally, species-level monitoring will measure the effects of management actions on Covered Species and the status and trends of Covered Species. 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 Action Area.

2.4.6.2 Nitrogen Deposition

Although we are unable to analyze cumulative effects associated with specific projects at this time, we do anticipate future development outside of the Action Area to continue during the permit term. The ideal management option for reducing effects of excess N is improving air quality. Although NOx emissions are declining in California, NHx emissions are not decreasing proportionally and N-deposition in California is expected to remain high for the foreseeable future (Fenn *et al*., 2010). Complex air quality modeling was conducted for the Plan in an attempt to quantify these cumulative effects. According to ICF modeling (2012, Appendix E), the contribution of emissions from outside of the Action Area, but within Santa Clara County, are estimated to increase from 1.1 kg-N/ha/yr in the base year to 1.5 kg- N/ha/yr in 2035 and 1.7 kg-N/ha/yr in 2060. The contribution of emissions from all other Bay Area counties are estimated to increase from 0.7 kg-N/ha/yr in the base year to 0.9 kg-N/ha/yr in 2035 and 1.0 kg-N/ha/yr in 2060. Estimates of future-year N-deposition could be even higher than indicated in Section 2.4.4 of this Opinion, if growth in the rest of the state were included (ICF International, 2012, Appendix E). A portion of the development resulting in this increase in N-deposition may not require future

Federal actions, which is why it is included in this discussion of cumulative effects. Determining the extent of the development that would not require future actions however, is not possible at this time.

2.4.7 Conclusion

After reviewing the current status of the Bay checkerspot butterfly, Tiburon Indian paintbrush, coyote ceanothus, Mount Hamilton thistle, Santa Clara Valley dudleya, fragrant fritillary, smooth lessingia, Metcalf Canyon jewelflower, and most beautiful jewelflower (serpentine covered species); the environmental baselines for the Action Area; the effects of the proposed action, including all measures to avoid, minimize, and mitigate adverse effects; and the cumulative effects, it is the Service's biological opinion and conference opinion that issuance of an incidental take permit pursuant to section 10(a)(1)(B) of the Act is not likely to jeopardize the continued existence of serpentine covered species, and is not likely to destroy or adversely modify designated critical habitat for the Bay checkerspot butterfly. No critical habitat has been designated for Tiburon Indian paintbrush, coyote ceanothus, Mount Hamilton thistle, Santa Clara Valley dudleya, fragrant fritillary, smooth lessingia, Metcalf Canyon jewelflower, or most beautiful jewelflower, therefore, none will be affected.

2.5 Aquatic Species

For the purposes of this Opinion, the California tiger salamander (Central California DPS), California red-legged frog, foothill yellow-legged frog, and western pond turtle are grouped together and identified as "aquatic species" because each of these species spends a portion of its life history in aquatic systems. As such, the types of anticipated effects on these species resulting from Covered Activities are similar. This Opinion analyzes the effects on each of these species individually. They are grouped together here, for the purposes of streamlining the Opinion and minimizing repetition in Section 2.5.4, *Species-Specific Effects of the Action.*

2.5.1 Status of the Species/Critical Habitat

2.5.1.1 California Tiger Salamander (Central California DPS)

Status

On May 23, 2003, the Service proposed to list the Central California DPS of the California tiger salamander as threatened. At that time, we also proposed reclassification of the Santa Barbara County DPS and Sonoma County DPS from endangered to threatened (68 FR 28647). In the same notice we also proposed a special rule under section 4(d) of the Act to exempt take for routine ranching operations for the Central California DPS and, if reclassified to threatened, for the Santa Barbara and Sonoma County DPSs (68 FR 28668). On August 4, 2004, after determining that the listed Central California population of the California

DPS of the Central California tiger salamander was threatened (69 FR 47212), we determined that the Santa Barbara and Sonoma County populations were threatened as well, and reclassified the Central California tiger salamander as threatened throughout its range (69 FR 47212), removing the Santa Barbara and Sonoma County populations as separately listed DPSs (69 FR 47241). In this notice we also finalized the special rule to exempt take for routine ranching operations for the Central California tiger salamander throughout its range (69 FR 47248).

On August 18, 2005, as a result of litigation of the August 4, 2004, final rule on the reclassification of the California tiger salamander DPSs (Center for Biological Diversity *et al*. v. United States Fish and Wildlife Service *et al*., C 04-04324 WHA N.D. Cal., 2005), the District Court of Northern California sustained the portion of the 2004 rule pertaining to listing the Central California tiger salamander as threatened with a special rule, but vacated the portion of the 2004 rule that re-classified the Santa Barbara and Sonoma DPSs to threatened status thereby reinstating their status as endangered. On August 31, 2011, the List of Endangered and Threatened Wildlife in part 17, subchapter B of Chapter I, title 50 of the Code of Federal Regulation was amended to reflect the vacatures contained in the 2005 court order, classifying the Santa Barbara DPS and the Sonoma DPS of the California tiger salamander as endangered, and the Central DPS of the California tiger salamander as threatened with a special rule to exempt routine ranching operations from take (76 FR 54346).

The California tiger salamander is a large, stocky, terrestrial salamander with a broad, rounded snout. Recorded adult measurements have been as much as 8.2 inches (20.8 centimeters) long ((Petranka, 1998). California tiger salamanders exhibit sexual dimorphism (differences in body appearance based on gender) with males tending to be larger than females. Coloration generally consists of random white or yellowish markings on a black body. The markings on adults California tiger salamanders tend to be more concentrated on the lateral sides of the body, whereas other tiger salamander species tend to have brighter yellow spotting that is heaviest on the dorsal surface.

The California tiger salamander is endemic to California and historically inhabited the low-elevation grassland and oak savanna plant communities of the Central Valley, adjacent foothills, and Inner Coast Ranges (Jennings and Hayes, 1994; Storer, 1925; Shaffer *et al*., 1993). The species has been recorded from near sea level to approximately 3,900 feet (1,189 meters) in the Coast Ranges and to approximately 1,600 feet (488 meters) in the Sierra Nevada foothills (Shaffer and Trenham, 2004). Along the Coast Ranges, the species occurred from the Santa Rosa area of Sonoma County, south to the vicinity of Buellton in Santa Barbara County. The historic distribution in the Central Valley and surrounding foothills included northern Yolo County southward to northwestern Kern County and northern Tulare County. Three distinct California tiger salamander populations are recognized and correspond to the Santa Maria area within Santa Barbara County, the Santa Rosa Plain in Sonoma County, and vernal pool/grassland habitats throughout the Central Valley.

Thirty-one percent (221 of 711 records and occurrences) of all Central Valley DPS California tiger salamander records and occurrences are located in Alameda, Santa Clara, San Benito (excluding the extreme western end of the County), southwestern San Joaquin, western Stanislaus, western Merced, and southeastern San Mateo Counties. Of these counties, most of the records are from eastern Alameda and Santa Clara Counties (California Department of Fish and Game, 2012).

Shaffer *et al*. (1993) found that the East Bay counties of Alameda and Contra Costa supported the greatest concentrations of California tiger salamanders. California tiger salamander populations in the Livermore Valley are severely threatened by the ongoing conversion of grazing land to subdivisions and vineyards (Stebbins, 2003; East Bay Regional Park District, 2003). Proposed land conversion continues to target large areas of California tiger salamander habitat. One such project in Alameda County totals 700 acres (East Bay Regional Park District, 2003). Other proposed projects located within the California tiger salamander's range include another 310-acre project in Alameda County, two in San Joaquin County totaling 12,427 acres, and a 19-acre project in Santa Clara County. California tiger salamanders are under increasing pressure from habitat conversion, urbanization, and development (i.e. Dublin Ranch, Fallon Village, Fallon Sports Park, Staples Ranch, Shea Center Livermore, and Livermore Toyota); and infrastructure, utility, and safety improvement projects (i.e. I-580 Eastbound HOV, I-580/Isabel Avenue Interchange, and I-580/Charro Avenue Interchange). The species' low recruitment and high juvenile mortality make it particularly susceptible to habitat loss, fragmentation, urbanization, and construction-related harm and mortality. Most of the California tiger salamander's natural historic habitat (vernal pool grasslands) available in this region has been lost due to urbanization and conversion to intensive agriculture (Keeler-Wolf *et al*., 1998). California tiger salamanders are now primarily restricted to artificial breeding ponds, such as bermed ponds or stock ponds, which are typically located at higher elevations (California Department of Fish and Game, 2012).

The California tiger salamander has an obligate biphasic life cycle (Shaffer *et al*., 2004). Although the larvae develop in the vernal pools and ponds in which they were born, tiger salamanders are otherwise terrestrial and spend most of their post-metamorphic lives in widely dispersed underground retreats (Shaffer *et al*., 2004; Trenham *et al*., 2001). Because they spend most of their lives underground, tiger salamanders are rarely encountered even in areas where salamanders are abundant. Subadult and adult tiger salamanders typically spend the dry summer and fall months in the burrows of small mammals, such as California ground squirrels and Botta's pocket gopher (Storer, 1925; Loredo and Van Vuren, 1996; Petranka, 1998; Trenham, 1998b). Although ground squirrels have been known to eat tiger salamanders, the relationship with their burrowing hosts is primarily commensal (Loredo *et al*., 1996).

Tiger salamanders may also use landscape features such as leaf litter or desiccation cracks in the soil for upland refugia. Burrows often harbor camel crickets and other invertebrates that provide likely prey for California tiger salamanders. Underground refugia also provide protection from the sun and wind associated with the dry California climate that can cause excessive drying of amphibian skin. Although California tiger salamanders are members of a family of "burrowing" salamanders, they are not known to create their own burrows. This may be due to the hardness of soils in the California ecosystems in which they are found. California tiger salamanders depend on persistent small mammal activity to create, maintain, and sustain sufficient underground refugia for the species. Burrows are short lived without continued small mammal activity and typically collapse within approximately 18 months (Loredo *et al*., 1996).

Upland burrows inhabited by California tiger salamanders have often been referred to as aestivation sites. However, "aestivation" implies a state of inactivity, while most evidence suggests that tiger salamanders remain active in their underground dwellings. Past studies have found that California tiger salamanders move, feed, and remain active in their burrows (van Hattem, 2004). Because tiger salamanders arrive at breeding ponds in good condition and are heavier when entering the pond than when leaving, researchers have long inferred that California tiger salamanders are feeding while underground. Direct observations have confirmed this (Trenham, 2001; van Hattem, 2004). Thus, "upland habitat" is a more accurate description of the terrestrial areas used by California tiger salamanders.

California tiger salamanders typically emerge from their underground refugia at night during the fall or winter rainy season (November-May) to migrate to their breeding ponds (Stebbins, 2003; Shaffer *et al*., 1993; Trenham *et al*., 2000). The breeding period is closely associated with the rainfall patterns in any given year with less adults migrating and breeding in drought years (Loredo and Van Vuren, 1996; Trenham *et al*., 2000). Male salamanders are typically first to arrive and generally remain in the ponds longer than females. Results from a 7-year study in Monterey County suggested that males remain in the breeding ponds for an average of 44.7 days while females remain for an average of only 11.8 days (Trenham *et al*., 2000). Historically, breeding ponds were likely limited to vernal pools but now include livestock stock ponds. Ideal breeding ponds are typically fishless and seasonal or semi-permanent (Barry and Shaffer, 1994; Petranka, 1998).

While in the ponds, adult salamanders mate and females lay their eggs in the water (Twitty, 1941; Shaffer *et al*., 1993; Petranka, 1998). Egg laying typically peaks in January (Loredo and Van Vuren, 1996; Trenham *et al*., 2000). Females attach their eggs singly, or in rare circumstances, in groups of two to four, to twigs, grass stems, vegetation, or debris (Storer, 1925; Twitty, 1941). Eggs are often attached to objects, such as rocks and boards in ponds with no or limited vegetation (Jennings and Hayes, 1994). Average clutch sizes from a Monterey County study was 814 eggs (Trenham *et al*., 2000). Seasonal pools may not exhibit sufficient depth, persistence, or other necessary parameters for adult

breeding during times of drought (Barry and Shaffer, 1994). After breeding and egg laying is complete, adults leave the pool and return to their upland refugia (Loredo *et al*., 1996; Trenham, 1998b). Adult salamanders often continue to emerge nightly for approximately the next two weeks to feed in their upland habitat (Shaffer *et al*., 1993).

Tiger salamander larvae typically hatch within 10 to 24 days after eggs are laid (Storer, 1925). The peak emergence of these metamorphs is typically between mid-June and mid-July (Loredo and Van Vuren, 1996; Trenham *et al*., 2000). The larvae are totally aquatic and range in length from approximately 0.45 to 0.56 inches (1.14 to 1.42 centimeters) (Petranka, 1998). They have yellowish gray bodies, broad fat heads, large, feathery external gills, and broad dorsal fins that extend well up their back. The larvae feed on zooplankton, small crustaceans, and aquatic insects for about six weeks after hatching, after which they switch to larger prey (J. Anderson, 1968). Larger larvae have been known to consume the tadpoles of Pacific tree frogs, western spadefoot toads, and California red-legged frogs (J. Anderson, 1968; P. Anderson, 1968). California tiger salamander larvae are among the top aquatic predators in seasonal pool ecosystems. When not feeding, they often rest on the bottom in shallow water but are also found throughout the water column in deeper water. Young salamanders are wary and typically escape into vegetation at the bottom of the pool when approached by potential predators (Storer, 1925).

The California tiger salamander larval stage is typically completed in 3 to 6 months with most metamorphs entering upland habitat during the summer (Petranka, 1998). In order to be successful, the aquatic phase of this species' life history must correspond with the persistence of its seasonal aquatic habitat. Most seasonal ponds and pools dry up completely during the summer. Amphibian larvae must grow to a critical minimum body size before they can metamorphose (change into a different physical form) to the terrestrial stage (Wilbur and Collins, 1973).

Larval development and metamorphosis can vary and is often site-dependent. Larvae collected near Stockton in the Central Valley during April varied between 1.88 to 2.32 inches (4.78 to 5.89 centimeters) in length (Storer, 1925). Feaver (1971) found that larvae metamorphosed and left breeding pools 60 to 94 days after eggs had been laid, with larvae developing faster in smaller, more rapidly drying pools. Longer ponding duration typically results in larger larvae and metamorphosed juveniles that are more likely to survive and reproduce (Pechmann *et al*., 1989; Semlitsch *et al*., 1988; Morey, 1998; Trenham, 1998a). Larvae will perish if a breeding pond dries before metamorphosis is complete (P. Anderson, 1968; Feaver, 1971). Pechmann *et al*. (1988) found a strong positive correlation between ponding duration and total number of metamorphosing juveniles in five salamander species. In Madera County, Feaver (1971) found that only 11 of 30 sampled pools supported larval California tiger salamanders, and 5 of these dried before metamorphosis could occur. Therefore, out of the original 30 pools, only 6 (20 percent) provided suitable conditions for successful reproduction that year. Size at metamorphosis is positively correlated with stored

body fat and survival of juvenile amphibians and negatively correlated with age at first reproduction (Semlitsch *et al*., 1988; Morey, 1998).

Following metamorphosis, juveniles leave their pools and enter upland habitat. This emigration can occur in both wet and dry conditions (Loredo and Van Vuren, 1996; Loredo *et al*., 1996). Wet conditions are more favorable for upland travel but rare summer rain events seldom occur as metamorphosis is completed and ponds begin to dry. As a result, juveniles may be forced to leave their ponds on rainless nights. Under dry conditions, juveniles may be limited to seeking upland refugia in close proximity to their aquatic larval pool. These individuals often wait until the next winter's rains to move further into more suitable upland refugia. Although likely rare, larvae may over-summer in permanent ponds. Juveniles remain active in their upland habitat, emerging from underground refugia during rainfall events to disperse or forage (Trenham and Shaffer, 2005). Depending on location and other development factors, metamorphs will not return as adults to aquatic breeding habitat for 2 to 5 years (Loredo and Van Vuren, 1996; Trenham *et al*., 2000).

Lifetime reproductive success for tiger salamander species is low. Results from one study suggest that the average female tiger salamander bred 1.4 times and produced 8.5 young per reproductive effort that survived to metamorphosis (Trenham *et al*., 2000). This resulted in the output of roughly 11 metamorphic offspring over a breeding female's lifetime. The primary reason for low reproductive success may be that this relatively short-lived species requires two or more years to become sexually mature (Shaffer *et al*., 1993). Some individuals may not breed until they are four to six years old. While California tiger salamanders may survive for more than ten years, many breed only once, and in one study, less than 5 percent of marked juveniles survived to become breeding adults (Trenham, 1998a). With such low recruitment, isolated populations are susceptible to unusual, randomly occurring natural events as well as human-caused factors that reduce breeding success and individual survival. Factors that repeatedly lower breeding success in isolated pools can quickly extirpate a population.

Dispersal and migration movements made by California tiger salamanders can be grouped into two main categories: (1) breeding migration and (2) interpond dispersal. Breeding migration is the movement of salamanders to and from a pond from the surrounding upland habitat. After metamorphosis, juveniles move away from breeding ponds into the surrounding uplands, where they live continuously for several years. A study in Monterey County found that upon reaching sexual maturity, most individuals returned to their natal/ birth pond to breed, while 20 percent dispersed to other ponds (Trenham *et al*., 2001). After breeding, adult California tiger salamanders return to upland habitats, where they may live for one or more years before attempting to breed again (Trenham *et al*., 2000).

California tiger salamanders are known to travel large distances between breeding ponds and their upland refugia. Generally it is difficult to establish the maximum

distances traveled by any species, but California tiger salamanders in Santa Barbara County have been recorded dispersing up to 1.3 miles (2.1 kilometers) from their breeding ponds (Sweet, 1998). California tiger salamanders are also known to travel between breeding ponds. One study found that 20-25 percent of the individuals captured at one pond were recaptured later at other ponds approximately 1,900 and 2,200 feet (579 to 671 meters) away (Trenham *et al.*, 2001). In addition to traveling long distances during juvenile dispersal and adult migration, tiger salamanders may reside in burrows far from their associated breeding ponds.

Although previously cited information indicates that California tiger salamanders can travel long distances, they typically remain close to their associated breeding ponds. A trapping study conducted in Solano County during the winter of 2002/2003 suggested that juveniles dispersed and used upland habitats further from breeding ponds than adults (Trenham and Shaffer, 2005). More juvenile salamanders were captured at traps placed at 328, 656, and 1,312 feet (100, 200, and 400 meters) from a breeding pond than at 164 feet (50 meters). Approximately 20 percent of the captured juveniles were found at least 1,312 feet (400 meters) from the nearest breeding pond. The associated distribution curve suggested that 95 percent of juvenile salamanders were within 2,099 feet (640 meters) of the pond, with the remaining 5 percent being found at even greater distances. These data show that many California tiger salamanders travel far while still in the juvenile stage. Post-breeding movements away from breeding ponds by adults appear to be much smaller. During post-breeding emigration from aquatic habitat, radio-equipped adult tiger salamanders were tracked to burrows between 62 to 813 feet (19 to 248 meters) from their breeding ponds (Trenham, 2001). These reduced movements may be due to adult California tiger salamanders exiting the ponds with depleted physical reserves, or drier weather conditions typically associated with the post-breeding upland migration period.

California tiger salamanders are also known to use several successive burrows at increasing distances from an associated breeding pond. Although previously cited studies provide information regarding linear movement from breeding ponds, upland habitat features appear to have some influence on movement. Trenham (2001) found that radio-tracked adults were more abundant in grasslands with scattered large oaks, than in more densely wooded areas. Based on radio-tracked adults, there is no indication that certain habitat types are favored as terrestrial movement corridors (Trenham, 2001). In addition, captures of arriving adults and dispersing new metamorphs were evenly distributed around two ponds completely encircled by drift fences and pitfall traps. Thus, it appears that dispersal into the terrestrial habitat occurs randomly with respect to direction and habitat types.

The California tiger salamander is imperiled throughout its range due to a variety of human activities (69 FR 47212). Current factors associated with declining tiger salamander populations include continued habitat loss and degradation due to agriculture and urbanization; hybridization with the non-native eastern tiger salamander (*Ambystoma tigrinum*) (Fitzpatrick and Shaffer, 2004; Riley *et al.*, 2003); and predation by introduced species. California tiger salamander

populations are likely threatened by multiple factors but continued habitat fragmentation and colonization of non-native salamanders may represent the most significant current threats. Habitat isolation and fragmentation within many watersheds have precluded dispersal between sub-populations and jeopardized the viability of metapopulations (broadly defined as multiple subpopulations that occasionally exchange individuals through dispersal and are capable of colonizing or "rescuing" extinct habitat patches). 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 percent of the genes examined to date (Fitzpatrick *et al*., 2010).

Other threats include disease, predation, interspecific competition, urbanization and population growth, exposure to contaminants, rodent and mosquito control, and road-crossing mortality. Currently, these various primary and secondary threats are largely not being offset by existing Federal, State, or local regulatory mechanisms. The California tiger salamander is also prone to chance environmental or demographic events, to which small populations are particularly vulnerable.

Critical Habitat

Critical habitat was designated on August 23, 2005 in 19 counties for the Central Valley DPS and was divided into the following four geographic regions: (1) Central Valley Region, (2) Southern San Joaquin Region, (3) East Bay Region, and (4) Central Coast Region (70 FR 49379). The Final Rule identifies approximately 199,109 acres within 32 critical habitat units.

The Central Valley Geographic Region is generally found in an area from northern Yolo County south and southeast to the northern half of Madera County, including eastern Solano and Contra Costa Counties. Twelve critical habitat units are designated within this region, totaling 97,045 acres. The 12 critical habitat units contain all PCEs and include extant occurrences. The 12 units occur in the Solano-Colusa, Southeastern Sacramento Valley, Southern Sierra Foothills, and San Joaquin Valley vernal pool regions.

The Southern San Joaquin Valley Geographic Region is found from the southern half of Madera County south to northeastern Kings County and northwestern Tulare County. This region includes 4 critical habitat units that total approximately 20,293 acres. The four critical habitat units contain extant occurrences of the Central California DPS and represent the San Joaquin Valley and Southern Sierra Foothills vernal pool regions in the southern San Joaquin Valley.

The East Bay Geographic Region is found in Alameda County, south to Santa Benito and Santa Clara Counties, and west to the eastern portions of San Joaquin and Merced Counties. The East Bay Geographic Region contains approximately 68,873 acres of critical habitat. This region includes 14 critical habitat units and

contains extant occurrences. The 14 critical habitat units within the East Bay Geographic Region occur in the Livermore, Central Coast, and San Joaquin vernal pool regions.

The Central Coast Geographic Region is located from Monterey County to northeastern San Luis Obispo County and northwestern Tulare County. The region contains two critical habitat units and totals approximately 12,898 acres. The critical habitat units within the Central Coast Geographic Region contains extant occurrences.

The three primary constituent elements for the California tiger salamander are:

- Standing bodies of fresh water [including natural and manmade (i.e., 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;

- Upland habitats adjacent to and accessible from breeding ponds that contain small mammal burrows or other underground habitat that California tiger salamanders depend upon for food, shelter, and protection from the elements and predation; and

- Accessible upland dispersal habitat between occupied locations that allow for movement between such sites.

The following factors are responsible for the current condition of California tiger salamander critical habitat (70 FR 49379):

- **Non-native predators.** Introduction of non-native predators such as bullfrogs and fish could be significant threats to California tiger salamander breeding success;

- **Breeding habitat disturbance.** Activities that involve heavy equipment operation, ground disturbance, maintenance activities, off-road travel, or recreation could disturb aquatic breeding habitats during the breeding season;

- **Water quality impairment.** Activities that impair the water quality of aquatic breeding habitat could threaten the breeding success of the species;

- **Rodent control.** Rodent control activities that reduce small mammal populations may result in insufficient underground refugia used for foraging, protection from predators, and shelter from the elements;

- **Barriers.** The creation of impassable barriers for the California tiger salamander could increase mortality in upland habitat, reduce breeding success, and fragment populations;

- **Disruption of vernal pool complexes.** Activities that disrupt vernal pool complexes could reduce breeding success of California tiger salamanders.

2.5.1.2 California Red-Legged Frog

Status

The California red-legged frog was listed as a threatened species on May 23, 1996 (61 FR 25813). The California red-legged frog is the largest native frog in the western United States (Wright and Wright, 1949), ranging from 1.5 to 5.1 inches in length (Stebbins, 2003). The abdomen and hind legs of adults are largely red, while the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins, 2003), and dorsolateral folds are prominent on the back. Larvae (tadpoles) range from 0.6 to 3.1 inches in length, and the background color of the body is dark brown and yellow with darker spots (Storer, 1925).

The historic range of the California red-legged frog extended from the vicinity of Elk Creek in Mendocino County, California, along the coast inland to the vicinity of Redding in Shasta County, California, and southward to northwestern Baja California, Mexico (Fellers, 2005; Jennings and Hayes, 1985; Hayes and Krempels, 1986). The species was historically documented in 46 counties but the taxa now remains in 238 streams or drainages within 23 counties, representing a loss of 70 percent of its former range (U.S. Fish and Wildlife Service, 2002b). California red-legged frogs are still locally abundant within portions of the San Francisco Bay Area and the Central California Coast. Isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse Ranges. The species is believed to be extirpated from the southern Transverse and Peninsular ranges but is still present in Baja California, Mexico (California Department of Fish and Game, 2012).

California red-legged frogs predominately inhabit permanent water sources such as streams, lakes, marshes, natural and manmade ponds, and ephemeral drainages in valley bottoms and foothills up to 4,921 feet in elevation (Jennings and Hayes, 1994; Bulger *et al*,. 2003; Stebbins, 2003). However, they also inhabit ephemeral creeks, drainages and ponds with minimal riparian and emergent vegetation. California red-legged frogs breed from November to April, although earlier breeding records have been reported in southern localities. Breeding generally occurs in still or slow-moving water often associated with emergent vegetation, such as cattails, tules, or overhanging willows (Storer, 1925: Hayes and Jennings, 1988). Female frogs deposit egg masses on emergent vegetation so that the egg mass floats on or near the surface of the water (Hayes and Miyamoto, 1984).

Habitat includes nearly any area within 1-2 miles of a breeding site that stays moist and cool through the summer including vegetated areas with coyote brush, California blackberry thickets, and root masses associated with willow and

California bay trees (Fellers, 2005). Sheltering habitat for California red-legged frogs potentially includes all aquatic, riparian, and upland areas within the range of the species and includes any landscape feature that provides cover, such as animal burrows, boulders or rocks, organic debris such as downed trees or logs, and industrial debris. Agricultural features such as drains, watering troughs, spring boxes, abandoned sheds, or hay stacks may also be used. Incised stream channels may provide important summer sheltering habitat. Accessibility to sheltering habitat is essential for the survival of California red-legged frogs within a watershed and can be a factor limiting frog population numbers and survival.

California red-legged frogs do not have a distinct breeding migration (Fellers, 2005). Adults are often associated with permanent bodies of water. Some individuals remain at breeding sites year-round, while others disperse to neighboring water features. Dispersal distances are typically less than 0.5 mile, with a few individuals moving up to 1-2 miles (Fellers, 2005). Movements are typically along riparian corridors, but some individuals, especially on rainy nights, move directly from one site to another through normally inhospitable habitats, such as heavily grazed pastures or oak-grassland savannas (Fellers, 2005).

In a study of California red-legged frog terrestrial activity in a mesic area of the Santa Cruz Mountains, Bulger *et al*. (2003) categorized terrestrial use as migratory and non-migratory. The latter occurred from one to several days and was associated with precipitation events. Migratory movements were characterized as the movement between aquatic sites and were most often associated with breeding activities. Bulger *et al*. (2003) reported that non-migrating frogs typically stayed within 200 feet of aquatic habitat 90 percent of the time and were most often associated with dense vegetative cover (i.e., California blackberry, poison oak, and coyote brush). Dispersing frogs in northern Santa Cruz County traveled distances from 0.25 mile to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger *et al*., 2003).

In a study of California red-legged frog terrestrial activity in a xeric environment in eastern Contra Costa County, Tatarian (2008) noted that a 57 percent majority of frogs fitted with radio transmitters in the Round Valley study area stayed at their breeding pools, whereas 43 percent moved into adjacent upland habitat or to other aquatic sites. This study reported a peak seasonal terrestrial movement occurring in the fall months associated with the first 0.2 inch of precipitation and tapering off into spring. Upland movement activities ranged from 3 to 233 feet, averaging 80 feet and were associated with a variety of refugia including grass thatch, crevices, cow hoof prints, ground squirrel burrows at the base of trees or rocks, logs, and under man-made structures; others were associated with upland sites lacking refugia (Tatarian, 2008). The majority of terrestrial movements lasted from 1 to 4 days; however, one adult female was reported to remain in upland habitat for 50 days (Tatarian, 2008). Upland refugia closer to aquatic sites were used more often and were more commonly associated with areas exhibiting higher object cover (i.e., woody debris, rocks, and vegetative cover).

Subterranean cover was not significantly different between occupied upland habitat and non-occupied upland habitat.

California red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto, 1984). Egg masses containing 2,000 to 5,000 eggs are attached to vegetation below the surface and hatch after 6 to 14 days (Storer, 1925; Jennings and Hayes, 1994). In coastal lagoons, the most significant mortality factor in the pre-hatching stage is water salinity (Jennings *et al*., 1992). Eggs exposed to salinity levels greater than 4.5 parts per thousand resulted in 100 percent mortality (Jennings and Hayes, 1990). Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae undergo metamorphosis 3.5 to 7 months following hatching and reach sexual maturity at 2 to 3 years of age (Storer, 1925; Wright and Wright, 1949; Jennings and Hayes, 1985, 1990, 1994). Of the various life stages, larvae probably experience the highest mortality rates, with less than 1 percent of eggs laid reaching metamorphosis (Jennings *et al*., 1992). California red-legged frogs may live 8 to 10 years (Jennings *et al*., 1992). Populations can fluctuate from year to year; favorable conditions allow the species to have extremely high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of occupied sites. In contrast, the species may temporarily disappear from an area when conditions are stressful (i.e., during periods of drought, disease, etc.).

The diet of California red-legged frogs is highly variable, changing with the life history stage. The diet of the larval stage has been the least studied and is thought to be similar to that of other ranid frogs, which feed on algae, diatoms, and detritus (Fellers, 2005; Kupferberg, 1996, 1997). Hayes and Tennant (1985) analyzed the diets of California red-legged frogs from Cañada de la Gaviota in Santa Barbara County during the winter of 1981 and found invertebrates (comprising 42 taxa) to be the most common prey item consumed; however, they speculated that this was opportunistic and varied based on prey availability. They ascertained that larger frogs consumed larger prey and were recorded to have preyed on Pacific chorus frog, three-spined stickleback, and to a limited extent, California mice, which were abundant at the study site (Hayes and Tennant, 1985; Fellers, 2005). Although larger vertebrate prey was consumed less frequently, it represented over half of the prey mass eaten by larger frogs suggesting that such prey may play an energetically important role in their diets (Hayes and Tennant, 1985). Juvenile and subadult/adult frogs varied in their feeding activity periods; juveniles fed for longer periods throughout the day and night, while subadult/adults fed nocturnally (Hayes and Tennant, 1985). Juveniles were significantly less successful at capturing prey, and all life history stages exhibited poor prey discrimination, feeding on several inanimate objects that moved through their field of view (Hayes and Tennant, 1985).

Habitat loss, non-native species introduction, and urban encroachment are the primary factors that have adversely affected the California red-legged frog throughout its range. Several researchers in central California have noted the decline and eventual local disappearance of California and northern red-legged

frogs in systems supporting bullfrogs (Jennings and Hayes, 1990; Twedt, 1993), red swamp crayfish, signal crayfish, and several species of warm water fish including sunfish, goldfish, common carp, and mosquito fish (Fisher and Schaffer, 1996). This has been attributed to predation, competition, and reproduction interference. Twedt (1993) documented bullfrog predation of juvenile northern red-legged frogs and suggested that bullfrogs could prey on subadult California red-legged frogs as well. Bullfrogs may also have a competitive advantage over California red-legged frogs. For instance, bullfrogs are larger and possess more generalized food habits (Bury and Whelan, 1984). In addition, bullfrogs have an extended breeding season during which an individual female can produce as many as 20,000 eggs (Emlen, 1977). Furthermore, bullfrog larvae are unpalatable to predatory fish (Kruse and Francis, 1977). Bullfrogs also interfere with California red-legged frog reproduction by eating adult male California red-legged frogs. Both California and northern red-legged frogs have been observed in amplexus with both male and female bullfrogs (Jennings and Hayes, 1990; Twedt, 1993). Thus bullfrogs are able to prey upon and out-compete California red-legged frogs, especially in sub-optimal habitat.

The urbanization of land within and adjacent to California red-legged frog habitat has also affected the species. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks dispersal, and introduction of predatory fishes and bullfrogs. Disease may also pose a significant threat, although the specific effects of disease on the California red-legged frog are not known. Pathogens are suspected of causing global amphibian declines (Davidson *et al*., 2003). Chytridiomycosis and ranaviruses are a potential threat because these diseases have been found to adversely affect other amphibians, including the listed species (Davidson *et al*., 2003; Lips *et al*., 2006). Mao *et al*. (1999, as cited in Fellers, 2005) reported northern red-legged frogs infected with an iridovirus, which was also presented in sympatric threespine sticklebacks in northwestern California. Non-native species, such as bullfrogs and non-native tiger salamanders that live within the range of the California red-legged frog have been identified as potential carriers of these diseases (Garner *et al*., 2006). Humans can facilitate the spread of disease by encouraging the spread and introduction of non-native carriers and by acting as carriers themselves (i.e., contaminated boots, waders, or fishing equipment). Human activities can also introduce stress by other means, such as habitat fragmentation, that results in the listed species being more susceptible to the effects of disease.

Recovery Units

The Service published the *Recovery Plan for the California Red-Legged Frog (Rana Aurora draytonii)* on September 12, 2002 (U.S. Fish and Wildlife Service, 2002b). The Recovery Plan identifies eight recovery units. The establishment of these recovery units is based on the determination that various regional areas of the species' range are essential to its survival and recovery. These recovery units are delineated by major watershed boundaries as defined by U.S. Geological Survey hydrologic units and the limits of the species' range. The goal of the

Recovery Plan is to protect the long-term viability of all extant populations within each recovery unit. The current status of each unit, as described in the Recovery Plan, is briefly summarized below.

- **Sierra Nevada Foothills and Central Valley.** The California red-legged frog was likely extirpated from the Central Valley floor before 1960. Elimination of the species from the valley floor was significant because it isolated the Sierra-Nevada foothill populations that may have depended on immigrants from the valley floor. Currently, only a few drainages in the foothills of the Sierra Nevada are known to support the species.

- **North Coast Range Foothills and Western Sacramento River Valley.** There are many documented historic and extant occurrences throughout this recovery unit.

- **North Coast and North San Francisco Bay.** There are many documented historic and extant occurrences in small coastal drainages, ponds, and man-made stock ponds throughout this recovery unit.

- **South and East San Francisco Bay.** Contra Costa and Alameda Counties contain the majority of known California red-legged frog localities within the San Francisco Bay area, although they seem to have been nearly eliminated from the western lowland portions of these counties. Small isolated populations in the East Bay foothills still persist and the species also thrives in several areas in the eastern portions of Alameda and Contra Costa Counties.

- **Central Coast.** The central coast from San Francisco to Santa Barbara County supports the greatest number of currently occupied drainages.

- **Diablo Range and Salinas Valley.** Currently, no more than 10 percent of the historic localities within the Salinas River hydrographic basin and inner coast ranges still support the species.

- **Northern Transverse Ranges and Tehachapi Mountains.** The largest known populations in the northern Transverse Range are on upper Alamo Creek, a northern tributary to the Sisquoc River, and La Brea Creek.

- **Southern Transverse and Peninsular Ranges.** Population levels have plummeted from historic levels as a result of non-native predators (i.e. bullfrogs, crayfish, and non-native fish species), disease, and parasites. Today in southern California, south of the Tehachapi Mountains, the species is known only from a few locations.

Within each recovery unit, core areas have been delineated and represent contiguous areas of moderate to high California red-legged frog densities that are relatively free of exotic species such as bullfrogs. The goal of designating core areas is to protect metapopulations. Thus when combined with suitable dispersal habitat, core areas will allow for the long term viability within existing populations. This management strategy identified within the Recovery Plan (U.S. Fish and Wildlife Service, 2002b) will allow for the recolonization of habitats within and adjacent to core areas that are naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of the California red-legged frog.

Critical Habitat

The Service designated critical habitat for the California red-legged frog on April 13, 2006 (71 FR 19244), and a revised designation to critical habitat was published on March 17, 2010 (75 FR 12816). The Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* in the 2010 redesignation. The 2010 Final Rule designated approximately 1,636,609 acres of critical habitat for the California red-legged frog in 48 units. We determined that all units were occupied at the time of listing.

The four primary constituent elements for the California red-legged frog are:

- **Aquatic Breeding Habitat.** Standing bodies of fresh water (with salinities less than 4.5 parts per thousand), including natural and manmade (i.e., 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.

- **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 short-term dry periods.

- **Upland Habitat.** Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of one mile in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetational types such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog. Upland features are also essential in that they are needed to maintain the hydrologic, geographic, topographic, ecological, and

edaphic features that support and surround the wetland or riparian habitat. These upland features contribute to: (1) filling of aquatic, wetland, or riparian habitats; (2) maintaining suitable periods of pool inundation for larval frogs and their food sources; and (3) providing non-breeding feeding and sheltering habitat for juvenile and adult frogs (i.e., shelter, shade, moisture, cooler temperatures, prey base, foraging opportunities, and areas for predator avoidance). Upland habitat should include structural features such as boulders, rocks, and organic debris (i.e., downed trees, logs), small mammal burrows, or moist leaf litter.

- **Dispersal Habitat.** Accessible upland or riparian dispersal habitat within and between occupied or previously occupied sites that are located within one mile of each other, and that support movement between such sites. Dispersal habitat includes various natural habitats and altered habitats such as agricultural fields, that do not contain barriers (i.e., heavily traveled roads without bridges or culverts) to dispersal. Dispersal habitat does not include moderate- to high-density urban or industrial developments with large expanses of asphalt or concrete, nor does it include lakes or reservoirs over 50 acres in size, or other areas that do not contain those features identified in PCE 1, 2, or 3 as essential to the conservation of the species.

The following factors are responsible for the current condition of California red-legged frog critical habitat: disease; human recreational activities; flood control maintenance activities; water diversions; mining; dredging; sedimentation; water chemistry or temperature alterations; pesticide application; overgrazing; competition and predation by nonnative animal species; habitat removal and alteration by urbanization, timber activities, and nonnative plant introduction (75 FR 12816). These threats resulted in the current condition of critical habitat because they altered, degraded, or fragmented habitat and directly or indirectly resulted in the loss of California red-legged frog eggs, juveniles, and/or adults.

2.5.1.3 Foothill Yellow-Legged Frog

The foothill yellow-legged frog is not currently listed under the Act nor does it have designated critical habitat. Descriptions of the species' physical characteristics can be found in Stebbins (2003).

The known elevation range of the species extends from near sea level to approximately 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). The foothill yellow-legged frog is still common along the north coast of California (Fellers, as cited Stebbins and Cohen, 1995). Fellers (1994, as cited in ICF International, 2012, Appendix D) reported healthy, reproducing populations throughout suitable habitat in the Diablo Range in

Alameda, western Stanislaus, Santa Clara, San Benito, and western Fresno Counties.

Foothill yellow-legged frogs require shallow, flowing water in small to moderate-sized streams with at least some cobble-sized substrate (Hayes and Jennings, 1986). This habitat is believed to favor oviposition (Fitch, 1936) and refugial habitat for larvae and postmetamorphs (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 (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; Kupferberg, 1997).

The foothill yellow-legged frog is a highly aquatic amphibian, spending most or all of its life in or near streams, though frogs have been documented underground and beneath surface objects more than 165 feet from water (Nussbaum *et al*., 1983). Bourque (2008) reported the movements of radiotracked frogs being restricted to watercourses, though movement distances were considerably longer than previously reported with mark recapture techniques. Average distance from water was less than 10 feet with a range from 22.6 to 131.2 feet (Bourque, 2008). Distance moved from perennial, ephemeral, and intermittent streams was similar. Bourque (2008) documented movements up to 1,896 feet (males) and 23,106 feet (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 sites (Bourque, 2008).

Foothill yellow-legged frogs in California generally breed between March and early June (Wright and Wright, 1949; Jennings and Hayes, 1994). The species deposits its egg masses on the downstream side of cobbles and boulders over which a relatively thin, gentle flow of water exists (Fitch, 1936; 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 degrees Celsius (Zweifel, 1955). After oviposition, a minimum of approximately 15 weeks is required to reach metamorphosis, which typically occurs between July and September (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 frogs chose sites to lay eggs and timed egg laying to avoid fluctuations in river stage and current velocity associated with changes in river discharge (Kupeferberg, 1996). This suggests that stable flow and current velocities are important to create suitable reproductive sites for foothill yellow-legged frogs.

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; Kupferberg, 2009), and decreased flows can force adult frogs to move into permanent pools, where they may be more susceptible to predation. Threats include stream scouring (which may negatively affect frogs in streambed hibernation sites), introduced incompatible aquatic animals, riverine and riparian effects 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 watersheds with dams. Davidson *et al*. (2002) found evidence that airborne agrochemicals play a significant role in the decline of this species; habitat destruction, climate change, and UV-B radiation also appear to be contributing factors. Lind (2005) further linked changes in land use and use of air-borne toxins to 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 boylii* populations in northern California but had only a slight effect on *Pseudacris regilla.* Interspecific matings between male *R. boylii* and female bullfrogs have been observed; these interactions with nonnative bullfrogs might reduce the reproductive output of *R. boylii* (Lind *et al*., 1996). Furthermore, centrachid 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).

2.5.1.4 Western Pond Turtle

The western pond turtle is not currently listed under the Act nor does it have designated critical habitat. A description of the species' physical characteristics is available in Stebbins (2003).

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).

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, thermoregulating, and avoiding predators. They prefer habitats with large areas for cover (i.e. logs, algae, and vegetation) and basking sites (i.e. boulders or other substrates). The species has been observed avoiding 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 (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).

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 opportunistically. Individuals will also scavenge carrion and browse on plant material. Prey items are ingested in the water as 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).

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. 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.

Western pond turtles first breed at 10 to 14 years of age (Stebbins, 2003). Most females lay eggs in alternate years. Gravid females leave drying creeks from May through July to deposit their eggs in sunny, upland habitats, including grazed pastures and agricultural fields. Nesting has been documented up to 1,391 feet from water (Jennings and Hayes, 1994) but is usually closer, averaging 92 feet from aquatic habitat (Rathbun *et al*., 2002). Incubation lasts 80 to 100 days, and the normal hatch success is approximately 70 percent. Nest predation rates are high, and complete failure of nests is common (ICF International, 2012, Appendix D).

The species is declining throughout its range, more so in Washington and Oregon than in California (NatureServe Explorer, 2011). The status of the population in California is not well understood but decline is generally attributed to a loss of nesting habitat. Currently, the sizes and densities of western pond turtle populations in California are not well known (ICF International, 2012 Appendix D).

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 (Jennings and Hayes, 1994).

Common western pond turtle 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 have scarred shells and missing limbs, manifestations of previous predation attempts. Hatchlings are especially vulnerable to predators because their shells are 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). 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.

2.5.2 Environmental Baseline

2.5.2.1 California Tiger Salamander (Central California DPS)

Of the 964 presumed extant occurrences of California tiger salamanders recorded in the CNDDB, approximately 11 percent (102 occurrences) are documented in the Action Area (California Department of Fish and Game, 2012). The occurrences are scattered throughout the Action Area, on both sides of the valley, with large clusters of occurrences in Joseph D. Grant County Park. Stock ponds likely serve as the primary breeding habitat for the species within the Action Area. However, most of these stock ponds have not been surveyed, particularly those in remote areas (ICF International, 2012, Appendix D).

Due to the programmatic nature of the proposed action, the environmental baseline for the California tiger salamander described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the occurrence data summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the California tiger salamander and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5).

See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution, lack of predator survey data), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Modeled breeding habitat within the Action 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 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 (ICF International, 2012, Appendix D). There are 324,748 acres of California tiger salamander modeled habitat (breeding and non-breeding) within the Action Area. There are 97,423 acres (30 percent) of modeled habitat located on Type 1, 2, or 3 Open Space with 45,767 acres (14 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.2 and Table 5-17).

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. As a result, nonnative barred salamanders have been identified during surveys in North Fork Pacheco Creek, above Pacheco Reservoir (Smith pers. comm., 2010, as cited in ICF International, 2012, Appendix K).

Some level of hybridization is most likely present in a large number of ponds throughout the Action Area and may be high in some ponds in the southern portion of the Action Area, near non-native tiger salamander introduction sites (i.e., Bluestone Lake and North Fork Pacheco Creek). Of the Santa Clara County populations genotyped, all had some low-level of hybridization (Johnson pers. comm., 2009, as cited in ICF International, 2012, Appendix K), and one, Bluestone Lake, had an average introduced allele frequency of 60 percent (Fitzpatrick *et al*., 2009).

Critical Habitat

There are eight critical habitat units within the Action Area: East Bay Region Units 5–12 (see Plan Figure 4-5). The Action Area supports 28,096 acres of critical habitat, which includes 92 acres of modeled breeding habitat and 27,235 acres of modeled non-breeding habitat. The Action Area supports an additional

769 acres of critical habitat outside of modeled habitat[72] (ICF International, 2012, Table 4-9).

Portions of the critical habitat units have already been preserved through acquisition and conservation easements (see Plan Figure 4-4). As indicated in Table 5-21 of the Plan, 6,443 acres (23 percent) of all critical habitat in the Action Area is currently protected as Type 1 Open Space and another 33 percent is located in open space Types 2–4. As a result, 41 percent of critical habitat remains outside of any type of open space (ICF International, 2012, Section 5.4.2). All eight units contained in the Action Area are occupied by the species and contain each of the three PCEs (70 FR 49379). Nearly all the critical habitat units are in or on the periphery of urban areas (ICF International, 2012, Section 4.7.2).

Threats that require special management considerations and contribute to the current condition of critical habitat in the Action Area are listed below:

- Unit 5 (Poverty Ridge): Conversion of grazing land to housing and commercial development
- Unit 6 (Smith Creek): Urban development, agricultural conversion, and associated infrastructure
- Unit 7 (San Felipe Creek): Urban development, agricultural conversion, and associated infrastructure
- Unit 8 (Laurel Hill): Urban development and associated infrastructure and bullfrogs
- Unit 9 (Cebata Flat): Urban development and associated infrastructure and bullfrogs
- Units 10a and 10b (Lions Peak): Urban development and associated infrastructure and bullfrogs
- Unit 11 (Braen Canyon): Erosion and sedimentation, pesticide application, introduction of predators (i.e. bullfrogs and mosquito fish), development that may alter aquatic habitat hydrology, upland disturbance that may alter upland refugia and dispersal habitat, and activities such as road development and widening that may develop barriers for dispersal
- Unit 12 (San Felipe Unit): Erosion and sedimentation, pesticide application, introduction of predators (i.e. bullfrogs and mosquito fish), development that may alter aquatic habitat hydrology, upland disturbance that may alter upland refugia and dispersal habitat, and activities such as road development and widening that may develop barriers for dispersal

Critical habitat in the Action Area is crucial to the conservation of the species because the Action Area contains the majority (approximately 70 percent) of the

72 The acreage difference between critical habitat in the Action Area and the Plan's modeled habitat is an artifact of the differing purposes and scopes of critical habitat designation and the Plan.

land contained in the East Bay Region critical habitat units. The critical habitat units within the East Bay Geographic Region are essential to the conservation of the Central population of the California tiger salamander because these units collectively maintain the geographic and genetic variability that currently exists within the range of the species. Some of the designated units are in pristine condition (70 FR 49379).

2.5.2.2 California Red-Legged Frog

Of the 1,314 presumed extant occurrences of the California red-legged frog recorded in the CNDDB, approximately 5 percent (68 occurrences) are documented in the Action Area (California Department of Fish and Game, 2012). Adult frogs have been observed in Upper Alameda Creek in the Sunol Regional Wilderness south to Henry W. Coe State Park (U.S. Fish and Wildlife Service, 2002b). The species is also abundant in many ponds in the Palassou Ridge area, south of Henry W. Coe State Park (U.S. Fish and Wildlife Service, 2002b). Some of the occurrences are on private property; however, the majority of recorded occurrences are on public lands (i.e. City of San Jose, County, and SCVWD property).

Riparian areas within the Action Area are largely channelized or contain a wide variety of introduced predatory fishes and bullfrogs (Padley pers. comm., as cited in ICF International, 2012, Appendix D). However, California red-legged frogs are still found in the foothill and mountain ranges throughout the Action Area (H.T. Harvey and Associates, 1997). For example, breeding sites are documented near Kirby Canyon Landfill (east of U.S. 101) as well as along the upper reaches of several streams in the Action Area, including Guadalupe and Upper Penitencia Creeks (Santa Clara Valley Water District, 2011).

Due to the programmatic nature of the proposed action, the environmental baseline for the California red-legged frog described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the occurrence data summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the California red-legged frog and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution, lack of predator survey data), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

For the purposes of the Plan, 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 are included in modeled breeding and foraging habitat for the California red-legged frog. All grassland, chaparral and coastal scrub, oak woodland, riparian forest/scrub, and conifer woodland land cover types within 100 feet of primary habitat in the Action Area are included in modeled 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 modeled habitat are included in modeled dispersal habitat (ICF International, 2012, Appendix D).

There are 341,773 acres of California red-legged frog modeled habitat (primary and secondary habitat) within the Action Area. A total of 101,164 acres (30 percent) of that modeled habitat are located in Type 1, 2, or 3 Open Space with 46,253 acres (14 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.3 and Table 5-17).

Recovery Units

The Action Area is mainly contained in two Recovery Units (U.S. Fish and Wildlife Service, 2002b). The northern portion of the Action Area overlaps Recovery Unit 4, the South and East San Francisco Bay Recovery Unit. The southern portion of the Action Area overlaps Recovery Unit 6, the Diablo Range and Salinas Valley Recovery Unit. A very small portion of the Action Area, located southwest of Uvas Reservoir, overlaps Recovery Unit 5, the Central Coast Recovery Unit.

Core Areas

The Action Area contains three core areas, as defined by the Recovery Plan (U.S. Fish and Wildlife Service, 2002b). Core Area 16, East San Francisco Bay, has the largest overlap with the Action Area. It covers much of the Diablo Range on the eastern side of the Action Area. Very small portions of Core Area 17, Santa Clara Valley, and Core Area 19, Watsonville Slough-Elkhorn Slough, overlap the southern portion of the Action Area.

All three core areas in the Action Area were designated because they are currently occupied, are source population, and are important for connectivity. Conservation needs in the East San Francisco Bay Core Area include protecting existing populations; controlling non-native predators; studying the effects of grazing on riparian corridors, ponds, and uplands; reducing impacts associated with livestock grazing; protecting habitat connectivity; minimizing effects of recreation and off-road vehicle use; avoiding and reducing effects of urbanization; and protecting habitat buffers from nearby urbanization. Conservation needs in the Santa Clara Valley Core Area include protecting existing populations and controlling non-native predators. Conservation needs in the Watsonville Slough-Elkhorn Slough

Core Area include protecting existing populations, protecting habitat connectivity, reducing effects of agriculture, improving water quality, and reducing effects of urbanization (U.S. Fish and Wildlife Service, 2002b).

Critical Habitat

The Action Area supports approximately 150,962 acres of critical habitat, including 2,964 acres of modeled primary habitat and 146,452 acres of modeled secondary habitat. An additional 1,546 acres of critical habitat are outside of the Plan's modeled habitat[73] (ICF International, 2012, Table 4-9). Approximately 36,703 acres (24 percent) of the units contained in the Action Area are permanently protected (ICF International, 2012, Table 5-21). Another 14 percent is located in open space Types 2–4. However, this leaves 62 percent of critical habitat outside of any type of open space (ICF International, 2012, Section 5.4.3 and Table 5-21).

The two man critical habitat units in the Action Area are STC-1 and STC-2. A small portion of ALA-2 is also contained in the Action Area. All critical habitat units in the Action Area are located in the South and East San Francisco Bay Recovery Unit. These critical habitat units include both breeding and upland habitat and account for 9 percent of the designated critical habitat for this species throughout the species' range (ICF International, 2012, Section 4.7.3).

STC-1 (Cañada de Pala) is located south of Calaveras Reservoir, near Los Buellis Hills, south along the ridgeline east of Santa Clara Valley to Anderson Lake and Henry W. Coe State Park. STC-1 includes approximately 52,283 acres of land and contains all four PCEs. The unit was known to be occupied at the time of listing and is currently occupied. STC-1 contains high-quality permanent and ephemeral aquatic habitats consisting of artificial and natural ponds and streams surrounded by emergent vegetation, grasslands and oak woodlands that provide for breeding, and upland areas for dispersal, shelter, and food. The Action Area is essential to the conservation role of critical habitat because STC-1 is completely contained in the Action Area. As indicated in the Final Rule (75 FR 12816), the designation of this unit was expected to assist in preventing further fragmentation of habitat in this portion of the species' range and represents a corridor between units farther north into Contra Costa County and south into Merced and San Benito Counties. Threats that may require special management considerations in STC-1 include, but are not limited to, predation by nonnative species, urbanization, presence of exotic species, siltation and erosion of ponded habitat, and overgrazing of aquatic and riparian habitats.

STC-2 (Wilson Peak) is adjacent to STC-1 in the north and continues south to the southern and eastern boundaries of the Action Area. In total, this unit contains approximately 204,718 acres of land and contains all four PCEs. STC-2 was

73 The acreage difference between critical habitat in the Action Area and the Plan's modeled habitat is an artifact of the differing purposes and scopes of critical habitat designation and the Plan.

known to be occupied at the time of listing and is currently occupied. The unit contains high-quality permanent and ephemeral aquatic habitats suitable for breeding and upland areas for dispersal, shelter, and food. The Action Area is essential to the conservation role of critical habitat because 97,214 acres (47 percent) of STC-2 is contained in the Action Area. As indicated in the Final Rule (75 FR 12816), the designation of this unit was expected to prevent further habitat fragmentation; provide connectivity to units farther north in Santa Clara, Alameda, and Contra Costa Counties; and represent the southern portion of the areas designated within Santa Clara County and east bay. Threats that may require special management considerations in STC-2 include, but are not limited to, predation by nonnative species and habitat alteration from development activities.

ALA-2 (Arroyo Valle) is located in southwestern Alameda County, south of Highway 580 at Altamont Pass southeast into San Joaquin County and southwest into Santa Clara County, near Arroyo Hondo and Calaveras Reservoir. In total, this unit contains approximately 153,624 acres, 1,465 acres (1 percent) of which, is located in the northern most portion of the Action Area. ALA-2 was known to be occupied at the time of listing and is currently occupied. It contains all four PCEs. The unit contains permanent and ephemeral aquatic habitats comprised of natural ponds and streams and manmade stock ponds with emergent vegetation, willows (*Salix* spp.) surrounded by riparian vegetation, grasslands, and oak forest that provide for breeding, and upland areas for dispersal, shelter, and foraging opportunities. Although only 1 percent of this unit is contained in the Action Area, the Action Area is essential to the conservation role of critical habitat because ALA-2 provides for connectivity between populations farther north and south in the interior Coast Range. Threats that may require special management considerations in ALA-2 include, but are not limited to, urbanization, alteration of aquatic and riparian habitats, and erosion and siltation of ponded habitat.

2.5.2.3 Foothill Yellow-Legged Frog

Of the 803 presumed extant occurrences of foothill yellow-legged frog recorded in the CNDDB, approximately 1 percent (9 occurrences) is documented in the Action Area (California Department of Fish and Game, 2012). Seven of the occurrences are on the east side of the valley, the northern most of which is in Penitencia Creek. The remaining occurrences are in the Santa Cruz Mountains, west of Gilroy (ICF International, 2012, Appendix D).

Relatively few areas have been adequately surveyed for the foothill yellow-legged frog in the Action Area because of the difficulty to gain access to private lands (H.T. Harvey and Associates, 1999). In 1999, H.T. Harvey and Associates summarized the distribution status of the foothill yellow-legged frog for SCVWD. 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. Although the species is declining throughout the Action Area, it is still present in the Santa Cruz Mountains and is fairly abundant in the foothill and mountain

ranges of eastern Santa Clara County (H.T. Harvey and Associates, 1999). This species has been found in most perennial streams and rivers in the Action 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.

Due to the programmatic nature of the proposed action, the environmental baseline for the foothill yellow-legged frog described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the occurrence data summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the foothill yellow-legged frog and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

For the purposes of the Plan, low gradient streams (0 to 4 percent slope) or rivers not regulated by a dam, in riparian forest/scrub, grassland, oak woodland, and conifer woodland land cover types are classified as primary (breeding and foraging) habitat. Secondary habitat (low use habitat) is defined as moderate gradient streams (4 to 10 percent slope) or rivers in riparian woodland/scrub, grassland, oak savanna, and oak woodland land cover types (ICF International, 2012, Appendix D).

There are 690 miles of foothill yellow-legged frog modeled primary and secondary habitat within the Action Area. A total of 222 stream miles (32 percent) of modeled primary and secondary habitat are located on Type 1, 2, or 3 Open Space with 119 stream miles (17 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.4 and Table 5-17).

There are no conservation efforts within the Action Area that directly target the recovery of this species. However, stream restoration projects that return creeks and streams to natural flow regimes likely benefit this species.

2.5.2.4 Western Pond Turtle

Of the 1,104 presumed extant occurrences of western pond turtles recorded in the CNDDB, approximately 3 percent (33 occurrences) are documented in the Action Area (California Department of Fish and Game, 2012). Most were recorded with

fair to excellent confidence, were recorded in the southern half of Action Area, and were associated with reservoirs or creeks (namely Uvas and Llagas Creeks). Western pond turtles have also been documented throughout the Coyote Creek drainage (California Department of Fish and Game, 2012).

Due to the programmatic nature of the proposed action, the environmental baseline for the western pond turtles described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the occurrence data summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the western pond turtle and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

For the purposes of the Plan, all ponds, streams, canals/ditches, and coastal and valley freshwater marsh are included in modeled primary (nesting, basking, and overwintering) habitat. In addition, areas within 150 feet of these land cover types; excluding rock outcrops, vineyards, orchards, or urban areas; are considered suitable nesting and overwintering habitat. Modeled secondary habitat (nest sites and movement) 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 (ICF International, 2012, Appendix D).

There are 314,916 acres of western pond turtle modeled habitat (primary and secondary) within the Action Area. A total of 98,060 acres (31 percent) of that modeled habitat are located in Type 1, 2, or 3 Open Space with 44,967 acres (14 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.5 and Table 5-17).

There are currently no known conservation actions in the Action Area that target this species. However, any creek or stream restoration that returns altered aquatic systems to a natural setting will likely benefit the western pond turtle.

2.5.3 General Effects of the Action on Aquatic Species

To minimize repetition, anticipated effects common to all covered aquatic species evaluated in this Opinion are discussed here, in Section 2.5.3. General effects of the

Action on all Covered Species, previously described in Section 2.4.3 above, are not repeated. Species specific effects that are in addition to effects common to covered aquatic species are described below, in Sections 2.5.4.1 - 2.5.4.4.

Mortality, Injury, Harm, and Harassment: Most of the effects on California tiger salamanders, California red-legged frogs, and western pond turtles will result from the conversion of habitat to developed land cover types within the San Jose, Morgan Hill, and Gilroy planning limits of urban growth. Effects on these three covered aquatic species in the Santa Cruz Mountains are expected to be limited to the Santa Cruz foothills. Effects on California red-legged frogs, California tiger salamanders, and western pond turtles in the Diablo Range will be limited to the Coyote watershed, primarily within the San Jose planning limit of urban growth (ICF International, 2012, Section 4.6.2).

The Plan minimizes these effects by limiting the allowable effects on aquatic land cover types. No more than 52 acres of ponds and 40 acres of wetlands 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 in the Action Area (4.7 percent of ponds and 6.9 percent of wetlands in the Action 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 Action Area (0.4 percent of the total stream miles in the Action Area) (ICF International, 2012, Section 4.6.2 and Table 4-2).

Proper implementation of the following Plan Conditions will further minimize potential direct and indirect effects on covered aquatic species:

- 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 7. *Rural Development Design and Construction Requirements*
- Condition 8. *Implement Avoidance and Minimization Measures for Rural Road Maintenance*
- Condition 11. *Stream and Riparian Setbacks*

Table 6-2 of the Plan contains 115 general, project design, construction, and post-construction avoidance and minimization measures (AMMs) for all water-related Covered Activities described in Condition 3, 4, and 5 of the Plan. Each local jurisdiction, or the Implementing Entity in the case of projects conducted by the Applicants, will verify that all appropriate AMMs in Table 6-2 are implemented to minimize effects to Covered Species and their aquatic habitat (ICF International, 2012, Section 6.4.1). All AMMs listed in Table 6-2 are required unless it is not appropriate for the activity or field data collected at the site or in comparable areas demonstrate that the AMM would not benefit wildlife or reduce impacts on natural communities. The Implementing Entity will update the AMMs in Table 6-2 over time so that they are more appropriate for implementing a specific Covered Activity or more beneficial for Covered Species.

Proposed revisions will be reviewed by the Wildlife Agencies upon submission of each annual report to ensure the successful implementation of the conservation strategy (ICF International, 2012, Section 6.4.2).

In the analysis that follows, we discuss anticipated direct and indirect effects on covered aquatic species along with specific Plan Conditions and AMMs that will minimize effects. The discussion that follows summarizes applicable AMMs; for a complete description of AMMs, refer to Chapter 6 of the Plan and its associated tables.

Covered Activities that occur in seasonal wetlands, marshes, ponds, streams, or riparian areas may directly affect covered aquatic species. Individuals could be entrained, injured, or killed by construction and operations and maintenance activities occurring in aquatic systems. For example, operation of new off-channel groundwater recharge basins could entrain species in outtakes from creeks (ICF International, 2012, Section 4.3.4). Furthermore, poorly timed water releases (i.e. dewatering events) could wash eggs, juveniles, and adults downstream and ultimately result in death or injury (see *Hydrology* below). Covered Activities could also degrade or remove occupied and suitable aquatic habitat and result in the harm of covered aquatic species. The following AMMs, listed in Plan Table 6-2, will minimize these potential effects (ICF International, 2012):

- AMM 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.
- AMM 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.
- AMM 31: When conducting vegetation management, retain as much understory brush and as many trees as feasible, emphasizing shade producing and bank stabilizing vegetation.
- AMM 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.
- AMM 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.
- AMM 50: If levee reconstruction requires the removal of vegetation that provides habitat value to the adjacent stream (i.e., 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.

- AMM 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.
- AMM 73: Avoid wet season construction.
- AMM 81: Temporary disturbance or removal of aquatic and riparian vegetation will not exceed the minimum necessary to complete the work.
- AMM 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.
- AMM 107: On streams managed for flood control purposes, when stream reaches require extensive vegetation thinning or removal, 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.
- AMM 108: When reaches require sediment removal, approaches will be considered that may reduce the effects 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.
- AMM 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.
- AMM 112: Pumps and generators shall be maintained and operated in a manner that minimizes effects on water quality and aquatic species.

Condition 11 will further minimize death, injury, harm, and harassment of covered aquatic species through the imposition of riparian setback requirements. In summary, projects occurring on slopes ranging from 0-30 percent adjacent to a category 1 stream[74] will be required to have a 100-foot riparian setback within the existing urban service area and a 150-foot setback outside of the existing service area. Projects occurring on slopes exceeding 30 percent will be required to have a 150-foot riparian setback within the existing urban service area and a 200-foot setback outside of the existing service area on category 1 streams. The Condition requires a 35-foot setback for all projects affecting category 2 streams[75], regardless of location or slope. In all cases, if the site supports

74 This stream type has sufficient flow to support Covered Species, include perennial streams and some intermittent streams, are typically larger than ephemeral drainages, and support movement of Covered Species.
75 This stream type may not have sufficient flow to support Covered Species, include all ephemeral streams and some intermittent stream reaches, and provide minimum support of water-quality functions and primary breeding habitat for Covered Species.

riparian vegetation, the setback will be equal to either the riparian edge plus a 35-foot buffer or the setback as defined above, whichever is greater. Unless a Covered Activity meets the Plan's "exemption" criteria or is granted a stream setback "exception," implementation of Covered Activities is prohibited within the stream setback (ICF International, 2012, Section 6.5 and Table 6-7). Exemptions listed in Section 6.5 of the Plan follow:

- Any activity that is not a Covered Activity and not subject to the Plan or its Conditions
- Activities listed as exempt in Section 6.2 of the Plan
- Development on parcels less than a 0.5 acre
- 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, and dam-related capital projects
- Recreational trails
- 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
- Stream crossings essential to provide a means of access to a parcel or facility

In the context of Condition 11, the term "exception" means an allowance for reductions in mandated setback distances necessary to allow reasonable use and development of a 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. Exceptions will be considered based on the following factors (ICF International, 2012, Section 6.5):

- The existence of legal uses within the setback
- The extent to which meeting the required setback would result in a demonstrable hardship for the project proponent
- 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
- The stream setback exception does not preclude achieving the biological goals and objectives of the Plan or conflict with other applicable requirements of the Plan and local policies

Regardless of project location, stream setback exceptions may not reduce a category 1 stream setback to less than 50 feet for new development or 35 feet for existing or previously developed sites (ICF International, 2012, Section 6.5). As indicated in Section 8.11 of the Plan, annual reports will include a list of all riparian setback exceptions granted each calendar year. The Service will review this information to ensure that granted exemptions do not preclude the successful implementation of the Plan.

Condition 12 will further minimize death, injury, harm, and harassment by imposing avoidance and minimization measures to reduce effects on wetlands and ponds that could be utilized by covered aquatic species. Condition 12 requires projects to avoid and minimize effects on wetlands to the maximum extent practicable. If a Covered Activity has adverse indirect effects on a wetland's function (i.e. alters hydrology), the project will be required to avoid indirect effects, as determined on a case-by-case basis. With few exceptions[76], wetlands that are not completely avoided, including indirect effects, will be considered permanently affected and will count towards the Plan's impact limits on wetlands (see Plan Table 4-2). In addition, Condition 12 specifically requires a 100-foot buffer from septic facilities when space allows, installation of vegetated stormwater filtration features if the run off from the development will flow within 100 feet of a wetland or pond, and installation of native vegetation between a wetland or pond and development such that the line of sight between the wetland or pond and the development is shielded. Condition 12 also specifies many measures to minimize the effects of construction actions (i.e. staking, fencing, and installing erosion control) (ICF International, 2012, Section 6.5).

In addition to direct effects anticipated in aquatic systems, covered aquatic species could be trapped, injured, or killed as a result of construction, operation, and maintenance activities that occur in uplands located within dispersal and migration distance of occupied aquatic habitat. Covered aquatic species could also be harmed by Covered Activities that remove or degrade upland components of their habitat. The removal or alteration of uplands adjacent to potential breeding sites may prevent covered aquatic species from completing their life cycles. For example, activities that result in the removal of ground squirrel burrows could result in the direct loss of California tiger salamanders and California red-legged frogs utilizing those burrows and indirectly affect these species' ability to inhabit that area in the future because of the loss of upland refugia. Covered Activities that isolate breeding sites from adjacent upland habitats may reduce overall productivity, and isolation of many breeding sites could result in local extirpations. The following AMMs will reduce the potential for these effects (ICF International, 2012, Table 6-2):

- AMM 58: Existing access routes and levee roads shall be used if available to minimize effects of new construction in special status species habitats and riparian zones.
- AMM 61: Minimize ground disturbance to the smallest area feasible.
- AMM 71: Preserve existing vegetation to the extent possible.
- AMM 84: Filter fences and mesh will be composed of material that will not entrap reptiles and amphibians.
- AMM 89: The potential for traffic effects on terrestrial animal species will be minimized by adopting traffic speed limits.

76 If 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 Plan Table 4-2. "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 (ICF International, 2012, Section 6.5).

- AMM 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 effects on streams.
- AMM 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.
- AMM 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.

Borrow sites for dam retrofit activities could potentially affect upland refugia and dispersal habitat for covered aquatic species. Sites where alluvial materials may be obtained without impacting wetlands, stream channels, existing or proposed Plan reserves, and California tiger salamander or California red-legged frog habitat will be targeted for borrow sites (ICF International, 2012, Section 4.3.2). 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 (ICF International, 2012, Section 8.7.3). With these measures, effects resulting from future borrow site activities on covered aquatic species will be adequately minimized.

The Plan includes Neighboring Landowner Assurances (see Sections 4.3.7 and 10.2.7 of the Plan) that apply to the California tiger salamander, California red-legged frog, and western pond turtle. Neighboring Landowner Assurances are extended to certain "farmlands," which are lands on which normal agricultural practices occur, including but not limited to, crop planting and production, irrigation and fertilization, soil tilling, crop harvesting, 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. California tiger salamanders, California red-legged frogs, and western pond turtles could be harmed, harassed, injured, or killed as a result of rodent control activities, active farming practices, vehicle and machinery operation, runoff from fields, or disturbance to adjacent streams or wetlands.

Take associated with this program will not result in a significant effect on these three covered aquatic species for several reasons. First, the extent of the effect is likely low. Based on the landowner participation in approved HCPs that have similar programs (i.e., San Joaquin County), no more than 10 percent of eligible lands are anticipated to enroll into the program (i.e. only 1,240-2,040 acres). In addition, these assurances end with the expiration of the permit. Take authorization is further limited to California red-legged frogs, California tiger salamanders, and western pond turtles on private farmlands within 1.0 mile of the Reserve System. These species are known to disperse further than 1.0 mile, so this geographic limitation reduces the level of potential take authorized under the Plan. Furthermore, although take coverage afforded by Neighboring Landowner Assurances could result in a diminution of the benefits of the conservation strategy for

these three covered aquatic species, Neighboring Landowner Assurances do not provide for incidental take of existing populations at the time baseline conditions are documented. Finally, affected habitat on farmlands would likely be secondary/dispersal habitat with little effect on breeding habitat (ICF International, 2012, Section 10.2.7). Habitat in farmlands would, in many cases[77], be highly degraded by ongoing agricultural practices.

As previously indicated Section 2.4.3.1 of this Opinion, urban and rural development Covered Activities may directly and indirectly result in an increase in vehicle-related deaths and injuries of Covered Species. Roads-related traffic may result in high mortality, particularly for slow-moving taxa like amphibians and reptiles (Ashley and Robinson, 1996; Gibbs and Steen, 2005; Hels and Buchwald, 2001; Carr and Fahrig, 2001). Amphibians and reptiles tend to be particularly susceptible on two-lane roads with low to moderate traffic (deMaynadier and Hunter, 1995; Hodson, 1966). Van Gelder (1973) examined the effect of roads on amphibians and found that because of their activity patterns, population structure, and preferred habitats, aquatic breeding amphibians are more vulnerable to traffic mortality than some other species. Vehicles pose a serious threat when these amphibians need to cross a road to get from upland refugia to breeding sites (Hels and Buchwald, 2001). Of species associated with wetlands, amphibians and reptiles are especially vulnerable to road mortality because they are limited by their thermoregulation needs and are often slow or less cognizant of passing vehicles (Ashley and Robinson, 1996). For covered aquatic species, time of day that roads are most likely to be occupied is an important factor of road mortality. As previously indicated in Section 2.4.3.1 of this Opinion, these effects will be minimized through the implementation of Conditions 2, 6, and 8. Implementation of AMMs 58, 62, 89, and 94, as previously described in this section of the Opinion, will further reduce vehicle-related mortality and injury.

The Plan further minimizes the indirect effects associated with increased human presence by specifying the following minimum distances from urban development required for aquatic land cover types to count toward Plan acquisition, restoration, or creation requirements (ICF International, 2012, Table 5-15):

- Coastal and valley freshwater marsh: 750 feet
- Seasonal wetland: 100 feet if the wetland is up-gradient from development and 250 feet if the wetland is down-gradient from development
- Pond: 750 feet
- Stream: 150 feet
- Riparian woodland/scrub: 50 feet

Harm and harassment resulting from increased recreation in the Reserve System (see Section 2.4.3.1 of this Opinion) will be minimized with the implementation of Condition

77 Suitably managed livestock ranch land is generally compatible with the successful use of rangelands by California tiger salamanders and California red-legged frogs. The long-term effect of ranching on these species is either neutral or beneficial, as long as burrowing rodents are not completely eradicated and stock ponds are built and maintained for livestock production (69 FR 4712 and 71 FR 19244).

9 of the Plan, which prohibits new trails within 100 feet of wetlands and streams that provide suitable habitat for covered aquatic species unless topography or other landscape characteristics shield trails from habitat or it can be otherwise demonstrated that the trail is not affecting these species (ICF International, 2012, Section 6.4.6).

The Plan's primary means of mitigating unavoidable direct and indirect effects to covered aquatic species is the preservation, enhancement, creation, and management of suitable habitat. Table 5-12 of the Plan describes required preservation, enhancement, restoration, and creation mitigation ratios to offset effects to riparian, wetland, and open water land cover types. If all anticipated effects to aquatic land cover types occur, the Applicants will protect and restore a total of 917 acres of willow riparian forest and scrub and mixed riparian forest and woodland, 54 acres of Central California sycamore alluvial woodland, 95 acres of perennial wetland, 60 acres of seasonal wetland, and 110.4 miles of streams. The Applicants will also protect and create a total of 177 acres of ponds if all anticipated effects to ponds occur (ICF International, 2012, Table 5-13). Aquatic habitat preserved will be adjacent to permanently protected upland habitat for Covered Species (ICF International, 2012, Objective 10.1). In addition, stream/riparian and wetland restoration and pond creation will be initiated (i.e. ground breaking) prior to effects occurring (ICF International, 2012, Sections 5.3.6 and 5.3.7) to minimize temporal losses of habitat.

Habitat Fragmentation: Installation of new, and operation of existing, in-channel structures (i.e., dams, diversion facilities, drop structures, and stream gauge weirs) will create barriers to upstream and downstream movement of covered aquatic species. Movement of larval amphibians may be particularly impeded during low-flow periods. 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. In-channel ponds behind diversion dams will also act as barriers to movement because these areas are often populated by exotic species that prey on covered aquatic species.

These potential effects may be minimized by the implementation of geomorphic rehabilitation proposed under the Three Creeks HCP Conservation Program, where certain reaches of streams below the reservoirs would be substantially modified to improve fish passage. If implemented, these actions would likely have ancillary benefits for covered aquatic species. Enhancement may include physical re-configuration of channels, installation of structures to enhance channel complexity, and riparian planting. Specific projects proposed include (ICF International, 2012, Section 2.3.3):

- Ogier Ponds separation from the channel
- Coyote Percolation Pond separation from the channel
- Channel enhancements on 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 in the Guadalupe River Watershed below Calero, Almaden, and Guadalupe Dams

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 implemented (ICF International, 2012, Section 2.3.3).

Water Quality: All Covered Activities have the potential to directly and indirectly affect water quality in the Action Area. Likely effects include increased sedimentation and turbidity, dissolved oxygen, stream temperature, pollution/nutrient loads, and methyl mercury. Water quality issues are inherently related to hydrology, which is also discussed below under the *Hydrology* subsection.

Urban and rural development will increase the amount of impervious surface cover (ISC) in the Action Area (Hogan and Walbridge, 2007), which will indirectly affect water quality and could thus potentially harm covered aquatic species. By increasing the extent of impervious cover, development-related Covered Activities will indirectly result in increased runoff, especially during storm events (Wissmar *et al*., 2004). Such increases could result in increased sediment loads (Hogan and Walbridge, 2007); increased turbidity; increased local stream temperatures (Galli, 1990); increased transport of pollutants and chemicals (Paul and Meyer, 2001; Forman and Alexander, 1998); altered transport of nutrients (Hogan and Walbridge, 2007); and increased scour and incision (Chin and Gregory, 2001).

The Center for Watershed Protection developed the Impervious Cover Model, which predicts that most stream quality indicators decline when watershed impervious cover exceeds 10 percent, with severe degradation expected beyond 25 percent (Center for Watershed Protection, 2003; T.R. Schueler, 1994). The Plan includes an analysis of the anticipated increase in impervious cover resulting from Covered Activities (ICF International, 2012, Section 4.4.2 and Table 4-8). The analysis likely overestimates effects because it does not account for stormwater management activities that would decrease run-off (i.e., cisterns or retention ponds), which are requirements currently integrated into San Francisco Bay Regional Board National Pollutant Discharge Elimination System (NPDES) permits and will be incorporated into future Central Coast Regional Board NPDES permits (ICF International, 2012, Section 4.4.2). The majority of the subwatersheds in the Action Area are estimated to have less than 10 percent impervious cover at buildout. In most cases, total impervious cover at the end of the permit term will be less than 6 percent (ICF International, 2012, Table 4-8). Therefore, increased impervious cover alone is expected in most cases, to have a minor indirect effect on covered aquatic species.

However, portions of the following three subwatersheds currently have more than 10 percent impervious cover: the Coyote watershed below Anderson Dam (13.7 percent); the Guadalupe watershed below Guadalupe, Almaden, and Calero Dams (25.9 percent); and the Llagas watershed below Chesbro Dam (11.3 percent) (ICF International, 2012, Table 4-8). Covered Activities increasing impervious cover in the Action Area will further deteriorate these poor baseline conditions. However, the Coyote and Llagas watershed impervious cover will remain below 25 percent. The Guadalupe watershed below Guadalupe, Almaden, and Calero Dams is currently above the 25 percent threshold for severe degradation. In this case, Covered Activities are anticipated to increase total impervious cover to 26.8 percent by the end of the permit term (ICF International, 2012,

Table 4-8). The following AMMs will minimize these anticipated effects (ICF International, 2012, Table 6-2):

- AMM 34: Use the minimum amount of impermeable surface (building footprint, paved driveway, etc.) as practicable.
- AMM 35: Use pervious materials, such as gravel or turf pavers, in place of asphalt or concrete to the extent practicable.

While all of the effects described above are likely to occur, their potential to adversely affect the long-term persistence of covered aquatic species will be minimized by the Plan's impact limits on land cover types (ICF International, 2012, Table 4-2). Land conversion will be limited to 17,975 acres (4.9 percent of the Action Area) during the permit term, which will limit the amount of new impervious cover in the Action Area and subsequently minimize the extent of associated indirect effects on Covered Species. In addition, public education and outreach will be an integral component of reserve management and will minimize some of the effects described above. Outreach efforts focusing on best management practices to minimize effects on streams will likely reduce indirect effects on hydrology and water quality. The Implementing Entity will also develop Stream Management Guidelines for private landowners, including an educational program to assist in the implementation of the guidelines, within five years of permit issuance (ICF International, 2012, Section 5.3.2).

Covered Activities that result in increased sedimentation and turbidity may adversely affect covered aquatic species' ability to forage, avoid predation, and breed (i.e. fine sediment may adversely affect eggs and egg laying substrate). Changes in gravel embeddedness and flow may affect food production and transport. Low food production and transport associated with gravel embeddedness and fine sediment accumulations may adversely affect California red-legged frogs, foothill yellow-legged frogs, and western pond turtles.

Covered Activities occurring in the active stream, or otherwise discharging into the channel, may directly degrade water quality by increasing turbidity and sedimentation. Construction and maintenance activities involving ground disturbance could result in construction-related runoff if there is precipitation during the construction period or before vegetation is reestablished onsite. These effects may be temporary in some cases (i.e. as a result of dewatering a work site and bypassing flow) and in some cases, they may be permanent. The following AMMs will reduce the potential for these effects (ICF International, 2012, Table 6-2):

- AMM 14: If high levels of groundwater in a work area are encountered, the water will be 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.
- AMM 16: When work in a flowing stream is unavoidable, the entire stream flow 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.

- AMM 17: 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. All water shall be discharged in a non-erosive manner.
- AMM 36: Use flow control structures such as swales, retention/detention areas, and/or cisterns to maintain the existing (pre-project) peak runoff.
- AMM 63: Prepare and implement sediment erosion control plans.
- AMM 104: Measures will be utilized on site to prevent erosion along streams, 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.

The following avoidance and minimization measures will be applied to the SCVWD's Pipeline Maintenance Program Covered Activities, in addition to applicable Plan AMMs, to further minimize direct effects on covered aquatic species habitat (ICF International, 2012, Section 6.4.3):

- 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 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. Corrective measures will 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, or equivalent measures. The new flow path and discharge point will be monitored for signs of erosion.

Covered Activities that result in the removal or degradation of vegetation along stream corridors could indirectly result in increased flows and subsequently increase erosion,

incision, and sedimentation. The following AMMs will reduce the potential for these effects (ICF International, 2012, Table 6-2):

- AMM 32: The top of the bank will be protected by leaving vegetation in place to the maximum extent possible.
- AMM 102: Immediately after project completion and before close of the seasonal work window, stabilize all exposed soil with mulch, seeding, and/or placement of erosion control blankets.
- AMM 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.

Road maintenance activities may also indirectly affect covered aquatic species by introducing sediment and other pollutants into downstream waterways. Maintenance of unpaved roads is likely to have a relatively greater adverse effect on covered aquatic species than maintenance of paved 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 Action Area are paved, except for a portion of one road[78]. County Parks maintains an extensive network of unpaved maintenance and emergency access roads 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 (ICF International, 2012, Section 6.4.5). All road operation and maintenance-related indirect effects on aquatic covered species will be minimized through the implementation of Condition 8, and the 52 associated AMMs in Table 6-4 of the Plan. Many of the AMMs in Table 6-4 overlap with those in Table 6-2 of the Plan and are thus not repeated here. In addition to the AMMs in Table 6-4, project proponents will comply with additional AMMs described in Condition 8, as listed below, to further minimize indirect effects on covered aquatic species (ICF International, 2012, Section 6.4.5):

- Minimize ground disturbance to the smallest area feasible.
- Within the riparian setback zone (see Condition 11), silt fencing or other sediment control devices will be installed downslope from maintenance activities that disturb soil.
- 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 effect on the environment before using pesticides.
- Regularly scheduled visual inspections of all roads will be conducted to identify sites where erosion is contributing sediment to local

78 The one unpaved road maintained by County Roads and Airports in the Action Area is 1.75 miles of Mount Madonna Road, between Redwood Retreat Road and Summit Road.

streams; appropriate actions will be taken within the road right-of-way to manage the erosion.

- Flow lines (i.e., culverts and ditches) will be cleared annually to maintain flow lines free of debris.
- All new public roads that are accessible to general public vehicular use will be paved[79].

The operation of reservoirs and in-channel ponds behind diversion dams may create heat and nutrient sinks. This combination may result in substantial algal production, which could increase turbidity and result in dissolved oxygen fluctuations (discussed below). Other potential causes of increased turbidity include overflow and scheduled releases to channels from reservoirs, recharge ponds, and pipelines. These releases may increase turbidity both at, and downstream of, release points. These releases may coincide with, or be independent of, storm events. Although these effects are likely, significant levels of take associated with in-stream operations-related turbidity are not anticipated because scheduled releases from ponds or pipelines do not generally cause extensive turbidity increases except during the first release after an extended period of time during which sediments built up in a pipeline or pond. Furthermore, suspended sediments from such releases likely settle out of the water column within 300–1,000 feet, depending on flow rate (ICF International, 2012, Section 4.3.3).

Reservoir operations will result in the capture of sediment and debris that would otherwise reach the channel below the dams. In particular, reservoirs capture sand, gravel, and large woody debris, while fine sediment that remains in the reservoir suspension passes downstream. The result is a combination of altered hydrology and altered sediment transport, which is expected to degrade downstream habitat quality. Some Covered Activities are expected to improve water quality. For example, the proposed Three Creeks HCP includes modifications of reservoir and groundwater recharge operations to enhance flow in the channels downstream of reservoirs. These activities are proposed on Coyote Creek, Upper Penitencia Creek, and Alamitos Creek (Almaden Lake and the Alamitos Diversion). Although these actions are intended to mimic natural conditions to benefit salmonids, they are expected to have ancillary beneficial effects on covered aquatic species. 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 (ICF International, 2012, Section 4.3.3). The following activities proposed under the Three Creek HCP Conservation Program, which are Covered Activities under the Plan, may mitigate some of the effects of increased turbidity and

79 This does not include fire roads that may also serve recreational needs.

sedimentation resulting from other Covered Activities (ICF International, 2012, Section 2.3.3):

- Geomorphic Rehabilitation: Previously described under *Habitat Fragmentation* in this section of the Opinion.
- Gravel Enhancement Program: Installation of gravel traps in the upstream reaches of Coyote, Anderson, Almaden, and Guadalupe Reservoirs are proposed.

In-stream operations (i.e. reservoir operation) and recharge pond operations may indirectly affect dissolved oxygen levels by increasing algal production. Given the right conditions, nightly dissolved oxygen levels may drop to levels stressful to covered aquatic species. 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-channel diversion ponds. Dissolved oxygen levels may also be affected during normal reservoir operations, where water may be released from the hypolimnion, cold water pool, with very low dissolved oxygen levels. A short reach downstream of these releases thus experiences decreased dissolved oxygen levels but flow rapidly aerates water as it moves downstream. SCVWD studies indicate that this effect may extend about 100–300 yards downstream of the release point, where aquatic species are less likely to occur during high flows. In addition, some dams have facilities for ensuring oxygenation of release water (ICF International, 2012, Section 4.3.3). For these reasons, increased dissolved oxygen levels are not anticipated to have a significant effect on covered aquatic species.

Impermeable surfaces may indirectly affect aquatic covered species by increasing in-stream water temperatures if runoff temperature is higher than the temperature of receiving waters. Covered Activities that result in the removal of shaded riverine aquatic vegetation may also indirectly increase stream temperatures. Stream temperatures may also increase as a direct result of in-stream construction activities (i.e. flood control projects and geomorphic rehabilitation), most of which will require dewatering. If flow is bypassed around the construction site, there may be temporary increases in bypassed water temperature. Some operations and maintenance activities could also directly increase water temperature. For example, the SCVWD's Pipeline Maintenance Program will involve the release of blow-off water. Blow-off water temperature may cause temporary fluctuations in stream temperature. However, Pipeline Maintenance Program-related effects on stream temperatures are likely to be minimal due to the frequency of maintenance (no more than 10 blow-offs per year and maintenance of up to 5 pipelines per year) and the implementation of AMMs (ICF International, 2012, Section 4.3.5). The following AMMs will reduce the potential for temperature-related effects (ICF International, 2012, Table 6-2):

- AMM 24: To prevent increases in temperature and decreases in dissolved oxygen, 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.

- AMM 33: Regional Board objectives for temperature change in receiving waters 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.
- AMM 50: If levee reconstruction requires the removal of vegetation that provides habitat value to the adjacent stream (i.e., 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.

To further minimize potential temperature-related effects associated with the SCVWD's Pipeline Maintenance Program Covered Activities, pipeline discharge for maintenance work will preferentially be performed during winter months, when storm events are more common and when water is naturally highest. Discharge flows would then be a minimal portion of overall stream or river flow. If draining must occur during summer or fall, a slow release will be required to ensure receiving waters do not experience a substantial temperature change (i.e. greater than 2 degrees Fahrenheit) (ICF International, 2012, Section 6.4.3).

AMMs previously discussed under *Mortality, Injury, Harm, and Harassment* in this section of the Opinion will further minimize the potential for increased stream temperatures resulting from the removal of shaded riverine aquatic vegetation.

The use of construction and maintenance equipment inside of, and in proximity to, stream channels, ponds, and wetlands increases the chances of fuel, lubricant, and other chemical spills which could directly result in the death, injury, or harm of covered aquatic species. The following AMMs in Table 6-2 of the Plan will minimize the potential for these effects:

- AMM 2: Reduce stream pollution by removing pollutants from surface runoff before the polluted surface runoff reaches local streams.
- AMM 7: Personnel shall prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water into channels.
- AMM 8: Spill prevention kits shall always be in close proximity when using hazardous materials (i.e., crew trucks and other logical locations).
- AMM 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.
- AMM 11: Vehicles shall be washed only in approved areas. No washing of vehicles shall occur at job sites.
- AMM 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).
- AMM 76: Prevent spills and clean up spilled materials.

- AMM 101: Runoff pathways shall be free of trash containers or trash storage areas. Trash storage areas shall be screened or walled.

Water quality will likely be indirectly degraded as a result of increased runoff from urban and rural development, which will increase pollutant load. Urban and rural development (i.e. leach fields, orchards, vineyards[80], and livestock) could indirectly harm Covered Species by increasing nutrient loads and algal growth in local streams, the subsequent decomposition of which could adversely affect covered aquatic species (Carpenter *et al*., 1998). Leach field seepage may also alter existing vegetation if nutrient-rich water reaches the surface. Exposed soil, common to vineyards and equestrian or livestock enclosures, are potential sources of sediment input to streams, especially when sited in steep terrain. These potential effects will be minimized with the implementation of Condition 7, which is fully described in Section 6.4.4 of the Plan. Condition 7 will enforce existing County ordinances and NPDES permits overseen by the Regional Boards. More importantly however, Condition 7 contains several new requirements for leach fields, private rural roads, and vineyards to further minimize effects on water quality. For example, Condition 7 requires the minimization of ground disturbance, stabilization and containment of exposed soils adjacent to drainages, minimization of use of impermeable surfaces, installation of sediment control systems designed to minimize the discharge of sediment from vineyards, etc. (ICF International, 2012, Section 6.4.4).

Reservoir and recharge pond operations could create methyl mercury. 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 wildlife. Releases from the hypolimnion release methyl mercury, which may be taken up by plants and animals downstream, thus accumulating in the food chain. Over time, methyl mercury may bioaccumulate in covered aquatic species and may cause reduced fertility, impaired growth and development, and abnormal behavior (ICF International, 2012, Section 4.3.3). Furthermore, subsequent sediment removal downstream of releases (or in stream reaches downstream of abandoned mercury mining operations) may indirectly harm covered aquatic species because these activities may release mercury into the water column. The Plan does not cover mercury removal or remediation projects. Mercury removal that occurs in the course of sediment removal or dredging projects is however, covered by the Plan (i.e., projects whose primary purpose is sediment removal, not mercury remediation) (ICF International, 2012, Section 2.4). Conditions on Covered Activities require dewatering prior to the commencement of work in channels that may contain mercury (ICF International, 2012, AMM 79). In addition, removed sediments will be tested for mercury and, if required, disposed of in a proper receiving facility (ICF International, 2012, Section 4.3.3 and AMM 10). Therefore, mercury-related effects will be significantly reduced.

80 Agricultural activities will only be subject to the Plan if they are a part of an application that requires approval from one of the Applicants (i.e. a grading permit from the County).

Hydrology: In general, in-stream capital projects and in-stream operations and maintenance projects will be the main sources of direct effects on the hydrology of the Action Area, while urban and rural development and rural operations and maintenance will be the main sources of indirect effects on hydrology. As previously indicated, urban and rural development will increase the amount of impervious surface cover in the Action Area. Such increases could result in alterations of downstream hydrology (Hogan and Walbridge, 2007). An increase in impermeable surfaces may also inhibit natural percolation of stormwater into groundwater basins, resulting in a drawdown in ground water levels. These effects may be temporary or permanent. Each of these potential effects is discussed below. The discussion that follows is inherently linked to the water quality effects that were previously discussed.

Dewatering events are necessary for seismic safety retrofit and major maintenance (ICF International, 2012, Section 6.4.2)[81]. Although up to 18 dewatering events on SCVWD dams are covered under the Plan, SCVWD will only undertake a dewatering event if absolutely required to maintain dam safety. Since project-level details are not available at this time, the maximum covered stream flows shown in Table 2-4 of the Plan are provided as an anticipated worst-case scenario for the purposes of the effects analysis. If at the time a dewatering plan (described below) is developed, 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 (ICF International, 2012, Sections 2.3.3).

Reservoir dewatering will initially result in higher reservoir releases affecting the channel downstream of the reservoir. Extended periods of high flow will affect a significant portion of the channel downstream. Increases in flow may affect California red-legged frog egg masses or juveniles if flows are released in early spring before individuals are able 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 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 (ICF International, 2012, Section 4.3.2).

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. There may be some local runoff from tributary watersheds and from domestic irrigation, and in some locations the channel may be fed by an upwelling of groundwater. However, 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

81 Dewatering events are covered for smaller dams owned and operated by County Parks and the City of San Jose. These dams are much smaller than those operated by the SCVWD. The effects analysis in this Opinion focuses on SCVWD dewatering events, as they will result in significant effects, relative to County and city-related dewatering events. Dewatering effects resulting from county and San Jose activities are anticipated to be similar to those described for SCVWD activities but on a much smaller scale.

dry and remaining wetted portions would be of poor habitat quality for covered aquatic species. 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, 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 could potentially be affected. Watershed-level effects will be minimized through measures described in Chapter 6 of the Plan that only allow one reservoir per watershed to be dewatered at any given time (ICF International, 2012, Section 4.3.2).

Loss of water in channels downstream of dams is likely to affect covered aquatic species. The year following a dewatering event, flows are expected to be lower than normal (ICF International, 2012, Section 4.6.2). This will likely reduce the availability of egg laying substrate for California red-legged frogs and foothill yellow-legged frogs, if present downstream of dams. For the past 10–15 years, dry-back of channels below reservoirs has been minimized to avoid effects on sensitive species. 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 aquatic species are not accustomed to seasonal fluctuations in flows, particularly in the northern watersheds of the Action Area. Some stream segments in the Action 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 aquatic covered species will move away from dry streams in search of new water sources. Because dewatering events are generally only expected to last one season, riparian vegetation is not likely to be substantially altered. However, effects 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. 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 the Wildlife Agencies and may be required to provide additional mitigation beyond that required by the Plan. 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 (ICF International, 2012, Section 4.3.2).

Maintaining the reservoir free of water during construction will eliminate the majority of aquatic habitat upstream of the dams around the reservoir perimeter for covered aquatic species, including western pond turtles. Covered Species using this area would be required to seek other habitats to survive, which will be limited and which will affect their ability to re-establish following dewatering events. Under the worst-case scenario, inflow may be non-existent for several months of the construction period, likely between July and September, when evapotranspiration is highest and ambient air and water temperatures are also high (ICF International, 2012, Section 4.3.2). 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 effects on Covered Species could occur, the potential effect would be identified in the dewatering

plan (described below) and species surveys, as described in Chapter 6 of the Plan, would be required (ICF International, 2012, Section 4.3.2).

During refilling of the reservoir, outflow may also be constrained. First, the reservoir will not make releases until water 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.

If California red-legged frog, western pond turtle, or foothill yellow-legged frog populations are found in streams hydrologically affected by existing dams in the Action Area, the Implementing Entity will monitor the effects of flow regulation (including dewatering events) on the species as specified in Section 7.3.3 of the Plan. 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. Conversely, if monitoring data suggests that reservoir release flows described in Table 2-4 are not having adverse effects on covered aquatic species, flows may be increased with Wildlife Agency approval (ICF International, 2012, Section 2.3.3).

In accordance with Condition 4, 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 to minimize effects on covered aquatic species. 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 review process, or as required by the environmental compliance process, and will include the following (ICF International, 2012, Section 6.4.2):

- 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 of the Plan) 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 (i.e., 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 document 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 (ICF International, 2012, Section 6.4.2):

- 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 move to new locations[82]
- Survey for Covered Species as required by Chapter 6 of the Plan, 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 turtles
- The lined gravel traps will be designed to allow bypass of inflow through or around the reservoir

Dry back effects, similar to those anticipated as a result of dewatering events, may occur as a result of proposed operating rules for reservoirs. SCVWD manages flows and diversions to meet water supply objectives. Dry-back conditions may occur due to fluctuations in seasonal operations. When in-channel flow reductions are made, covered aquatic species 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 located on stream margins. SCVWD generally

82 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 when beginning reservoir draining will minimize the likelihood of washing Covered Species downstream. Ramping down flows at the end of draining will minimize the likelihood of drying back the channel faster than covered aquatic species can move to new locations (ICF International, 2012, Section 4.3.2).

attempts to avoid stranding of aquatic species when flows are reduced using a ramped schedule for flow reduction (ICF International, 2012, Section 4.6.2).

As indicated in Section 4.3.3 of the Plan, reservoir operation under Division of Safety of Dams (DSOD) interim storage restrictions could affect the implementation of the proposed Three Creeks HCP Conservation Program target flows or future operating rules for the Uvas and Llagas watersheds. Increased storage restrictions would result in lower summer flow regimes than proposed under the Three Creeks HCP Conservation Program. Dry back of the affected channels would thus occur earlier and could result in the stranding and desiccation of California red-legged frog and foothill yellow-legged frog embryos and tadpoles, if present. The likelihood of these potential effects occurring however, are low. SCVWD does not have water rights to detain natural flows in the reservoir during the summer; these flows are bypassed around the reservoir to help maintain a wetted channel, even though it may not reach the requirements of Three Creeks HCP Conservation Program flows. During wet years, bypassed flows are greater and alternative flows from tributaries or groundwater upwelling may also help to maintain a wetted channel below dams. 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, except under drought conditions. Over the last 12 years of DSOD storage restrictions, SCVWD has been generally successful in avoiding dry-back of channels. As previously noted, 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. Stream reaches that are dry for more than one year as a result of DSOD storage restrictions will be considered permanently affected for the purposes of this Plan, and SCVWD will begin a separate consultation process with the Wildlife Agencies and may be required to provide additional mitigation (ICF International, 2012, Section 4.3.3). Effects may be minimized if SCVWD installs supplemental water supply systems at the base of Anderson and Calero Main Dams as part of the Three Creeks HCP Conservation Program. Once functional, these systems could be used to meet flow targets (and therefore a wetted channel) during implementation of DSOD interim storage restrictions (ICF International, 2012, Section 4.3.3). These measures however, are not guaranteed to occur.

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 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 not likely 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, which will minimize effects to covered aquatic species (ICF International, 2012, Section 4.6.2).

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. 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. 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 since flow regulation would create more reliable breeding conditions. 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 and degrade habitat due to inadequate flows (ICF International, 2012, Section 4.3.3).

During operation, there may be times of rapid increases or decreases in flows; however, SCVWD generally ramps flows to minimize these potential effects. This may occur due to unplanned maintenance needs (i.e., blow-off of a pipeline, dewatering of a recharge pond, filling a recharge pond, etc.). Rapid decreases in flow may result in stranding of eggs and larvae of California red-legged frogs. The potential for increased flows are greatest in 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 (ICF International, 2012, Section 4.3.3). Foothill yellow-legged frogs are less likely to occur below major dams in the Action Area and are therefore less likely to be affected by changes in flows due to dam operations.

New operating rules for the reservoirs in the northern portion of the Action Area are proposed under the draft Three Creek HCP. New operating rules for Uvas and Chesbro reservoirs may be established through an informal consultation with NMFS and CDFW, a new HCP process, or through formal consultation with NMFS pursuant to section 7 of the Act. Implementation of new operating rules for reservoirs would include modifications of reservoir releases that would change the area of wetted channel. Changes in operating rules would focus on enhancing flow conditions and managing cold water habitat for listed fish species. Anticipated changes in operations would reduce early dry-season release rates and increase late dry-season release rates, effectively drying back the downstream reach of the wetted channel earlier than would occur under baseline conditions. Subsequently, foothill yellow-legged frogs (if present below dams) and California red-legged frogs may become stranded below the zone of sustained flow. Dry-back may occur before juvenile California red-legged frogs and foothill yellow 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. Western pond turtles below affected dams may also be displaced. 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 Action Area and report to the Wildlife Agencies (ICF International, 2012, Section 4.3.3).

Covered Activities occurring within stream channels will likely affect the existing streambed composition and hydrograph. Use of heavy equipment could directly affect

streambed composition through compaction and earth movement. The following AMMs will reduce the potential for these effects (ICF International, 2012, Table 6-2):

- AMM 3: Maintain the current hydrograph and, to the extent possible, restore the hydrograph to more closely resemble predevelopment conditions.
- AMM 4: Reduce the potential for scour at stormwater outlets to streams by controlling the rate of flow into the streams.
- AMM 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.
- AMM 20: 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.
- AMM 21: 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.
- AMM 38: Use flow dissipaters at runoff inlets (i.e., culvert drop-inlets) to reduce the possibility of channel scour at the point of flow entry.
- AMM 39: Minimize alterations to existing contours and slopes, including grading the minimum area necessary.
- AMM 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.
- AMM 56: 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.
- AMM 63: Prepare and implement sediment erosion control plans.
- AMM 82: Channel beds temporarily disturbed during construction activities will be returned to pre-project or ecologically improved conditions at the end of construction.
- AMM 97: Erosion control measures shall be in place at all times during construction. Do not start construction until all temporary control devices (i.e. straw bales, silt fences, etc.) are in place downstream of project site.
- AMM 98: When needed, utilize in-stream grade control structures to control channel scour, sediment routing, and headwall cutting.
- AMM 113: The channel bottom shall be re-graded at the end of the project to as close to original conditions as possible.

Covered Activities could also indirectly affect stream channel formation if they result in the removal or degradation of riparian land cover types, as vegetation removal in and along stream channels may result in increased local erosion due to increased flow velocity. Alterations in stream channel formation may degrade or limit the extent of suitable habitat for aquatic covered species. AMMs previously discussed under *Mortality, Injury, Harm, and Harassment* in this section of the Opinion will minimize these potential effects.

The construction of new levees could also prevent streams from naturally meandering, which could indirectly lead to channel incision and erosion and thus degrade or remove suitable habitat for covered aquatic species. However, flood protection projects are not expected to result in significant changes to in-stream flow or velocity because 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[83] cannot move upstream or are washed downstream. Flow bypass channels may be installed to reduce excessively high flows during storm events that cause erosion in earthen channels (ICF International, 2012, Section 4.3.2). Similarly, 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 (ICF International, 2012, Section 4.3.2). Potential effects will be further minimized by Wildlife Agency review. Both types of Covered activities must be reviewed and approved during implementation, in accordance with Section 8.7.3 of the Plan.

If implemented, the geomorphic rehabilitation component of the proposed Three Creeks HCP would ensure that affected reaches of the channels below the reservoirs in the northern watersheds would be substantially modified and improved in terms of factors such as channel sinuosity and riffle-pool habitat (ICF International, 2012, Section 4.3.2). These conservation actions would benefit California-red-legged frogs, foothill yellow-legged frogs, and western pond turtles. Similarly, in-stream habitat enhancement proposed under the Three Creeks HCP would result in the localized installation of in-stream cover elements such as boulders, large woody debris, or biotechnical treatments along stream banks (ICF International, 2012, Section 4.3.2), which would have a beneficial effect on covered aquatic species by improving stream hydrology.

Bridge-related Covered Activities will include the installation of pilings, piers, and footings, which may increase instream roughness and slow flows in the vicinity of instream structures. Sediments and vegetation may become trapped on the upstream side of pilings, potentially causing further disruptions to flow that may in turn, degrade suitable habitat for covered aquatic species. Also, scour may occur immediately downstream of pilings and contribute to channel erosion and downstream sedimentation (ICF International, 2012, Section 4.3.2). These effects will be minimized through the implementation of Conditions 3 and 4. AMM 45 in particular, will minimize these potential effects by requiring stream crossings to incorporate free-span bridges unless

83 Fish are an assumed proxy for the covered aquatic species.

infeasible due to engineering or cost constraints or unsuitable based on minimal size of streams. If free-span design is not feasible, bridge piers and footings will be designed to have minimal effects on the stream (ICF International, 2012, Table 6-2).

Covered Activities may directly and indirectly affect groundwater in the Action Area. Indirect effects on groundwater may occur if the channel bed is altered to prevent infiltration of flows (i.e., through installation of concrete). Continued use of groundwater recharge ponds and construction of new ponds as described in Chapter 2 of the Plan will minimize any changes to groundwater levels that could occur due to installation of flood protection projects (ICF International, 2012, Section 4.3.2).

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 anticipated during winter and spring, when surface water is most abundant, and SCVWD is actively recharging groundwater basins. Any increase in in-channel flows may help to offset the reduction in winter flows resulting from the operation or reservoirs and recharge ponds. However, changes to groundwater levels due to recharge that occur within the same hydrologic unit (i.e., 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 (ICF International, 2012, Section 4.3.4). Therefore, adverse effects resulting from ground water alterations on covered aquatic species are anticipated to be minimal.

No changes to downstream flows are expected as a result of the reoperation of the Ford Road or Church Avenue groundwater recharge ponds. However, if SCVWD identifies a potential change in downstream flows at either facility that may affect Covered Species beyond those identified in Chapter 4 of the Plan, additional Wildlife Agency review and approval will be required to ensure that adverse effects are minimized and actual effects are consistent with those analyzed under the Plan (ICF International, 2012, Section 8.7.3).

Up to 40 wells or spring boxes may be constructed in County parks, which could indirectly affect 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 could degrade aquatic habitat or prevent riparian vegetation from obtaining adequate water, which in turn could result in a reduction of suitable habitat for covered aquatic species. These potential effects however, are discountable because wells will be sited to avoid effects on aquatic land cover types, and subsequently, covered aquatic species. Wells that are found to result in adverse effects to adjacent streams will be decommissioned and sited elsewhere (ICF International, 2012, Section 4.3.4).

Disease: Covered Activities that occur in aquatic habitat (i.e., in-stream capital projects, in-stream operations and maintenance, and monitoring) could facilitate the spread and introduction of diseases such as chytridiomycosis (ICF International, 2012, Section 4.6.2). To minimize potential effects on covered aquatic species, the Implementing Entity will use the best scientific information available to manage and stop the spread of chytrid fungus or other diseases if detected in ponds and wetlands (STUDIES-7) (ICF International, 2012, Section 5.3.7). Furthermore, Condition 4 (see AMM 92 in Plan Table 6-2) and Condition 12 require all staff working in ponds and wetlands to implement measures to minimize the spread of disease based on current Wildlife Agency protocols and other best available science (ICF International, 2012, Section 6.5).

Nonnative Invasives: As previously indicated in Section 2.4.3.5 of this Opinion, Covered Activities may directly and indirectly result in the introduction and spread of nonnative invasive animals. Nonnative aquatic wildlife is known to have serious effects on native amphibian and reptile populations. For example, aquarium species released in the wild may introduce new diseases. 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 aquatic species.

Some Covered Activities may directly result in the transport and release of nonnative wildlife. For example, nonnative aquatic species contained in reservoirs may enter the downstream channel in large numbers during reservoir dewatering events. While these exotic species already exist below dams, increased numbers of exotic species may increase existing levels of predation and competition. Implementation of AMM 91, which requires aquatic species to be netted at the drain outlet when draining reservoirs or ponds, will minimize the potential for this effect. Under AMM 91, exotic species will be dispatched.

Similarly, water supply operations that transport non-local water into the Action Area could introduce and spread nonnative species on an on-going basis. To minimize the potential for this effect, SCVWD will evaluate water inputs from outside the Action Area to control nonnative fish and other exotic species from entering and establishing populations in the Action Area (ICF International, 2012, Section 5.3.2).

In-stream capital projects and in-stream operations and maintenance may indirectly result in the introduction and spread of nonnative invasive species such as fish, bull frogs, mitten crabs, and zebra mussels that compete with and prey on covered aquatic species. For example, the creation and maintenance of groundwater recharge basins in the Action Area may indirectly result in an increased presence of these nonnative wildlife species. This potential effect could be exacerbated if new ponds provide habitat to Covered Species as well as recreational access to the general public because ponds that allow recreational access may be targets for illegal dumping of invasive species (ICF International, 2012, Section 4.3.4). These effects will be minimized by annual dry-cycling conducted by SCVWD. Dry cycling would reduce nonnatives inhabiting the ponds and slow the spread of nonnatives into surrounding natural areas. Although dry cycling could result in the death or injury of covered aquatic species, the benefits gained through non-native control will outweigh adverse effects to the small number of aquatic covered species (i.e. western pond turtles) that may inhabit these facilities (ICF

International, 2012, Section 4.3.5). Informal monitoring of percolation ponds conducted by SCVWD has shown that these ponds are infrequently used by Covered Species, so potential adverse effects of dry-cycling on covered aquatic species is anticipated to be minimal (ICF International, 2012, Section 4.3.3). To further reduce effects, current and future outflow systems will be screened to contain exotic species within off-channel recharge basins (ICF International, 2012, Section 5.3.2).

The Implementing Entity will work to eradicate or reduce nonnative predators through habitat manipulation (i.e., periodic draining of ponds), trapping, hand capturing, electroshocking, or other control methods. Draining ponds, sterilizing or removing subsoil, and removing bullfrogs can reduce predation by bullfrogs and other invasive species on covered aquatic species. Removal of bullfrogs and nonnative predatory fish will be a high priority in existing ponds or wetlands within the Reserve System (LM-13, POND-5). 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. Some existing ponds may be retrofitted with drains if the nonnative species populations cannot be controlled by other means. Existing ponds without drains, that do not drain naturally, may need to be drained periodically using pumps. During any maintenance or heightening of stock pond dams, the rebuilt structures will be fitted with drains (ICF International, 2012, Section 5.3.2 and 5.3.7).

Mosquito fish may adversely affect covered aquatic species (Leyse, 2005). Potential adverse effects will be minimized because mosquito control activities performed in the Reserve System will be addressed in each 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 effects on Covered Species (ICF International, 2012, Section 5.2.5).

All Covered Activities have the potential to spread and introduce nonnative invasive plant species, since all Covered Activities involve the transport of humans and equipment. Nonnative invasive plant species could be directly transported during Covered Activities (i.e. seeds transported and deposited by the wheels on heavy machinery) and indirectly as a result of increased human presence. The following AMMs will reduce the potential for these effects (ICF International, 2012, Table 6-2):

- AMM 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.
- AMM 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.

Lighting: Roadside lighting has been documented to alter nocturnal frog behavior (Buchanan, 1993). When project-level details are available, the Plan sometimes

describes requirements to reduce the effects of lighting, beyond those previously described in Section 2.4.3.7 of this Opinion. For example, the Plan describes operational requirements for the expansion of Freeman Quarry, which requires nighttime lighting during the rainy season to be directed away from California tiger salamander and California red-legged frog habitat (ICF International, 2012, Section 2.3.7).

2.5.4 Species-Specific Effects of the Action

The species-level effects described below build on Section 2.4.3, *General Effects of the Action on All Covered Species*, and Section 2.5.3, *General Effects of the Action on Aquatic Species*. Effects previously described in these two sections of the Opinion are not repeated below.

2.5.4.1 California Tiger Salamander (Central California DPS)

Mortality, Injury, Harm, and Harassment: California tiger salamanders could be injured or killed as a direct or indirect result of Covered Activities occurring in modeled habitat. Effects on California tiger salamander modeled breeding and upland habitat are expected to occur on the valley floor within the San Jose, Morgan Hill, and Gilroy planning limits of urban growth. Effects on breeding habitat are also expected to occur along upper and lower Llagas Creek, while effects on upland habitat are also 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 (ICF International, 2012, Section 4.6.2).

Development within the San Jose planning limit of urban growth, rural development, bridge construction/reconstruction, and road improvements are expected to affect 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). San Jose urban development within the planning limit of urban growth, flood protection projects, and levee reconstruction are expected to affect 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 affect potential breeding and upland habitat at Anderson Dam. Two known California tiger salamander occurrences are expected to be affected by Covered Activities. One is adjacent to Thompson Creek and the other is between Coyote and Thompson Creeks (ICF International, 2012, Section 4.6.2).

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 affect modeled upland habitat, with effects on modeled breeding habitat concentrated on the west side of Uvas Creek and the west side of the City of Morgan Hill. 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. Dam and reservoir maintenance is anticipated to affect potential breeding and upland habitat at Calero and Calero-Fellows Dike (ICF International, 2012, Section 4.6.2).

The California tiger salamander is one of three covered aquatic species eligible for the Plan's Neighboring Landowner Assurances Program. Up to 19,189 acres (6.0 percent) of modeled non-breeding habitat in the Action Area could be affected by activities conducted on lands enrolled in the Neighboring Lands Assurances Program (ICF International, 2012, Tables 4-4 and 10-3). As previously indicated in Section 2.5.3 of this Opinion, these anticipated effects will be relatively minor. In addition, many of the activities that would result in these effects are currently permissible under the species' 4(d) rule, which exempts routine livestock ranching activities on private or Tribal lands, where there is no Federal nexus, from the take prohibitions under section 9 of the Act (69 FR 47212).

The Plan minimizes the effects of Covered Activities on the California tiger salamander by limiting effects on modeled habitat during the permit term. Permanent effects on California tiger salamander modeled breeding habitat will not exceed 77 acres (7 percent of total modeled breeding habitat in the Action Area) and temporary effects will not exceed 14 acres (1 percent of total modeled breeding habitat in the Action Area). Permanent effects on California tiger salamander non-breeding modeled habitat will not exceed 12,855 acres (4 percent of total non-breeding modeled habitat in the Action Area) and temporary effects will not exceed 1,529 acres (less than 1 percent of total modeled non-breeding habitat in the Action Area) (ICF International, 2012, Section 4.6.2 and Table 4-4).

The Applicants will mitigate unavoidable direct and indirect effects to California tiger salamanders by preserving and managing modeled habitat. 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 Action Area in Type 1 Open Space (to 27 percent) and increase modeled habitat contained in Type 1, 2, or 3 Open Space to 39 percent. 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). Acquisition of wetlands and ponds will be prioritized by: (1) sites with documented records of breeding California tiger salamanders, (2) sites with known occurrences, though not necessarily breeding, and (3) sites without known occurrences of California tiger salamanders but with pond turtle habitat and known occurrences of other Covered Species (ICF International, 2012, Section 5.4.2 and Table 5-17).

Furthermore, the Implementing Entity will protect and enhance a minimum of 50 acres of ponds that either support, or have the potential to support, breeding

California tiger salamanders. Up to 104 acres of ponds will be protected and enhanced if all anticipated effects occur (ICF International, 2012, Section 5.4.2 and Table 5-13). A minimum of 20 acres of ponds at 40 locations will be created that either support or have the potential to support breeding California tiger salamander. Pond creation will occur regardless of the level of effects on pond habitat in order to contribute to the recovery of the California tiger salamander in the Action Area. In addition to this pond creation, the Implementing Entity will create ponds lost to Covered Activities at a ratio of 1 acre of conservation for every 1 acre affected (1:1) (estimated to be 52 acres) (POND-10). Therefore, an estimated 72 acres of ponds will be created if all anticipated effects occur (see Plan Table 5-13) (ICF International, 2012, Section 5.4.2 and Table 5-13).

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 (perennial and seasonal) will be protected and enhanced if all anticipated effects occur. Within the Reserve System the Implementing Entity will also restore a minimum of 20 acres of perennial wetlands. Up to 75 acres of wetlands (perennial and seasonal) will be restored if all anticipated effects occur. 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 salamanders if they are periodically drained or nonnative predators are controlled through other means (ICF International, 2012, Section 5.4.2).

The Implementing Entity will also protect grassland, oak woodland, riparian, or chaparral land cover types within California tiger salamander modeled habitat to provide upland refugia for the species. In most cases, when modeled breeding habitat is acquired, modeled upland habitat will also be acquired because it will occur on the same parcel (ICF International, 2012, Section 5.4.2).

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 salamanders such as Joseph D. Grant County Park, Palassou Ridge Open Space Preserve, and Henry W. Coe State Park (LAND-WP5) (ICF International, 2012, Section 5.4.2).

The Implementing Entity will increase the quality of modeled breeding habitat within the Action 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 (POND-13). The Implementing Entity will also reduce nonnative predators (i.e. bullfrogs, invasive fish) using a variety of management techniques, which include habitat manipulation (i.e., periodic draining of ponds and other wetlands), trapping, hand capturing, and electroshocking (LM-13). Other techniques may be employed upon the approval of the Wildlife Agencies. New ponds will be designed to rely on passive management (i.e., ponds designed to dry on their own periodically) or

minimal management (i.e., stock pond dams fitted with drainage structures) (ICF International, 2012, Section 5.4.2).

To ensure that the loss of individual California tiger salamanders is adequately mitigated, the Plan also requires that 30 percent[84] of ponds and wetlands in the entire Reserve System be occupied by the species at or before Year 45. An entire wetland or pond will be considered occupied if there is evidence of metamorphosis. This metric will ensure that ponds and wetlands have the correct hydroperiod to support the full life-cycle of the California tiger salamander. For compliance monitoring purposes, once occupied, a pond or wetland will be considered occupied for the rest of the permit term, even if it becomes unoccupied later[85]. As is the case for all Covered Species' habitat, habitat for this 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 the species will persist within the Reserve System. To ensure that the Implementing Entity is making progress towards this requirement during the permit term, this occupancy requirement will also be met for the Reserve System at Year 30, minus 5 percent (i.e., 25 percent). The measurement will be made based on the total Reserve System at Year 30 (ICF International, 2012, Section 5.3.1).

Although road kill is likely to increase as a direct (i.e. construction-related activities) and indirect (i.e. increased traffic) result of Covered Activities, it is not anticipated to be a significant source of take of California tiger salamanders because exposure to roads will be relatively small. As previously indicated, overall reserve unit size will be maximized with minimal edge. Condition 2 requires roads for new development at the urban-Reserve interface be placed on the interior of the development (i.e., away from the Reserve boundary), which will reduce the incidence of road-related injury and death. In addition, California tiger salamanders are most likely to migrate during the evening hours (Stebbins, 2003; Shaffer *et al*., 1993; Trenham *et al*., 2000), while the majority of traffic (on both dirt and paved roads) is expected during daytime hours (Hels and Buchwald, 2001).

Habitat Fragmentation: Proper implementation of the conservation strategy will minimize the effects of habitat fragmentation resulting from urban and rural development under the Plan. Land acquisition will be prioritized to retain or improve habitat connectivity between breeding California tiger salamanders in the

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84 Occupancy standards were based on surveys conducted in Henry W. Coe State Park and the East Bay Regional Park District system. Thirty percent is relative to the number of ponds and wetlands, not acreage. See Section 5.3.1. of the Plan for more details.

85 If a pond or wetland becomes unoccupied later, the Implementing Entity will consider altering management of the site to encourage recolonization. Disease and nonnative invasive species are the most likely cause of populations of Covered Species in the Reserve System disappearing during the Permit term. Both disease and nonnative invasives are anticipated Changed Circumstances under the Plan. Refer to Sections 2.4.3.4 and 2.4.3.5 of this Opinion for a discussion of remedial measures the Applicants will implement in response to these Changed Circumstances.

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). In addition, the Reserve System will link California tiger salamander habitat within the Action Area to areas important to the species outside of the Action Area, such as San Francisco Public Utilities Commission properties in Santa Clara and Alameda Counties and the Soap Lake region in San Benito County (ICF International, 2012, Section 5.4.2).

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). The Reserve System will be designed to maintain and improve connectivity between breeding 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 (ICF International, 2012, Section 5.4.2). Wetland restoration and pond creation, previously discussed, will further serve to reduce habitat fragmentation and promote genetic exchange within the Action Area's populations.

Nonnative Invasives: Appendix K of the Plan contains a hybrid management plan for the California tiger salamander that will be incorporated into relevant reserve unit management plans (ICF International, 2012, Section 5.2.5). Key components of the strategy include management, public education and outreach, and targeted studies conducted 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 native California tiger salamanders because perennial breeding sites studied in the hybrid zone often contained paedomorphic tiger salamanders (Fitzpatrick and Shaffer, 2004). Initial restoration actions will target sites where paedamorphs have been observed because their presence suggests the 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 the nonnative tiger salamander population. The adaptive management process will be used to adjust monitoring and management. Furthermore, outreach will be conducted to inform the public that the use of any salamander as bait in the State of California is illegal[86] (POND-12). The Implementing Entity will also conduct education and outreach to pond landowners, provide technical assistance, and offer financial and regulatory incentives to restore, create, and maintain breeding habitat conditions that favor native California tiger salamanders (POND-11). Finally, research will be conducted to determine the distribution and ecological effects of introgression and interbreeding of native and nonnative tiger salamanders (STUDIES-8). These

86 *A. tigrinum* was introduced to California for use as fishing bait (See Section 2.5.1.1 of this Opinion and Appendix K of the Plan for details).

studies will be coordinated with, and be complementary to, similar studies conducted outside of the purview of the Plan. With Wildlife Agency approval, the Implementing Entity will incorporate specific management prescriptions supported by this research and research conducted by others.

Critical Habitat

All three PCEs (previously listed in Section 2.5.1.1 of this Opinion) can be found in the Action Area and will be affected by Covered Activities. 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 (i.e., roads, water conveyance) could affect California tiger salamander critical habitat. However, Units 11 and 12 are less likely to be affected because these areas are in the far east hills of the Action Area, where fewer Covered Activities are anticipated (ICF International, 2012, Section 4.7.2).

Operations and maintenance activities will affect all Units in the Action 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 and reduce the overall habitat quality for year-round occupation (ICF International, 2012, Section 4.7.2). Plan avoidance and minimization measures previously described in Section 2.5.3 of this Opinion will minimize these potential effects.

Furthermore, the Plan minimizes effects to critical habitat by limiting the total acreage of California tiger salamander critical habitat that can be affected by Covered Activities. No more than 272 acres (1 percent) of all California tiger salamander critical habitat in the Action Area will be permanently affected by Covered Activities and no more than 125 acres (less than 1 percent) will be temporarily affected (ICF International, 2012, Section 4.7.2 and Table 4-9).

Due to the programmatic nature of the Plan, effects on critical habitat could not be identified to the unit level. However, 97 percent of all critical habitat is also modeled as breeding or non-breeding habitat by the Plan. As previously indicated, the Plan minimizes effects on Covered Species by limiting effects on modeled breeding and non-breeding habitat (ICF International, 2012, Table 4-4). Therefore, the Plan's impact limits on modeled habitat will greatly minimize effects on critical habitat within the Action Area.

As indicated in Section 8.10.2 of the Plan, the Wildlife Agencies may request information from the Implementing Entity to verify compliance with the Plan and the Wildlife Agencies' decision documents (ICF International, 2012). As such, during implementation, the Service will request that the Implementing Entity report effects on critical habitat by unit, so that we can verify that destruction and adverse modification of critical habitat is avoided.

Unavoidable effects to California tiger salamander critical habitat will be mitigated through the acquisition of critical habitat. An estimated 8,722 acres (31 percent of all critical habitat in the Action Area) will be protected within the Plan's 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 Action Area[87], substantially contributing to species recovery in the Action Area (ICF International, 2012, Section 5.4.2). When accounting for the 6,443 acres of critical habitat currently protected, this would result in the protection of a total of 54 percent of the critical habitat designated in the Action Area. Anticipated acquisitions by critical habitat unit are summarized below (ICF International, 2012, Table 5-21):

- EB-5: 549 acres (39 percent)
- EB-6: 2,519 acres (64 percent)
- EB-7: 1,757 acres (20 percent)
- EB-8: 1,701 acres (67 percent)
- EB-9: 190 acres (6 percent)
- EB-10B: 570 acres (82 percent)
- EB-12: 1,436 acres (26 percent)

Within the Diablo Range, land acquisition will be focused on protecting the connection between the southern portion of Henry W. Coe State Park, which has a robust California tiger salamander population, to the Soap Lake region in northern San Benito County. Some of the land acquired in this area falls within EB-12 and would include up to three known occurrences. Land acquisition will also occur within EB-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, protection and management will be enhanced within much of EB-6 (Joseph D. 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 Action Area. Land acquisition in this area would protect a small portion of EB-5 and one known occurrence. Additional populations are likely to be found in this area due to the high density of ponds and a high concentration of known occurrences nearby on existing open space (ICF International, 2012, Section 5.4.2).

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 Action 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

87 Subunits EB-10A and B were counted as one unit.

California tiger salamander habitats against urban development in southern San Jose and also protect the only portion of EB-8 that falls outside of Calero County Park. Land acquisition in this area will also protect two known occurrences of the species (ICF International, 2012, Section 5.4.2).

Acquisitions targeted north of Gilroy will result in the protection of all of EB-10b, including up to three known occurrences. Substantial land acquisition in the Santa Cruz Mountains at the southern end of the Action Area 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 (ICF International, 2012, Section 5.4.2).

As shown in Table 5-21 of the Plan, little to no critical habitat in units EB-9, EB-10A, and EB-11 is anticipated to be included in the Reserve System. This approach will not result in the adverse modification of the critical habitat because the threat level in these three units is relatively low. 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 is categorized with a Ranchland/Woodland land use type. No water or transportation projects are planned for this site, and open space areas account for approximately 66 percent of this unit. Covered Activities in existing open space will be minimal. This unit could be affected by rural development; however, due to the location of the site (outside urban areas), development density requirements, and portion available for development (approximately 34 percent), this unit is not anticipated to experience much development (ICF International, 2012, Section 4.7.2).

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. Although none of this unit is currently included in any type of open space, it largely overlaps Bay checkerspot critical habitat Unit 12. Permanent effects on Bay checkerspot butterfly modeled primary habitat that overlaps Bay checkerspot butterfly critical habitat is capped at 300 acres (see Plan Table 4-9). Subsequently, it is likely that permanent effects 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 characterized by the Ranchland/Woodland land use type. No water or transportation projects are planned for this site. 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, this unit is not anticipated to experience much development (ICF International, 2012, Section 4.7.2).

Finally, Unit EB-11 is located in the Diablo Range east and south of unit EB-9. Approximately 94 percent of this site is currently located within Henry W. Coe State Park, which is not located in the Action Area. As such, a maximum of 6 percent of this site could be affected by the Covered Activities. However, no

water or transportation projects are planned for this site and the unit is located in the far east portion of the Action Area and is unlikely to receive much rural development. As such, this unit is not likely to be substantially affected by the Covered Activities (ICF International, 2012, Section 4.7.2).

Due to the programmatic nature of the Plan and the fact that the Reserve System will be assembled through acquisition from willing sellers (ICF International, 2012, Section 5.2.3), the Applicants could not at this time commit to the acres of critical habitat that would be protected in total or by individual unit (i.e. Table 5-21 of the Plan provides estimated acreages of critical habitat within the Reserve System). However, the minimization measures and conservation actions previously described in this section of the Opinion will ensure that primary constituent elements essential to the conservation of the species will continue to function, even after all effects under the Plan occur. Furthermore, the Reserve design and assembly principles described in Section 5.2.3 of the Plan include maximizing size efficiently, preserving irreplaceable and threatened resources, preserving the highest-quality communities, and preserving connectivity (ICF International, 2012), all of which are factors taken into consideration when the Service designates critical habitat. Thus, it is likely that the Reserve System will contain significant portions of designated critical habitat. The Plan's conservation strategy and goals for this species could not be accomplished unless the functionality of critical habitat was maintained and in many cases, improved from the baseline condition.

In our Final Rule designating critical habitat (70 FR 49379), the Service determined that conserving the Central Population of the California tiger salamander over the long term would require the following:

- Maintaining the current genetic structure across the species range;
- Maintaining the current geographic, elevational, and ecological distribution;
- Protecting the hydrology and water quality of breeding pools and ponds;
- Retaining or providing for connectivity between breeding locations for genetic exchange and recolonization; and
- Protecting sufficient barrier-free upland habitat around each breeding location to allow for sufficient survival and recruitment to maintain a breeding population over the long term.

As previously discussed in this section and Section 2.4.3 above, the Plan's conservation strategy and Conditions on Covered Activities would accomplish each of the five actions necessary to conserve the Central Population of California tiger Salamander in the Action Area.

2.5.4.2 California Red-Legged Frog

Mortality, Injury, Harm, and Harassment: California red-legged frogs could be injured or killed as a direct or indirect result of Covered Activities occurring in

modeled habitat. Effects in the Diablo Range will be limited to the Coyote Watershed, primarily within the San Jose planning limit of urban growth. This includes effects on primary and refugia habitat from dam seismic retrofits at Anderson Dam; 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 affect potential breeding and upland habitat at the Coyote Dam. Development within the planning limit of urban growth of San Jose, Morgan Hill, and Gilroy; rural development; bridge construction/reconstruction; and construction of County Park facilities and infrastructure are expected to affect lower stream reaches that serve as California red-legged frog primary habitat and adjacent secondary habitat, including two documented California red-legged frog occurrences on Metcalf Creek and Coyote Creek. Effects on California red-legged frog modeled primary and secondary habitat are also expected to occur from flood protection projects, vegetation management on lower Llagas Creek, and road upgrades/construction in East Little Llagas Creek (ICF International, 2012, Section 4.6.2).

Effects on 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 affect 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 are expected to affect modeled secondary habitat adjacent to modeled primary habitat in the Santa Cruz foothills, especially along Uvas Creek and its lower tributaries (ICF International, 2012, Section 4.6.2).

The California red-legged frog is one of three covered aquatic species eligible for the Plan's Neighboring Landowner Assurances Program. Up to 51 acres (0.5 percent) of modeled primary habitat and 17,951 acres of secondary/dispersal habitat (5.4 percent) in the Action Area could be affected by activities conducted on lands enrolled in the Neighboring Lands Assurances Program (ICF International, 2012, Tables 4-4 and 10-3). These anticipated effects will be relatively minor. In addition, many of the activities that would result in these effects are currently permissible under the species' 4(d) rule, which exempts routine livestock ranching activities on private or Tribal lands, where there is no Federal nexus, from the take prohibitions under section 9 of the Act (71 FR 19244).

The Plan minimizes the effects of Covered Activities on the California red-legged frog by limiting effects on modeled habitat during the permit term. Permanent effects on California red-legged frog modeled primary habitat will not exceed 299 acres (3 percent of total modeled primary habitat in the Action Area) and temporary effects will not exceed 116 acres (1 percent of total modeled primary habitat in the Action Area). Permanent effects on California red-legged frog

modeled secondary habitat, which includes areas for refugia and dispersal, will not exceed 12,937 acres (4 percent of total modeled refugia habitat in the Action Area) and temporary effects will not exceed 1,489 acres (less than 1 percent of total modeled secondary habitat in the Action Area) (ICF International, 2012, Section 4.6.2 and Table 4-4). Implementation of Condition 11 of the Plan will further minimize effects on the California red-legged frog by requiring riparian setbacks, as previously described in Section 2.5.3 of this Opinion. An estimated 2,855 acres of primary modeled habitat (28 percent) is anticipated to be avoided as a result of Condition 11 (ICF International, 2012, Table 6-5).

The Applicants will mitigate unavoidable direct and indirect effects to California red-legged frogs by preserving and managing modeled habitat. 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 Action Area to approximately 26 percent in Type 1 Open Space and 39 percent in Type 1, 2, and 3 Open Space. The Reserve System will include 1,430 acres of modeled primary habitat and 41,800 acres of modeled secondary habitat (ICF International, 2012, Section 5.4.3 and Table 5-17).

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 may 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 with protected open space outside the Action 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. Incorporation of most of Joseph D. Grant County Park into the Reserve System will provide substantial opportunity to enhance suitable and occupied breeding habitat. The portion of Joseph D. Grant Park proposed for the Reserve System supports at least two known occurrences of the species (ICF International, 2012, Section 5.4.3).

Furthermore, areas targeted for land acquisition that will benefit this species and support implementation of the Recovery Plan (U.S. Fish and Wildlife Service, 2002b) include the area between Henry W. Coe State Park and the Soap Lake region of San Benito County (LAND-WP5). Preservation in this area will retain a connection between breeding populations in Henry W. Coe State Park and areas outside of the Action Area. Although this area has not been surveyed, it supports a high density of ponds, many of which are expected to be suitable breeding habitat for the species (ICF International, 2012, Section 5.4.3).

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. 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 (ICF International, 2012, Section 5.4.3).

Although there is no designated critical habitat for the California red-legged frog in the Santa Cruz Mountains, land acquisition in this area will protect a substantial amount of suitable breeding 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 Action Area will protect up to four known occurrences and a high density of ponds and other wetlands suitable for California red-legged frog breeding (ICF International, 2012, Section 5.4.3).

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 frogs, (2) sites with known occurrences, though not necessarily breeding, and (3) sites without known occurrences of California red-legged frogs but with western pond turtle habitat and known occurrences of other Covered Species (ICF International, 2012, Section 5.4.3).

Depending on the level of effect that occurs during Plan implementation, the Implementing Entity will protect and enhance 50-104 acres of ponds, create 20-72 acres of ponds at 40 locations, protect 10-50 acres of perennial wetlands, restore 20-45 acres of perennial wetlands, and restore 1.0-10.4 miles of stream. In addition, the Implementing Entity will protect 100 miles of streams, regardless of the level of effect. All of these conservation actions will occur in aquatic systems that support or have the potential to support breeding California red-legged frogs (ICF International, 2012, Section 5.4.3 and Table 5-13).

In addition to suitable breeding habitat, the Implementing Entity will protect grassland, oak woodland, riparian, or chaparral land cover types within California red-legged frog modeled habitat 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, 2002b) (LAND-WP4) and in areas adjacent to existing open space with known occurrences of California red-legged frogs, such as Joseph D. Grant County Park and Palassou Ridge Open Space Preserve (LAND-WP5) (ICF International, 2012, Section 5.4.3).

To ensure that the loss of individual California red-legged frogs is adequately mitigated, the Plan also requires 40 percent[88] of ponds and wetlands in each of the Federal Recovery Units 4 and 6 in the Reserve System to be occupied by the species at or before Year 45. An entire wetland or pond will be considered occupied if there is evidence of metamorphosis. This metric will ensure that

88 Occupancy standards were based on surveys conducted in Henry W. Coe State Park and the East Bay Regional Park District system. Forty percent is relative to the number of ponds and wetlands, not acreage. See Section 5.3.1 of the Plan for more details.

ponds and wetlands have the correct hydroperiod to support the full life-cycle of the California red-legged frog. Once occupied, a pond or wetland will be considered occupied for the rest of the permit term, even if it becomes unoccupied later[89]. As is the case for all Covered Species' habitat, habitat for this 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 this requirement during the permit term, this occupancy requirement will also be met for the Reserve System at Year 30, minus 5 percent (i.e., 35 percent). The measurement will be made based on the total Reserve System at Year 30 (ICF International, 2012, Section 5.3.1).

The Plan's conservation strategy and monitoring and adaptive management program, previously described in Section 2.1.7 and 2.1.8 of this Opinion respectively, are consistent with the *Recovery Plan for the California Red-legged Frog* (U.S. Fish and Wildlife Service, 2002b) and will contribute to the recovery of the species in the Action Area. The overall strategy for recovery described in the Recovery Plan involves (1) protecting existing populations by reducing threats, (2); restoring and creating habitat that will be protected and managed in perpetuity; (3) surveying and monitoring populations and conducting research on the biology of the threats to the subspecies; and (4) reestablishing populations of the subspecies within its historic range. Furthermore, the Plan is consistent with Recovery Criteria 1 (U.S. Fish and Wildlife Service, 2002b), which indicates that suitable habitats within all core areas should be protected and/or managed for the California red-legged frog in perpetuity and the ecological integrity of these areas should not be threatened by adverse anthropogenic habitat modification. The successful implementation of the Plan will also address the conservation needs outlined the in the Recovery Plan for each of the core areas contained in the Action Area.

Critical Habitat

All four PCEs (previously listed in Section 2.5.1.2 of this Opinion) for the California red-legged frog are located in the Action Area and will be affected by Covered Activities. Effects may occur as a result of rural development, park maintenance and new construction activities, and conservation strategy implementation. Operations and maintenance activities, particularly in streams, may affect critical habitat, but permanent changes in land use are anticipated to be minimal (ICF International, 2012, Section 4.7.3). Avoidance and minimization

89 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. Disease and nonnative invasive species are the most likely cause of populations of Covered Species in the Reserve System disappearing during the Permit term. Both disease and nonnative invasives are anticipated Changed Circumstances under the Plan. Refer to Sections 2.4.3.4 and 2.4.3.5 of this Opinion for a discussion of remedial measures the Applicants will implement in response to these Changed Circumstances.

measures previously described in Section 2.5.3 of this Opinion will reduce the potential for indirect effects on critical habitat.

Furthermore, the Plan limits the total acreage of California red-legged frog critical habitat that can be affected by Covered Activities. No more than 1,035 acres (less than 1 percent) of all California red-legged frog critical habitat in the Action Area will be affected by Covered Activities and no more than 277 acres (less than 1 percent) will be temporarily affected (ICF International, 2012, Section 4.7.3 and Table 4-9).

Due to the programmatic nature of the Plan, effects on critical habitat could not be identified to the unit level. However, 99 percent of all California red-legged frog critical habitat is also mapped as primary or secondary California red-legged frog habitat for the Plan. As previously indicated, the Plan minimizes effects on the species by limiting effects on modeled primary and secondary habitat (ICF International, 2012, Table 4-4). Therefore, the Plan's impact limits on modeled habitat will greatly minimize effects on critical habitat within the Action Area.

As indicated in Section 8.10.2 of the Plan, the Wildlife Agencies may request information from the Implementing Entity to verify compliance with the Plan and the Wildlife Agencies' decision documents (ICF International, 2012). As such, during implementation, the Service will request that the Implementing Entity report effects on critical habitat by unit, so that we can verify that destruction and adverse modification of critical habitat is avoided.

Unavoidable effects on critical habitat will be mitigated through the acquisition of critical habitat. An estimated 21,736 acres (14 percent of all critical habitat in the Action Area) will be protected within the Plan's 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 are anticipated to occur in all three critical habitat units within the Action Area. When accounting for the 36,703 acres of critical habitat currently protected, this would result in the protection of a total of 39 percent of the critical habitat designated in the Action Area. Anticipated acquisitions by critical habitat unit are summarized below (ICF International, 2012, Table 5-21):

- ALA-2: 819 acres (56 percent)
- STC-1: 13,573 acres (26 percent)
- STC-2: 7,344 acres (8 percent)

Due to the programmatic nature of the Plan and the fact that the Reserve System will be assembled through acquisition from willing sellers (ICF International, 2012, Section 5.2.3), the Applicants could not at this time commit to the acres of critical habitat that would be protected in total or by individual unit (i.e. Table 5-21 of the Plan provides estimated acreages of critical habitat within the Reserve System). However, the minimization measures and conservation actions previously described in this section of the Opinion will ensure that primary constituent elements essential to the conservation of the species will continue to

function, even after all effects under the Plan occur. Furthermore, the Reserve design and assembly principles described in Section 5.2.3 of the Plan include maximizing size efficiently, preserving irreplaceable and threatened resources, preserving the highest-quality communities, and preserving connectivity (ICF International, 2012), all of which are factors taken into consideration when the Service designates critical habitat. Thus, it is likely that the Reserve System will contain significant portions of designated critical habitat. The Plan's conservation strategy and goals for this species could not be accomplished unless the functionality of critical habitat was maintained and in many cases, improved from the baseline condition.

In our Final Rule designating critical habitat (75 FR 12816), the Service indicated that designation of critical habitat within the geographical area occupied by the species at the time of listing and those occupied areas identified subsequent to listing would be sufficient to conserve the California red-legged frog. The final designation of critical habitat includes large blocks of contiguous habitat that (1) provide geographic distribution across the range of the species; (2) represent the full range of habitat and environmental variability the species occupies; (3) avoid conflict with existing commercial and residential development; (4) focus on public land, where available; and (5) where possible, overlap with other critical habitat designations.

As previously discussed in this section and Section 2.5.3 above, the Plan's conservation strategy and Conditions on Covered Activities are consistent with each of these five criteria, that we deemed necessary to conserve the California red-legged frog. The successful implementation of the Plan's conservation strategy would further the conservation purpose of designating critical habitat for the California red-legged frog because the Plan would result in the protection, maintenance, and enhancement of critical habitat that support large stable populations throughout the species' range in the Action Area.

2.5.4.3 Foothill Yellow-Legged Frog

Mortality, Injury, Harm, and Harassment: 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. Projects that place structures in the channel (i.e. culverts) or that require stream access may crush individuals or create permanent pooling habitat, which poses a higher risk of predation for adults, metamorphs, and tadpoles. Furthermore, ground-disturbing activities, such as maintenance of stream banks, levees, and channel rights-of-way (i.e., bank repair, vegetation management), could directly and indirectly increase erosion and sediment discharge that could harm and harass individuals (ICF International, 2012, Section 4.6.3).

Pulse flows from reservoirs, intended to benefit listed fish species, released during the foothill yellow-legged frog egg-laying period, could dislodge egg masses, causing mortality. However, this potential effect is unlikely because pulse flows

will be released during winter months (January, February, and March) and are intended to simulate natural flow conditions (see Chapter 5 of the Plan for details). Foothill yellow-legged frog oviposition typically follows the period of high-flow discharge from winter rainfall and snowmelt (Jennings and Hayes, 1994), thus, pulse flows are expected to occur in advance of oviposition (ICF International, 2012, Section 4.6.3).

Effects on foothill yellow-legged frog on the valley floor are expected to be limited to modeled secondary habitat in-streams within the San Jose, Morgan Hill, and Gilroy planning limits of urban growth. Effects on secondary habitat are expected to occur from 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, and San Jose; rural development; bridge construction/reconstruction; County Park facility and infrastructure construction, and road improvements are also expected to affect foothill yellow-legged frog secondary habitat (ICF International, 2012, Section 4.6.3).

Effects on foothill yellow-legged frogs in the Diablo Range are expected to be limited to the Coyote Watershed, primarily within the San Jose planning limit of urban growth. Effects are primarily expected to be to secondary habitat and result from dam seismic retrofits at Anderson Dam; 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 and maintenance in Berryessa, Thompson, Coyote, and Upper Penitencia Creeks (ICF International, 2012, Section 4.6.3).

The Plan minimizes the effects of Covered Activities on the foothill yellow-legged frog by limiting effects on modeled habitat during the permit term. Permanent effects on foothill yellow-legged frog modeled primary habitat will not exceed 1.9 stream miles (less than 1 percent of the total modeled primary habitat within the Action Area). Temporary effects will not exceed 0.7 stream mile of modeled primary habitat (less than 1 percent of the total modeled primary habitat within the Action Area). Permanent effects on foothill yellow-legged frog modeled secondary habitat will not exceed 4.8 miles (less than 1 percent of total secondary modeled habitat in the Action Area) and temporary effects will not exceed 1.3 miles (less than 1 percent of total modeled secondary habitat in the Action Area) (ICF International, 2012, Section 4.6.3 and Table 4-4). Implementation of Condition 11 will further minimize effects on the foothill yellow-legged frog by requiring riparian setbacks, as previously described in Section 2.5.3 of this Opinion. An estimated 119 miles (49 percent) of primary modeled habitat and 229 miles (51 percent) of secondary modeled habitat is anticipated to be avoided as a result of Condition 11 (ICF International, 2012, Table 6-5).

The Applicants will mitigate unavoidable direct and indirect effects to the foothill yellow-legged frog habitat by preserving modeled foothill yellow-legged frog habitat. 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 Action Area to approximately 32 percent in Type 1 Open Space and 44 percent in Type 1, 2, or 3 Open Space (ICF International, 2012, Section 5.4.4 and Table 5-17).

The Implementing Entity will target acquisition of streams that currently have, or historically had, perennial flows and cobblestone substrate (LAND-R5). In addition, intermittent and ephemeral streams that connect to those perennial streams may be protected because Bourque (2008) found that although foothill yellow-legged frogs primarily utilize perennial systems, they also utilize associated intermittent and ephemeral streams within the same watershed. The following stream reaches will be targeted for acquisition (ICF International, 2012, Section 5.4.4):

- Uvas/Carnadero Creek above Uvas Reservoir
- Small creeks above Calero Reservoir
- Alamitos and Guadalupe Creeks, upstream and outside of urban San Jose
- Llagas Creek, above Chesbro Reservoir
- San Felipe Creek, above Anderson Reservoir
- Uvas Creek, below Uvas Reservoir
- Little Arthur Creek
- Upper Penitencia Creek

The Reserve System is expected to protect at least four known occurrences of foothill yellow-legged frogs, 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. 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 frogs, (2) sites with known occurrences, though not necessarily breeding, and (3) sites without known occurrences of foothill yellow-legged frogs but with western pond turtle habitat and known occurrences of other covered amphibian species (ICF International, 2012, Section 5.4.4).

In addition, the Implementing Entity will restore a minimum of 1 mile of stream to support breeding yellow-legged frogs, regardless of the level of effect; up to 10.4 miles of stream will be restored if all anticipated effects occur. This could include the perennial stream reaches mentioned above (ICF International, 2012, Section 5.4.4 and Table 5-13). The Implementing Entity will replace concrete,

earthen or other engineered channels to restore floodplain connectivity (STREAM-4, STREAM-5), which will create areas of slower flow or other natural habitats adjacent to the stream, where foothill yellow-legged frogs could take refuge during high water events. These actions would also facilitate the formation of gravel bars, behind which this species often lays eggs. The Implementing Entity will also 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). In all streams mentioned above there will be opportunities to increase the amount of cobblestone substrate by adding rocky substrate to the stream channel (STREAM-8). Gravel augmentation will avoid the breeding season. The Plan acknowledges that gravel augmentation is a short-term solution unless accompanied by complimentary land management practices upstream. However, gravel augmentation is included as a potential conservation action, given the practical challenges associated with managing riverine systems downstream of reservoirs (ICF International, 2012, Section 5.4.4).

To ensure that the loss of individual foothill yellow-legged frogs is adequately mitigated, the Plan also requires that occupancy be demonstrated in the Reserve System. For the purposes of demonstrating occupancy of foothill yellow-legged frogs in this Plan, occupied habitat within the Reserve System is defined as perennial streams with egg masses by Year 45 (ICF International, 2012, Section 5.3.1). Although there are some reports of foothill yellow-legged frogs breeding in perennial tributaries in the Action Area, the species typically breeds in perennial portions of main-stem channels (Gonsolin, pers. comm., 2010; Kupferberg *et al*., 2009). This is likely because main stem channels provide habitat that is more conducive to successful breeding in the Action 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 (Gonsolin, pers. comm., 2010). 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 (ICF International, 2012, Appendix D). For these reasons, correlating occupied stream segments (i.e., miles of stream) to observed egg masses would 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 depicted in Figure 3-6 of the Plan. Occupied habitat in the Reserve System will be in both the Diablo Range and in the Santa Cruz Mountain. 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 Action Area, remnant populations are likely to be adversely affected by continued dam operations. Foothill yellow-legged frog populations in regulated rivers are at greater risk of extinction by virtue of their low abundance, even before the effects of hydrologic stressors are considered (Kupferberg *et al*., 2009). Therefore, the

best opportunities for maintaining and increasing foothill yellow-legged frog populations exist upstream of dams or in streams unaffected by dam operations (ICF International, 2012, Section 5.3.1).

Although road kill is likely to increase as a result of Covered Activities, it is not anticipated to be a significant source of take of foothill yellow-legged frogs because exposure to roads will be relatively small. On average, foothill yellow-legged frogs do not disperse far from perennial water sources (Bourque, 2008), and are thus not expected to interface directly with roads on a regular basis.

2.5.4.4 Western Pond Turtle

Mortality, Injury, Harm, and Harassment: Effects on western pond turtle modeled primary and secondary habitat in the Santa Cruz Mountains are expected to be limited to the foothills. Effects are expected to occur from dam seismic retrofits on dams in the Santa Cruz Mountains and flood protection projects in Uvas and Gavilan Creeks.

Dam and reservoir maintenance is anticipated to affect potential habitat along Guadalupe and Vasona Creeks, below dams. Effects on western pond turtle primary and secondary habitat are also expected to occur from flood protection projects, vegetation management on lower Llagas Creek, and road upgrades/construction on East Little Llagas Creek. Development within the planning limit of urban growth of San Jose, Morgan Hill, and Gilroy; rural development; bridge construction/reconstruction; and County Park facility and infrastructure construction are expected to affect both modeled primary and secondary habitat, with effects concentrated on the west side of Uvas Creek. Two documented western pond turtle occurrences are expected to be affected by Gilroy urban development on the west side of Uvas Creek within the Santa Cruz Mountains. One western pond turtle known occurrence is expected to be affected at Vasona Reservoir.

Furthermore, effects on modeled primary and secondary habitat are expected to occur from dam seismic retrofits at Anderson Dam; 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 affect potential habitat on Coyote Creek, below Coyote and Anderson Dams (ICF International, 2012, Section 4.6.2).

The western pond turtle is one of three covered aquatic species eligible for the Plan's Neighboring Landowner Assurances Program. Up to 2,421 acres (3.0 percent) of modeled primary habitat and up to 12,732 acres (5.5 percent) of modeled secondary habitat in the Action Area could be affected by activities conducted on lands enrolled in the Neighboring Lands Assurances Program (ICF International, 2012, Tables 4-4 and 10-3). Most of the potential effects will occur

on land cover types that support farming activities used by western pond turtles for non-breeding or dispersal habitat, not breeding or primary habitat. Therefore, effects on species associated with the Neighboring Landowner Assurances Program are not anticipated to be significant.

The Plan minimizes the effects of Covered Activities on western pond turtle by limiting effects on modeled habitat during the permit term. Permanent effects on western pond turtle modeled primary habitat will not exceed 1,824 acres (2 percent of total modeled primary habitat in the Action Area) and temporary effects will not exceed 440 acres (less than 1 percent of total modeled primary habitat in the Action Area). Permanent effects on western pond turtle modeled secondary habitat will not exceed 7,825 acres (3 percent of total modeled secondary habitat in the Action Area) and temporary effects will not exceed 986 acres (less than 1 percent of total modeled secondary habitat in the Action Area) (ICF International, 2012, Section 4.6.2 and Table 4-4). Implementation of Condition 11 will further minimize effects on the western pond turtle by requiring riparian setbacks, as previously described in Section 2.5.3 of this Opinion. An estimated 13,480 acres (16 percent) of primary modeled habitat is anticipated to be avoided as a result of Condition 11 (ICF International, 2012, Table 6-5).

High flows associated with reservoir dewatering activities are not expected to affect western pond turtle breeding as this species tends to lay its eggs in uplands away from the active channel. In addition, Condition 4 requires that releases will not result in the overtopping of the channel between May and July, when western pond turtles are nesting (ICF International, 2012, Section 6.4.2).

Maintaining reservoirs free of water during dam seismic safety retrofit activities will eliminate the majority of aquatic habitat upstream of the dams around the reservoir perimeter for western pond turtles. Individuals occupying reservoirs will be required to seek other habitats, which will be limited and will affect their ability to re-establish following dewatering events. Under the worst-case scenario, inflow may be non-existent for several months of the construction period, likely between July and September, when evapotranspiration is highest and ambient air and water temperatures are also high (ICF International, 2012, Section 4.3.2). Individuals that do not successfully locate adjacent aquatic refugia will not survive. The reservoir-specific dewatering plan, previously described in Section 2.5.3 of this Opinion, will adequately minimize these effects. In addition, Condition 4 may further minimize effects since it requires gravel traps at the upstream end of the reservoirs, if present, to be isolated and lined to contain inflow and provide for a relocation site for rescued western pond turtles (ICF International, 2012, Section 6.4.2).

The Applicants will mitigate unavoidable direct and indirect effects by preserving western pond turtle modeled habitat. 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 Action Area to approximately 27 percent in Type 1 Open

Space and 40 percent in Type 1, 2, or 3 Open Space (ICF International, 2012, Section 5.4.5 and Table 5-17).

In addition, the Implementing Entity will protect and enhance a minimum of 50 acres of ponds, 10 acres perennial freshwater wetlands, 100 miles of stream, and 250 acres of riparian forest and scrub that either support or have the potential to support western pond turtles. Up to 104 acres of ponds, 50 acres of perennial freshwater wetlands, and **618 acres** of riparian forest and scrub (including California alluvial sycamore woodland) will be protected and enhanced if all anticipated effects occur (LAND-WP2a, LAND-WP2b, LAND-WP3a, LAND-WP3b, LAND-WP6a, LAND-WP6b). In addition to preservation and enhancement, a minimum of 1 mile of stream and 50 acres of riparian forest and scrub will be restored. Up to 10.4 miles of streams and 353 acres of riparian forest and scrub (including Central California sycamore alluvial woodland) will be restored if all anticipated effects occur (STREAM-4, STREAM-5) (ICF International, 2012, Section 5.4.5 and Table 5-13).

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 turtles 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 (ICF International, 2012, Section 5.4.5 and Table 5-13).

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. Basking platforms might also be used when natural debris in not suitable. Enhancement on Reserve lands will also include the reduction of nonnative competitors, such as red-eared sliders (Objective 19.3) (ICF International, 2012, Section 5.4.5).

To ensure that the loss of individual western pond turtles is adequately mitigated, the Plan also requires 25 percent[90] of ponds and wetlands in the entire Reserve System to be occupied at or before Year 45. A site will be considered occupied by western pond turtles if basking adults and juveniles are observed at the same site. Observations of juveniles and adults provide evidence of successful reproduction and therefore, are an indication of population viability. The presence of multiple age-classes is important given that adult turtle populations

90 Occupancy standards were based on surveys conducted in Henry W. Coe State Park and the Central Valley of California. Twenty-five percent is relative to the number of ponds and wetlands, not acreage. See Section 5.3.1 of the Plan for more details.

can persist in highly modified environments providing the illusion that the population is stable when in fact, reproduction is not occurring as a result of habitat degradation. Once occupied, a pond or wetland will be considered occupied for the rest of the permit term, even if it becomes unoccupied later[91]. As is the case for all Covered Species' habitat, habitat for this 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 this requirement during the permit term, the occupancy requirement will also be met for the Reserve System at Year 30, minus 5 percent (i.e. 20 percent). The measurement will be made based on the total Reserve System at Year 30 (ICF International, 2012, Section 5.3.1).

2.5.5 Cumulative Effects

As described in Section 1 of this Opinion, the Plan was developed in response to a biological opinion issued by the Service in 2001 to address the indirect and cumulative effects of several large-scale development and infrastructure projects in Santa Clara County. Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered in this Opinion because they will require separate consultation pursuant to section 7 of the Act. Many of the projects that are reasonably certain to occur in the Action Area will require future Federal actions and separate consultations under the Act and are thus not considered in this Opinion's cumulative effects analysis. Examples of these projects include the SCVWD's Three Creeks HCP, Pacific Gas and Electric Company's Bay Area Operations and Maintenance Habitat Conservation Plan, the California High-Speed Train System, and the SCVWD's Stream Maintenance Program. The remaining non-Federal actions that may occur in the Action Area are considered too speculative to evaluate at this point in time because there is no evidence of State or local approvals (i.e. permits, grants), obligation of venture capital, or initiation of contracts. Examples of these types of projects include rural development in the areas not subject to the Plan (see Plan Figure 2-5) and expansion beyond the City of Gilroy's current planning limit of urban growth. Subsequently, we are unable to analyze the cumulative effects of specific projects in the Action Area at this time.

Although we are unable to analyze cumulative effects associated with specific projects at this time, we do anticipate cumulative effects associated with climate change, as previously described in detail in Section 2.4.6.1 of this Opinion. The Plan's multi-level

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91 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. Disease and nonnative invasive species are the most likely cause of populations of Covered Species in the Reserve System disappearing during the Permit term. Both disease and nonnative invasives are anticipated Changed Circumstances under the Plan. Refer to Sections 2.4.3.4 and 2.4.3.5 of this Opinion for a discussion of remedial measures the Applicants will implement in response to these Changed Circumstances.

conservation strategy and monitoring and adaptive management program will minimize the anticipated effects of climate change. The Plan's protection of key ecosystem features such as riparian and wetland land cover types will ensure that covered aquatic species will have habitat available across a variety of environmental gradients. Furthermore, barrier removal (i.e., fences and medians) and creation of safe passage ways (i.e., culverts under roads) will increase the permeability of the landscape to facilitate covered aquatic species movement in the face of climate change.

2.5.6 Conclusion

After reviewing the current status of the California tiger salamander, California red-legged frog, foothill yellow-legged frog, and western pond turtle; the environmental baselines for the Action Area; the effects of the proposed action, including all measures to avoid, minimize, and mitigate adverse effects; and the cumulative effects, it is the Service's biological opinion and conference opinion that issuance of an incidental take permit pursuant to section 10(a)(1)(B) of the Act is not likely to jeopardize the continued existence of the California tiger salamander, California red-legged frog, foothill yellow-legged frog, and western pond turtle and is not likely to destroy or adversely modify designated critical habitat for the California tiger salamander and California red-legged frog. No critical habitat has been designated for the foothill yellow-legged frog or western pond turtle, therefore, none will be affected.

2.6 Avian Species

For the purposes of this Opinion, the western burrowing owl, least Bell's vireo, and tricolored blackbird are grouped together and identified as "avian species" because of the similarities in the anticipated effects on these species resulting from Covered Activities. This Opinion analyzes the effects on each of these species individually. They are grouped together here, for the purposes of streamlining the Opinion and minimizing repetition in Section 2.6.4, *Species-Specific Effects of the Action*.

2.6.1 Status of the Species

2.6.1.1 Western Burrowing Owl

The western burrowing owl is not currently listed under the Act nor does it have designated critical habitat. Descriptions of the species' physical characteristics, behavior, and distribution are provided in a variety of field guides (i.e. Sibley, 2000; National Geographic, 2002).

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 United States into Mexico (Haug *et al*., 1993).

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.

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 and dependent on the 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; Barclay *et al*., 2007). Owls breeding in northern California locales and at higher altitudes (i.e., Modoc Plateau) are believed to move south during the winter (Grinnell and Miller, 1944; California Department of Fish and Game, 1990). Thomsen (1971) reported that owls stayed on their breeding grounds in Oakland during the winter and remained in their burrows during the day. 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 0.12 to 33 miles for adult male burrowing owls in the Carrizo Plain.

There were 1,615 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).

In 2008, Albion Environmental Inc. conducted a survey including 96 locations in Santa Clara County, the Alviso environs, and northern San Benito County and estimated the presence of 21 to 23 breeding burrowing owl pairs. Owls were observed at 10 (10 percent) of the 96 locations surveyed. Survey results were sufficient to conclude that owls were absent at 61 (64 percent) of the locations surveyed and burrowing owl presence/absence was inconclusive (because of limited access or visibility) at 25 (26 percent) of the locations surveyed. Twenty-two (23 percent) of the locations surveyed were completely developed and contained no habitat for burrowing owls (Albion Enviornmental, Inc., 2008).

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 (U.S. Fish and Wildlife Service, 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). 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 Department of Fish and Game, 2012), and urban vacant lots, as well as the margins of airports, golf courses, and roads (Gervais *et al*., 2008).

Vegetative cover and height are significant factors due to the semi-fossorial nature and small size of the burrowing owl (Coulombe, 1971; Green and Anthony, 1989). These owls prefer open habitats that afford visibility of approaching predators or contain elevated perches for the same purpose (Green, 1983). 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. 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.

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. Owls use burrows dug by other animals such as ground squirrels (*Spermophilus* spp.), badgers (*Taxidea taxus*), prairie dogs (*Cynomys* spp.), kangaroo rats (*Dipodomys* spp.), and tortoises (*Gopherus* spp.) (Zarn, 1974). Burrowing owls in the western United States usually dig only to renovate and maintain their burrows, but they are capable of excavating entire burrows (Thomsen, 1971). Owls often use unlined earthen banks along agricultural irrigation canals and ditches (Haug *et al*., 1993) especially in the Imperial Valley (Coulombe, 1971). 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). 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. 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 percent 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, lava flows (Gleason and Johnson, 1985), and limestone (Coulombe, 1971), perhaps as a protection against digging predators 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 (Barclay, 2008), mitigate effects of development projects (Trulio, 1995), conserve individual colonies (Barclay, 2007), facilitate reintroductions (Leupin and Low, 2001; Poulin *et al*., 2006), enhance conservation (Wellicome *et al*., 1997), and enable research on aspects of breeding biology not easily studied in natural burrows (Haug *et al*., 1993; Wellicome, 1997; Poulin and Todd, 2006).

Thomsen (1971) calculated an average territory size of 1.98 acres (range 0.1–4.0 acres) for six territories studied at the Oakland International Airport. Rosenberg and Haley (2004) reported average nearest neighbor distances from 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 likely varies depending on local habitats present and local prey resources (Gervais *et al*., 2008). Rosenberg and Haley (2004) reported estimates of 280 acres for the area traversed and 111 acres for the area used by burrowing owls in the Imperial Valley. Rosenberg and Haley (2004) found that more than 80 percent of nocturnal foraging of telemetered owls in the Imperial Valley was within 1,969 feet of the nest, but long-distance movements also occurred. Home ranges for six radio-marked owls in Saskatchewan ranged from 35-1,200 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 1.6 miles) from their nest, but 95 percent of movements were within 0.4 mile from their nest (Haug and Oliphant, 1990).

Burrowing owls are opportunistic predators that will consume arthropods, small mammals, birds, amphibians, and reptiles (Haug *et al*., 1993; 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 (ICF International, 2012, Appendix D).

Nesting in California generally occurs from February through August, with peak activity from mid-April to mid-July (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. Trulio and Chromczak (2007) reported an average of 51 percent of urban nests produced young compared to 45 percent of parkland nests over a seven year period in northern Santa Clara County. The female performs all the incubation and brooding and remains 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, 1979; Wellicome, 2005). The young begin emerging from the nest burrow at approximately two weeks of age, 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 satellite burrow. 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).

Burrowing owls exhibit strong site fidelity and return to nest in the same areas year after year (Martin, 1973; Zarn, 1974). Rosenberg and Haley (2004) reported that 85 percent of adults remained within 1,312 feet 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. Rosier *et al*. (2006) reported variable post-breeding dispersal of adult owls in the Carrizo Plain. Adults that failed at nesting tended to move greater distances, up to 33 miles, than adults that were successful (Rosier *et al*. 2006).

Burrowing owls that have been intentionally relocated have generally shown strong fidelity to the sites from which they were moved (Delevoryas, 1997; Feeney, 1997). 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 30 miles during the breeding season returned to their original sites the same day.

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

range 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).

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 part, to ground squirrel eradication. All of the available information suggests that burrowing owl populations in several parts of the state declined during the second half of the 20th 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).

Although the overall range of the burrowing owl in California has not drastically changed since summarized by Grinnell and Miller (1944), breeding individuals have disappeared from portions of its former range (Center for Biological Diversity *et al*., 2003; 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) suggested that breeding burrowing owls have functionally disappeared from 22 percent of their former range and continue to decline in an additional 23 percent of their range. DeSante *et al*. (2007) estimated the State's burrowing owl population at 9,266 pairs, with 71 percent (6,571 pairs) of California's burrowing owls (exclusive of northeastern California and the eastern deserts) occurring in the Imperial Valley (which is less than 3 percent of California) and 24 percent in the Central Valley. The remaining 5 percent were in the western part of the State in the San Francisco Bay area, the central coast, and southern California.

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 during the post-fledging period (Clayton, 1997 as cited in ICF International, 2012, Appendix D). Vehicular collisions, which accounted for 25–60 percent of burrowing owl mortalities in three studies (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, (i.e., agricultural and construction activity, disking, shooting, and pest control) also contribute to burrowing owl mortality (Zarn, 1974; Thomsen, 1971; Haug *et al*., 1993).

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 burrowing owls depend (Haug *et al*., 1993).

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 less than 2 percent to more than 80 percent. They found that burrowing owl density and productivity of successful nests increased until 45–60 percent 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 percent development level to increased prey abundance on developed lots containing irrigated landscape vegetation. Wesemann and Rowe (1987) concluded that, above 60 percent 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.

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, but are not limited to, the Tri-National North American Conservation Action Plan for the Western Burrowing Owl (Comission for Environmental Cooperation, 2005), the Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States (U.S. Fish and Wildlife Service, 2003), and Effects of Management Practices on Grassland Birds: Burrowing Owl (Dechant *et al*., 1999). 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, the second in 1998 (Wellicome and Holroyd, 2001), and the third in 2006 (no proceedings).

2.6.1.2 Least Bell's Vireo

Refer to the Least Bell's Vireo (*Vireo bellii pusillus*) 5-Year Review: Summary and Evaluation (U.S. Fish and Wildlife Service, 2006) for the current status of the species.

2.6.1.3 Tricolored Blackbird

The tricolored blackbird is not currently listed under the Act nor does it have designated critical habitat. Descriptions of the species' physical characteristics, behavior, and distribution are provided in a variety of field guides (Sibley, 2000; National Geographic, 2002).

Tricolored blackbirds are endemic to the west coast of North America. More than 99 percent of the global population occurs in California (Beedy and Hamilton, 1999). Small breeding populations also exist at scattered sites in Oregon, Washington, Nevada, and the western coast of Baja California (Beedy and Hamilton, 1997). 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). In 1996, a colony of 300–500 individuals was documented just outside the Action Area in the San Antonio Valley, but colony success is unknown (California Department of Fish and Game, 2012).

Tricolored blackbirds typically forage within 0.6-1.2 miles of colonies but not infrequently 3.7 miles or more (Hamilton, 2004b). Ideal foraging conditions for tricolored blackbirds are created when shallow flood-irrigation, mowing, or grazing keeps the vegetation at an optimal height (less than 15 cm) (Tricolored Blackbird Working Group, 2007).

Tricolors opportunistically respond to insect abundance, thriving on grasshopper and other insect outbreaks (Hamilton, 2004b). Spring pre-breeding foraging typically consists of grains associated with dairy feedlots, cracked corn, sprouting rice, ripening oats, and milk barley (Skorupa *et al*., 1980). During the breeding season, tricolored blackbirds opportunistically feed (Beedy and Hamilton, 1997) and their diet often consists of grasshoppers (Orians, 1961), beetles (Crase and DeHaven, 1977), weevils, caddis fly larvae, moth and butterfly larvae, dragonfly larvae, and lakeshore midges (Hamilton, 2004b). Agricultural cropland with alfalfa and rice, irrigated pasture, lightly grazed grasslands, livestock operations, and dairy feedlots support fall foraging (post breeding) and seeds from pasture grassland and weeds are typically utilized during the winter (Hamilton, 2004b). 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). Open water within 0.3 mile is a requirement for colony settlement (Hamilton, 2004b).

Tricolored blackbirds have three basic requirements for selecting their breeding colony sites: open, accessible water; protected nesting substrate, including either flooded, thorny, or spiny vegetation; and suitable foraging space with adequate insect prey within a few miles of the nesting colony (Beedy and Hamilton, 1997, 1999). Almost 93 percent 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 percent of the colonies reported during the 1970s were in cattails and bulrushes (DeHaven *et al*., 1975). An increasing percentage of tricolored blackbird colonies in the 1980s and 1990s were reported in Himalayan blackberries (*Rubus discolor*) (Cook, 1996 as cited in ICF International, 2012, Appendix D), and some of the largest recent colonies have been in silage and grain fields (Beedy and Hamilton, 1997). Other substrates

where tricolored blackbirds have been observed nesting include giant cane (*Arundo donax*), safflower (*Carthamus tinctorius*) (DeHaven *et al*., 1975), tamarisk trees (*Tamarix* spp.), elderberry/poison oak (S*ambucus* spp. and *Toxicodendron diversilobum*), and riparian scrublands and forests (i.e., *Salix*, *Populus*, *Fraxinus*) (Beedy and Hamilton, 1999).

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 2004a). Colony formation typically occurs between March and May, and breeding occurs between March and July (Beedy and Hamilton, 1999). In the northern Central Valley and northeastern California, individuals move after their first nesting attempts, whether successful or unsuccessful (Beedy and Hamilton, 1997). Clutch size ranges from one to five eggs, typically between three or four. Females incubate eggs for 11 days and the nestling period is typically 10-14 days (Hamilton, 2004b). Tricolored blackbirds may have one or two broods at any particular location. During a given breeding season, individuals may remain at the one location or travel from one breeding location to another. Some individuals may make several nesting attempts following successive nest losses (Hamilton, 1998).

Banding studies indicate that significant movement into the Sacramento Valley occurs during the post-breeding period (DeHaven *et al*., 1975). 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; DeHaven *et al*., 1975). 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 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 as cited in ICF International, 2012, Appendix D), 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*., 1975).

Breeding colonies of tricolored blackbirds often go unreported because of their similar appearance to the common red-winged blackbird (*Agelaius phoeniceus*). 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 (Orians, 1961; Orians and Collier, 1963; Beedy and Hamilton, 1999). As many as 20,000 or 30,000 tricolored blackbird nests have been recorded in cattail marshes of 9 acres or less (Neff,

1937; DeHaven *et al*. 1975), and individual nests may be built less than 1.5 feet apart (Neff, 1937).

The Service, CDFW, and California Audubon co-sponsor statewide tricolored blackbird surveys. Local, regional, and statewide tricolored blackbird populations have experienced major declines since 1994, with a slight increase in 2008. Statewide totals of adults surveyed in six regions of California[92] are as follows: 369,359 (1994); 231,952 (1997); 94,269 (1999); 123,160 (2000), 174,205 (2001), 257,802 (2005), 394,848 (2008), and 259,322 (2011) (Kyle and Kelsey, 2011). Several areas that historically supported large (more than 2,000 individuals) colonies in the Central Valley no longer have birds present (Green and Edson, 2004; Hamilton, 2004a). The 2011 survey documented the majority of tricolored blackbirds (89 percent) in the San Joaquin Valley and Tulare Basin, similar to prior surveys. The three largest concentrations of birds occurred in Merced (54 percent), Kern (24 percent), and Tulare (9 percent) Counties. Notably, 65 percent of the population was consolidated into only six colony sites in Merced, Kern, and Tulare Counties (Kyle and Kelsey, 2011).

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 incompatible agricultural uses, including vineyards, orchards, and row crops (Frayer *et al*., 1989). 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 (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. Fifty percent of the breeding Tricolored Blackbirds in California in 2008 were observed nesting in silage fields during the 2008 statewide survey (Kelsey, 2008) and this has been a recurring pattern for the last decade.

Over the last 15 years public agencies and Audubon California paid landowners to delay harvest so that the tricolored blackbirds are able to finish nesting. So far, this has resulted in the protection of 600,000 nests and approximately 410,000 tricolored blackbird fledglings (Meese, 2009, unpublished data as cited in Kyle and Kelsey, 2011).

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

92 Northern California, Sacramento Valley, Central Coast, San Joaquin Valley, Tulare Basin, and Southern California (Kyle and Kelsey, 2011)

by black-crowned night herons (*Nycticorax nycticorax*) (Hamilton, 2004a). Other predators include ravens and raccoons (Hamilton, 2004b).

2.6.2 Environmental Baseline

2.6.2.1 Western Burrowing Owl

The Action Area for the western burrowing owl's environmental baseline corresponds to the larger Permit Area for the burrowing owl. That is, the baseline presented here is discussed in the context of the Permit Area for all Covered Species in addition to the *expanded Study Area for burrowing owl conservation* (see Sections 2.1.2 and 2.2 of this Opinion for more details).

Within the Action Area, 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. Most of the occupied nesting habitat is within the northern portion of the urban service area of the City of San Jose (ICF International, 2012, Section 4.6.4). Surveys in the 1990s revealed that about a third (43–47 pairs) of Santa Clara County breeding pairs occurred within the Action Area (Albion Environmental, Inc., 2000).

Using information from various unpublished sources, the burrowing owl population in Santa Clara County in 1997 was estimated to range from 120-141 pairs. Most of these owls occurred at 12 locations, where there was more than 1 pair. At least 10 of these locations qualified as "colonies," averaging five or more pairs. Approximately one-third of the County's population (43–47 pairs) occurred within the City of San Jose. A total of 39-40 pairs of owls were estimated to reside in the City of San Jose during a 2000 survey that included 53 sites within the City (Albion Environmental, Inc., 2000).

The Action Area was surveyed for breeding burrowing owls between May 26 and July 23, 2008 (Albion Enviornmental, Inc., 2008). This survey included 84 locations within the Action Area. In this survey, Albion Environmental estimated the presence of 19–20 pairs in the Action Area. All except two breeding pairs in the Action Area were located on either San Jose International Airport or north San Jose/Alviso (Albion Enviornmental, Inc., 2008). The data on San Jose burrowing owl populations from 1997, 2000, and 2008 suggest a population decline of approximately 50 percent since 1997.

In 2009, 10 locations where burrowing owls had been observed in 2008, or in other recent years, were surveyed again (Albion Environmental, Inc., Unpublished data). Fifteen pairs comprised of 34 adults were observed in the Action Area, suggesting a continued decline from the 19-20 pairs estimated in the Action Area in 2008 (Albion Enviornmental, Inc., 2008). However, the survey effort in 2009 was much less thorough than the 2008 survey, and some breeding pairs may have been missed. Because population numbers are so low and the

number of nesting locations is less than 10, the population viability analysis (PVA) conducted for the Plan (see Plan Appendix N) indicates that there is considerable danger of local extinction (ICF International, 2012, Section 5.4.6).

Due to the programmatic nature of the proposed action, the environmental baseline for the western burrowing owl described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the occurrence data summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the western burrowing owl and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Modeled occupied nesting habitat includes sites occupied within the previous 3 years that are surrounded by at least 140 acres of foraging habitat within 0.5 mile of a nest site. The 140-acre parameter was mapped based on aerial photo analysis of known occupied nest sites. Modeled potential nesting habitat includes 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 in Appendix D of the Plan. Modeled overwintering habitat includes all annual grassland, serpentine bunchgrass grassland, valley oak woodland, agricultural, and barren land cover types with flat (0–5 percent) or moderate (5–25 percent) slopes, outside of one of the burrowing owl conservation zones shown in Figure 2 of Appendix D of the Plan (ICF International, 2012, Appendix D).

There are an estimated 1,348 acres of modeled occupied nesting habitat, 63,751 acres of modeled potential nesting habitat, and 132,770 acres of modeled overwintering habitat in the Action Area (ICF International, 2012, Table 4-4). Of this, a total of 12,584 acres (9 percent) of modeled overwintering habitat are permanently protected as Type 1 Open Space. An additional 1,003 acres of modeled occupied and potential nesting habitat (2 percent) are permanently protected as Type 1 Open Space (ICF International, 2012, Table 5-17).

Urbanization has been, and continues to be, a threat to western burrowing owls in the Action Area. All of the remaining nesting locations are 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 (i.e. airports). As such, nesting habitat is subject to many threats typically

associated with urban areas (i.e. human disturbance and pets) (ICF International, 2012, Section 5.4.6).

Some efforts have been made in the Action Area to protect the burrowing owl. For example, Mineta San Jose International Airport has been implementing a burrowing owl management program since the mid-1990s (Barclay, 2007). Furthermore, in 2003, the City of Morgan Hill adopted a city-wide burrowing owl habitat mitigation plan and also 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.

2.6.2.2 Least Bell's Vireo

Of the 244 presumed extant occurrences of least Bell's vireo documented in the CNDDB, approximately 0.4 percent (1 occurrence) is documented in the Action Area (California Department of Fish and Game, 2012). 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 (California Department of Fish and Game, 2012; 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, but no individuals were detected (Santa Clara Valley Water District, 2002, 2003, 2004). However, SCVWD has been unable to survey the reaches with the most suitable habitat because they are under private ownership (Padley pers. comm., as cited in ICF International, 2012, Appendix D). Dense riparian corridors (sufficient overstory with a thick shrub understory) have been identified in other waterways in the southern portion of the Action Area, 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 least Bell's vireo was seen along Coyote Creek near the Coyote Creek Golf Club (Bousman and Smith, 2006). The bird was seen singing but no additional breeding behavior was observed (Mammoser pers. comm., as cited in ICF International, 2012, Appendix D).

Due to the programmatic nature of the proposed action, the environmental baseline for the least Bell's vireo described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the occurrence data summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the least Bell's vireo and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters

were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

For the purposes of the Plan, modeled primary habitat (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 suitable riparian corridors exist in other parts of the Action Area, the suitable habitat model is currently limited to areas where the species has been documented in the recent past (ICF International, 2012, Appendix D). There are 3,097 acres of primary least Bell's vireo modeled habitat in the Action Area. A total of 330 acres (11 percent) of modeled habitat are located on Type 1, 2, or 3 Open Space with 65 acres (2 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.7 and Table 5-17).

The extent of this species' range in the Action Area is not well understood (ICF International, 2012, Appendix D). SCVWD has conducted annual breeding season surveys for least Bell's vireo since 1997 (except in 2005, 2007, and 2008) along lower Llagas Creek and along sections of Uvas Creek (Santa Clara Valley Water District, 2011). The SCVWD began surveys for least Bell's vireo on Llagas Creek, Pajaro River, and Uvas Creek under its Stream Maintenance Program in 2005. Restoration efforts by the SCVWD and other groups like the Fisheries and Aquatic Habitat Collaborative Effort may benefit this species (ICF International, 2012, Appendix D).

Since the species was listed as endangered under the California Endangered Species Act in 1980, and under the Act in 1986, riparian habitat restoration and cowbird trapping resulted in considerable increases in the least Bell's vireo population in southern California, which now exceed 1,300 pairs (U.S. Fish and Wildlife Service, 1998a). The species may be expanding its range northward in California to now include the Action Area.

The Action Area is not contained in any of the 11 target recovery populations identified in the *Draft Recovery Plan for the Least Bell's Vireo (Vireo bellii pusillus)* (U.S. Fish and Wildlife Service, 1998a). Furthermore, The Least Bell's Vireo (*Vireo bellii pusillus*): 5-Year Review Summary and Evaluation (U.S. Fish and Wildlife Service, 2006) does not identify any least Bell's vireo territories in the Action Area. Although the majority of the current populations of least Bell's vireo remain in Southern California (U.S. Fish and Wildlife Service, 2006), there is evidence that the species may be expanding northward into its historical range, which includes Santa Clara County (U.S. Fish and Wildlife Service, 1998a, Grinnell and Miller, 1944). For example, a successful breeding pair was documented in 2005 and 2006 adjacent to the Action Area, in the San Joaquin National Wildlife Refuge in Stanislaus County (Howell, *et al*., 2010). Howell *et al*. (2010) suggest that the growth of the southern California least Bell's vireo population could result in the species' dispersal northward into its historic

breeding range, as breeding habitat in the south becomes saturated and as breeding habitat in the north becomes more suitable through various restoration efforts.

2.6.2.3 Tricolored Blackbird

Of the 357 presumed extant occurrences of tricolored blackbirds documented in the CNDDB, approximately 0.8 percent (3 occurrences) is documented in the Action Area (California Department of Fish and Game, 2012). Statewide surveys co-sponsored by the Service, CDFW, and the California Audubon have documented a declining population trend in Santa Clara County since 1994: 3,500 (1994), 550 (1997), 100 (2005), and 50 (2008) (Kyle and Kelsey, 2011). Although the exact location of the sightings in Santa Clara County are not specified by Kyle and Kelsey (2011), the occurrences were likely in the Action Area, which constitutes more than 60 percent of the County and is inclusive of the valley floor, where tricolored blackbirds are most likely to occur.

The Action Area was not adequately surveyed during the 2004 statewide surveys but the one historical location did not have any tricolored blackbirds present (Green and Edson, 2004). In 2006, a breeding colony of approximately 200 individuals was documented within the city limits of Morgan Hill (Rahmig pers. obs., as cited in ICF International, 2012, Appendix D). That colony was smaller in 2007 (~150 individuals) and absent during a 2008 statewide survey coordinated by California Audubon (Powers pers. comm., as cited in ICF International, 2012, Appendix D).

Due to the programmatic nature of the proposed action, the environmental baseline for the tricolored blackbird described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the occurrence data summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the tricolored blackbird and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al.*, 1997).

For the purposes of the Plan, modeled primary habitat, suitable for breeding and foraging, includes all riparian woodland and scrub, coastal and valley freshwater marsh and ponds within grassland, oak woodland, riparian forest/scrub, grain/row-crop/hay/pasture, and barren land cover types. Modeled secondary

habitat (foraging and wintering) includes seasonal wetlands, all grasslands, and all agricultural land cover types (ICF International, 2012, Appendix D). There are 140,291 acres of tricolored blackbird modeled habitat within the Action Area. A total of 29,435 acres (21 percent) of that habitat are located in Type 1, 2, or 3 Open Space with 11,037 acres (8 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.8).

All previous actions resulting in the loss of habitat, including natural habitat as well as agricultural lands providing suitable breeding and foraging habitat, have contributed to the species decline in the Action Area. There are no conservation actions targeting the tricolored blackbird in the Action Area.

Although documented population levels in the Action Area are small relative to population strong holds consistently observed in other parts of the State, such as Merced, Kern, and Tulare Counties (Kyle and Kelsey, 2011), maintaining and increasing the occupancy in the Action Area would be beneficial to the species. Rangewide population declines, particularly in California, suggest that any reduction in the species range and distribution would adversely affect the species' ability to survive and recover in the wild.

2.6.3 General Effects of the Action on Avian Species

Mortality, Injury, Harm, and Harassment: Covered Activities will have both direct and indirect effects on avian species addressed in this Opinion. To minimize repetition, anticipated effects common to all covered avian species evaluated in this Opinion are discussed here, at the beginning of Section 2.6.3. General effects of the Action on all Covered Species, previously described in Section 2.4.3 above, are not repeated here. Species specific effects that are in addition to effects common to avian species are described below, in Sections 2.6.4.1 - 2.6.4.3.

Vegetation management and maintenance on rural roads adjacent to natural land cover types conducted during the migratory bird breeding season could directly result in the loss or degradation of covered avian species' habitat and ultimately reduce breeding success by injuring or killing individuals (including adults, juveniles, and eggs), disrupting breeding behavior (i.e. singing, pair formations, nest building), and disrupting rearing behavior (i.e. feeding, fledging). Potential direct and indirect effects associated with vegetation management will be minimized because the Plan requires that vegetation management occur outside the migratory bird nesting period, or surveys will be conducted before clearing to avoid these effects (ICF International, 2012, Section 4.3.5). Condition 8 of the Plan will further reduce these potential effects because it requires maintenance activities on rural roads adjacent to natural land cover types to be seasonally timed, when safety and regulatory restrictions permit. This measure is particularly relevant for right-of-way mowing, brush clearing, 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 effects on covered avian species (ICF International, 2012, Section 6.4.5).

As previously indicated in Section 2.4.3.1 of this Opinion, urban and rural development Covered Activities will result in increased human presence. Increased human presence could have a profound indirect effect on birds. For example, a single pedestrian passing through a bird's territory in some cases[93], may reduce singing (Gutzwiller *et al*., 1994). For many birds, song is a critical component of territory defense, mate acquisition, and other reproductive activities. Thus, human intrusion that alters normal singing of passerine birds has the potential to lower reproductive fitness (Gutzwiller *et al*., 1994). Furthermore, human intrusion could be particularly disruptive to foraging bird colonies (Klein, 1993). Human disturbance could also have profound effects on successful nesting of certain bird species. Flushing parents from nests decreases parental attendance and increases the likelihood of nest abandonment predicating inadequate heat regulation and increased predation (Safina and Burger, 1983; Hunt, 1972). Plan minimization measures previously discussed in Section 2.4.3.1 of this Opinion will significantly reduce the potential for, and extent of, these effects.

2.6.4 Species-Specific Effects of the Action

The species-level effects described below build on Section 2.4.3, *General Effects of the Action on All Covered Species* and Section 2.6.3, *General Effects of the Action on Avian Species*. Effects previously described in these two sections of the Opinion are not repeated below.

2.6.4.1 Western Burrowing Owl

Due to the poor baseline conditions of the western burrowing owl, and subsequent unique conservation strategy for the species, the analysis that follows is presented differently than presented for other Covered Species in this Opinion. The Action Area evaluated in the western burrowing owl effects analysis corresponds to the larger Permit Area for the burrowing owl. That is, the effects analysis is discussed in the context of the Permit Area for all Covered Species in addition to the *expanded Study Area for burrowing owl conservation* (see Sections 2.1.2 and 2.2 of this Opinion for more details).

Mortality, Injury, Harm, and Harassment: The only take that would occur in the *expanded Study Area for burrowing owl conservation* will result from conservation strategy actions implemented for the burrowing owl. Take associated with any of the six other categories of Covered Activities listed in Section 2.1.4 of this Opinion, or conservation actions for Covered Species other than the burrowing owl, are not covered in the *expanded Study Area for burrowing owl conservation* (ICF International, 2012, Section 4.6.4).

Loss and degradation of modeled habitat is the primary form of take of western burrowing owls anticipated under the Plan. Harm or harassment may occur from

93 Level of habituation to human intrusion, body mass, and line of site may play a role in effects of intrusion (Gutzwiller *et al*.., 1994).

construction or operations and maintenance activities if these activities disrupt normal foraging or nesting behavior. In some instances, harassment may cause an owl to abandon its active burrow and die offsite. The potential for these effects will be minimized through the implementation of Condition 15, which requires habitat surveys, preconstruction surveys, and avoidance measures during both the breeding and non-breeding seasons (ICF International, 2012, Section 6.6.1). Condition 15 is described in more detail below.

The Plan minimizes the effects of Covered Activities on the western burrowing owl by limiting effects on modeled habitat during the permit term. A maximum of 198 acres (15 percent) of modeled occupied burrowing owl nesting habitat could be lost to Covered Activities within the Action Area. Temporary effects will not exceed 20 acres (1 percent) of modeled occupied nesting habitat in the Action Area (see Plan Table 4-4). The San Jose International Airport, although considered modeled occupied burrowing owl nesting habitat, will not be affected by Covered Activities. All of the anticipated effects on occupied burrowing owl habitat would occur within the City of San Jose, as a result of urban development (ICF International, 2012, Section 4.6.4).

A maximum of 4,000 acres (6 percent) of modeled potential burrowing owl nesting habitat in the Action Area may be permanently affected by Covered Activities. Temporary effects will not exceed 604 acres (less than 1 percent) of modeled potential nesting habitat (see Plan Table 4-4). Effects on potential nesting habitat will occur primarily as the result of rural residential development in unincorporated County areas, San Jose, Gilroy, and Morgan Hill. Additional effects are expected on some types of agricultural lands on the valley floor, where agricultural lands are converted to other uses (i.e. housing or commercial) (ICF International, 2012, Section 4.6.4).

Finally, a maximum of 9,671 acres (7 percent) of modeled overwintering habitat in the Action Area may be permanently affected by Covered Activities. Temporary effects will not exceed 762 acres (less than 1 percent) of modeled overwintering habitat in the Action Area (see Plan Table 4-4). Effects on overwintering habitat will occur primarily as the result of rural residential development under the jurisdiction of the County. Additional effects may occur as the result of roadway improvements or stream maintenance in areas where burrowing owls have been documented using berms or levees (ICF International, 2012, Section 4.6.4). Condition 8, will minimize some of roadway improvement-related effects because it requires maintenance activities on rural roads adjacent to natural land cover types to be seasonally timed, when safety permits and regulatory restrictions allow (ICF International, 2012, Section 6.4.5).

The Applicants will mitigate unavoidable direct and indirect effects to western burrowing owl modeled habitat by managing a total of 5,300 acres of occupied or potential nesting habitat and permanently protecting a total of 21,310 acres of modeled overwintering habitat (ICF International, 2012, Table 5-17). The Plan's general approach is to increase the numbers, distribution, and connectivity of burrowing owl colonies in the Action Area by using a phased conservation

approach, initially focusing efforts on areas within immediate flight distance from known colonies. Subsequent phases will focus on lands further out to allow for growth in both numbers and range. Initial techniques will include gathering data to inform management decisions, utilizing current best management practices, testing new management techniques, acquiring existing and potential breeding and foraging areas, managing burrowing owl habitat, and augmenting populations.

These measures will be applied in the following four burrowing owl conservation regions: North San Jose/Baylands, South San Jose, Morgan Hill, and Gilroy (see Plan 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. Land that is likely most suitable for the species is already publically owned. Therefore, the Implementing Entity will either acquire in fee title, secure conservation easements, or secure management agreements to ensure enhanced management on sites to support the species and meet the Plan's goals. At least initially, limited burrowing owl habitat acquisition and/or management will occur along the southern edge of the Action 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. If conservation actions in the North San Jose/Baylands Region prove successful, it is reasonable to assume the nesting burrowing owl population will expand into suitable habitat in the South San Jose, Morgan Hill, and Gilroy Regions (ICF International, 2012, Section 5.4.6).

Conservation targets for the western burrowing owl that are based on habitat availability (similar to the Plan's approach for other covered wildlife species) are likely to be inadequate to ensure population recovery in the Action Area because of extremely poor baseline conditions. Instead, conservation targets for population size were developed based on a population viability analysis (PVA). This analysis was used to determine the probability of persistence of populations at Moffett Airfield, San Jose International Airport, and Shoreline at Mountain View, the three largest remaining burrowing owl colonies in the South Bay area. 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). It was assumed that the population performance at these three sites could be used as an index for population performance for burrowing owls in the Action Area (ICF International, 2012, Section 5.4.6). For an in depth description of the PVA, refer to Plan Appendix N.

PVA results suggested that growth rate is a more correct predictor of burrowing owl persistence in the Action Area than an ultimate population size. PVA results suggested 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 for data collection and additional analysis. 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 South Bay burrowing owl population

by Year 15 of Plan implementation. This will be accomplished by managing land on the valley floor and in the Diablo Range through fee title, easements, or management agreements (ICF International, 2012, Section 5.4.6).

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 Action Area). If three burrowing owls were recruited to the population every year during the permit term, an additional 150 adults would be added, for a total population size of 220 adults. The Plan would be responsible for 70 percent 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 Plan Appendix M for calculations) in the Action Area. Of this acreage, a minimum of 600 acres of occupied nesting habitat must be protected in fee title or conservation easement in accordance with the rough proportionality provision for the burrowing owl, described below, as the 600 acres will mitigate unavoidable effects to modeled occupied nesting habitat. The remaining 4,700 acres may be managed through fee title, easement, or management agreements. 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 (ICF International, 2012, Section 5.4.6).

When identifying and acquiring the 600 acres for permanent protection and enrolling them into the Reserve System, the Implementing Entity will use the following guidelines (ICF International, 2012, Section 5.4.6):

- Preferentially select a parcel that is inside of the Plan Study Area over a parcel that is inside of the *expanded Study Area for burrowing owl conservation*.
- Preferentially select parcels that are closer (i.e., within 0.5 mile) to documented nest locations over those that are farther away.
- Parcels that do not meet the second criteria (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[94].

The 600 acres of occupied nesting habitat acquired for the Reserve System must have the following (ICF International, 2012, Section 5.4.6):

- 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.

94 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 (i.e., the North First Street area of San Jose).

- 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.
- Currently supports ground squirrels or is located adjacent to another parcel with ground squirrels.
- 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.

The Plan includes a Stay-Ahead provision specifically designed for the burrowing owl because the conservation strategy for this species, unlike other Covered Species, does not strictly require land acquisition but also allows for some land management where fee title purchase or easement is not feasible. The burrowing owl Stay-Ahead provision only applies to occupied and potential nesting habitat (not overwintering only habitat) because these two habitat types are the most critical to achieving a positive population growth rate. The Stay-Ahead requirement for burrowing owl will be applied similar to the Stay-Ahead provision for the Reserve System as a whole (see Plan Section 8.6.1), 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 percent deviation of permanent effects on occupied nesting habitat based on a 3:1 ratio (management or protection to effects). For example, if 50 acres of occupied nesting habitat are affected, then 150 acres of occupied nesting habitat must be under a management agreement or permanently protected (ICF International, 2012, Section 8.6.1). 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 percent of the Stay-Ahead requirement against implementation of conservation actions on managed lands. Together with the allowable 10 percent deviation, this provides for up to a 15 percent allowance in meeting Stay-Ahead requirement for the western burrowing owl[95].

The 5,300 acres will include burrowing owl nesting habitat within 5 miles of the San Jose Water Pollution Control Plant bufferlands located north of Highway 237 (LAND-G6) and burrowing owl nesting habitat within 5 miles of the San Jose International Airport or other important northern San Jose breeding sites (LAND-

95 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).

G7). Because the North San Jose/Baylands Region is the most important for burrowing owl conservation and has the most conservation opportunities, a goal is set for 70 percent (3,700 acres) of the total land management commitment occurring in that region. A recommended 15 percent (800 acres) of the total land managed would occur in the Gilroy Region. The remaining 15 percent could occur in any of the regions, but it is assumed that 5 percent (270 acres) will occur in the South San Jose Region and 10 percent (530 acres) will occur in the Morgan Hill Region (ICF International, 2012, Section 5.4.6).

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 (i.e., 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 burrowing owl Stay-Ahead provision. However, by Year 45 of the permit term, all management agreements must be permanent (ICF International, 2012, Section 5.4.6).

The management agreements must be legally binding documents to which the Wildlife Agencies are parties. The management agreements will be developed consistent with the land acquisition process described in Section 8.6 of the Plan; however, the Implementing Entity would work with the land owner to establish the management agreement rather than acquire the land in fee title or with a conservation easement. The duration and management requirements will be agreed upon by all parties. 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 (ICF International, 2012, Section 5.4.6).

Although the Implementing Entity 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 decreases during the permit term (ICF International, 2012, Section 5.4.6).

Priority will be given towards management on modeled occupied habitat, followed by modeled potential nesting habitat (ICF International, 2012, Section 5.4.6). Specific burrowing owl conservation actions that would occur on the

5,300 acres of modeled occupied and potential nesting habitat are grouped into the following 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 Jose/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 Action Area by managing potential burrowing owl nesting habitat in all portions of the Action Area. Tier 2 conservation actions will also take place immediately and will initially be implemented in the North San Jose/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 Action Area to increase owl numbers and expand distribution. Tier 3 actions will be implemented in response to population performance at the three index sites, 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.

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 Plan Section 5.3.3), valley oak woodlands (see Plan Section 5.3.5), and seasonal wetlands (see Plan Section 5.3.7) are intended to benefit the western burrowing owl through breeding and foraging habitat conservation and management (ICF International, 2012, Section 5.4.6).

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. The Plan proposes to acquire a minimum of 17,000 acres of modeled overwintering habitat. In addition, 4,310 acres of modeled overwintering 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 Action Area to 26 percent in Type 1 Open Space and 34 percent in Type 2, 3, or 4 Open Space (ICF International, 2012, 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 Action 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 Jose could support burrowing owls in the future. In addition, several acres will be acquired in the southern portion of the Action 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 (ICF International, 2012, Section 5.4.6).

To minimize the potential of recreation in the Reserve System resulting in the harm and harassment of burrowing owls, Condition 9 prohibits new trails in the Reserve System to be 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 dependent on the nest (ICF International, 2012, Section 6.4.6).

Potential effects on individuals include direct death or injury as a result of development and operations and maintenance Covered Activities. Individuals could be crushed by heavy equipment used during construction and staging activities. Individuals may be indirectly killed or injured if displaced as a result of burrows being disturbed or filled. Increased vehicle traffic may also indirectly result in more fatalities and injuries.

Until the Plan's population growth trend goal is achieved, take will be primarily limited to loss and degradation of modeled habitat. That is, before a positive population growth trend is achieved, take of individual owls in the form of death and injury will be avoided, with two possible exceptions: (1) projects associated with conservation strategy implementation or (2) projects for which an exception to the passive relocation prohibition is granted (discussed below) (ICF International, 2012, Section 4.6.4).

Potential direct and indirect effects on individuals will be either avoided or significantly minimized with the proper implementation of Condition 15, which is fully described in Plan Section 6.6.1. Condition 15 requires western burrowing owl habitat surveys in all modeled occupied nesting habitat (see Plan Figure 5-11) during both the breeding and non-breeding season. If a project site falls within modeled occupied nesting habitat, a qualified biologist will map areas with burrows on the project site. If suitable habitat is identified during the habitat

survey, and if the project does not fully avoid effects on the suitable habitat, preconstruction surveys will be required. Suitable habitat is considered fully avoided if the project footprint does not impinge on a 250-foot buffer around the suitable burrow. Prior to any ground disturbance, a qualified biologist will conduct preconstruction surveys in all suitable habitat areas 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. Surveys will conclude no more than 2 calendar days prior to construction (ICF International, 2012, Section 6.6.1).

In order to allow Covered Activities to go forward in burrowing owl habitat prior to formal take authorization of individuals taking effect, project applicants will employ avoidance measures, to ensure that death or injury of individual burrowing owls does not occur [96] (ICF International, 2012, Section 6.6.1). 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 construction during the remainder of the breeding season or while the nest is occupied by adults or young. Avoidance will include establishment of a 250-foot buffer around nests. Construction may occur inside of the 250-foot buffer during the breeding season if (ICF International, 2012, Section 6.6.1):

- 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 approve the avoidance and minimization plan.
    - A qualified biologist monitors the owls for at least 3 days prior to construction to determine baseline nesting and foraging behavior.
    - 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 and will not resume within the buffer until all 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 buffer zone may be removed. The biologist will excavate the

96These avoidance measures apply to all projects that affect any burrowing owl habitat, regardless of whether surveys are required by Condition 15. In other words, a project occurring outside of modeled occupied nesting habitat is still obligated to implement avoidance and minimization measures.

burrow to prevent reoccupation after receiving approval from the Wildlife Agencies.

During the non-breeding season (September 1–January 31), the project proponent will establish a 250-foot buffer around occupied burrows as determined by a qualified biologist. Construction activities within the buffer are allowed if the following criteria are met (ICF International, 2012, Section 6.6.1):

- A qualified biologist monitors the owls for at least 3 days prior to construction to determine baseline foraging behavior.
- 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. 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 (ICF International, 2012, Section 6.6.1).

Once the population growth trend is achieved, take of individual owls in all forms, including death or injury, 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 may be allowed. Since the population is now in decline and because of the limitations of the PVA model, it is anticipated that at least a 10 year period is necessary for the Plan's conservation actions to have a positive effect (ICF International, 2012, Section 4.6.4).

Once the target growth trend is achieved, and death or injury of individual owls as a result of any type of Covered Activity is allowed, the amount of allowable take will be determined annually by the Implementing Entity in partnership with the Wildlife Agencies. The amount of take annually will be the number of owls in excess of those needed to maintain the positive growth trend. 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 (ICF International, 2012, Section 4.6.4).

Loss of individual burrowing owls resulting from the expiration of temporary management agreements will only be authorized if the targeted population growth trend 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 (ICF International, 2012, Section 4.6.4).

Passive relocation would not be allowed under the Plan until the Plan's positive growth trend goal is achieved. Once this occurs, passive owl relocation may be allowed, with the approval of the Wildlife Agencies, during the non-breeding season only. Due to the relatively low numbers of burrowing owls in the Action Area, it is not expected that the prohibition of passive relocation will result in project delays. However, it is possible that Condition 15 may preclude a Covered Activity from proceeding. In such cases, a project proponent may apply for an exception to Condition 15 and request approval for passive relocation of burrowing owls. Passive relocation would only be proposed if a burrow needed to be removed or had the potential of collapsing. If passive relocation is allowed, a qualified biologist could passively exclude western burrowing owls from their burrows by installing one-way doors at burrow entrances. Other methods of passive relocation, based on best available science, may be approved by the Wildlife Agencies during Plan implementation (ICF International, 2012, Section 6.6.1).

Exceptions may be requested through the standard application process described in Section 6.8 of the Plan, 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 the exception a passive relocation plan that documents the following (ICF International, 2012, Section 6.6.1):

- Owls have occupied the site for a full year without relocating voluntarily.
- 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 (ICF International, 2012, Section 6.6.1):

- 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.
- If the site has been used for nesting within the last 3 years.

- If the site is a target for a burrowing owl temporary or permanent management agreement.

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. Exceptions to the Plan's passive relocation prohibition will be used in a minority of cases (ICF International, 2012, Section 6.6.1).

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. If it becomes evident that portions of the burrowing owl strategy will not be feasible, a Plan amendment may be necessary (ICF International, 2012, Section 5.4.6).

The extent to which bird strikes may increase as a result of the South County Airport Expansion is unknown at this time. However, the number of aircrafts based at the South County Airport nearly doubled in the past three 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 (ICF International, 2012, Section 4.3.4). Barclay *et al*. (2011) found that annual strike reports of owls (including some barn owls) were not correlated with the annual burrowing owl population size at the San Jose International Airport.

Noise: The South County Airport expansion will likely result in increased noise as a result of increased aircraft traffic. Though suitable habitat for western burrowing owls is present in and around the South County Airport, there are no recent occurrences of western burrowing owls breeding at the site. Increased noise from airport expansion (and associated operation) is not anticipated to preclude burrowing owls, as demonstrated by the continued use by this species of the San Jose International Airport nearby, which has much greater levels of aircraft noise than would be experienced at the South County Airport. Should this species be documented at the site prior to airport expansion, Condition 15 would be implemented to minimize potential construction-related noise effects (ICF International, 2012, Section 4.3.4).

Lighting: Lighting improvements proposed under the South County Airport Master Plan are not anticipated to preclude burrowing owl occupancy for the same reasons discussed above, under the subsection *Noise*. Should this species be documented at the site prior to airport expansion, Condition 15 would be implemented to minimize potential construction-related lighting effects.

Capture and Collection: As previously described, Tier 3 conservation actions, could include population augmentation and owl relocation. These activities would be experimental in nature and thus could result in the direct or indirect death or injury of individual owls. As indicated in Section 2.6.1.1 of this Opinion, previous studies have documented limited success in relocation attempts

(Delevoryas, 1997; Feeney, 1997). Individuals could be incidentally killed or injured during collection, rearing, and/or transport. Individuals may also be killed or injured after being released at introduction sites. Potential effects associated with implementing Tier 3 activities, will be minimized because they will be carried out on an experimental basis by qualified biologists and will only be conducted with the approval of the Wildlife Agencies (ICF International, 2012, Section 8.7). The current baseline condition of the species warrants the consideration of Tier 3 activities, as there is a significant chance of local extirpation if proactive conservation actions are not taken.

2.6.4.2 Least Bell's Vireo

Mortality, Injury, Harm, and Harassment: Due to the rarity of the species in the Action Area and the importance of maintaining all individuals that occur, the Applicants are not requesting take authorization for the least Bell's vireo in the form of direct injury or mortality. The Applicants are also not requesting take authorization for nests or eggs (ICF International, 2012, Section 4.6.5).

Implementation of Condition 16, described in Section 6.6.1 of the Plan, will ensure that take in the form of death and injury is avoided. Under Condition 16, Least Bell's vireo surveys will 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 this time, surveys are only required in the Pajaro watershed, including the Uvas, Llagas, and Pacheco sub-watersheds (ICF International, 2012, Section 6.6.1).

Projects occurring within the mapped area require surveys if the project-specific verified land cover map (see Section 6.8.3 of the Plan) 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 that could be used for nesting. If early successional riparian vegetation is found, the project proponent may revise the proposed project to avoid all areas within 250 feet of potential nesting habitat, in which case, surveys will be concluded (ICF International, 2012, Section 6.6.1).

If the project proponent does not avoid the potential nesting site and associated 250-foot buffer, additional nesting surveys will be required under Condition 16. Prior to any ground disturbance, a qualified biologist will do the following (ICF International, 2012, Section 6.6.1):

- 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).
- If there is no evidence of nesting in the past 3 years, he/she will conduct a preconstruction survey in areas identified in the habitat

survey as supporting potential nesting habitat. Surveys will be made at the appropriate time of year when nesting use is expected to occur. The surveys will document the presence or absence of nesting individuals. Protocol-level surveys will be used. Surveys will conclude no more than 3 calendar days prior to construction.

If one or more least Bell's vireo nests are present, the nest site(s) plus a 250-foot buffer will be avoided, and the Wildlife Agencies will be notified immediately of nest locations (ICF International, 2012, Section 6.6.1).

In addition to avoiding death of, and injury to, least Bell's vireo, Condition 16 will ensure avoidance of active nests and historical breeding sites. To do this, Condition 16 requires Covered Activities to 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 buffer. Disturbance to previous nesting sites, used within the previous 3 years, will also be avoided during the breeding season unless the disturbance is required to implement the conservation strategy or to maintain public safety. 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 buffer distance on a case-by-case basis (ICF International, 2012, Section 6.6.1).

If occupied nests are identified, a qualified biologist will monitor construction to ensure that the 250 foot buffer around 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. 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 train 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 (ICF International, 2012, Section 6.6.1).

With the proper implementation of Condition 16, take of least Bell's vireos will be limited to harm and harassment. Least Bell's vireos could be directly or indirectly affected by Covered Activities. Individuals could be directly harassed as a result of construction or operation activities conducted in or adjacent to streams and riparian corridors. Successful nesting may be adversely affected as an indirect effect of in-stream capital and in-stream operation and maintenance activities that diminish natural stream dynamics (i.e. flooding and scouring) needed to sustain early successional riparian communities used by breeding least Bell's vireos. Potential effects to streams and associated riparian corridors, along with minimization measures (AMMs, Plan Conditions, and components of the conservation strategy) were previously described in Section 2.5.3 of this Opinion, under the *Water Quality* and *Hydrology* subsections.

Effects on least Bell's vireo modeled habitat will be limited to the Santa Cruz Mountains foothills and the valley floor in the southern portion of the Action Area. Effects on suitable habitat are anticipated from dam seismic retrofit at Uvas and Chesbro Dams, flood protection projects in the Uvas and Llagas Creek watersheds, vegetation management on lower Llagas Creek, and road projects along East Little Llagas Creek (ICF International, 2012, Section 4.6.5).

The Plan minimizes the effects of Covered Activities on the least Bell's vireo by limiting effects on modeled habitat during the permit term. No more than 72 acres of primary least Bell's vireo modeled habitat (2 percent of total modeled habitat in the Action Area) will be permanently affected. Temporary effects will not exceed 43 acres of modeled primary habitat (1 percent of total modeled habitat in the Action Area) (ICF International, 2012, Section 4.6.5 and Table 4-4).

Condition 11 will further minimize the potential effects on least Bell's vireo habitat by requiring riparian setbacks, as previously described in Section 2.5.3 of this Opinion. An estimated 837 acres (55 percent) of least Bell's vireo primary modeled habitat is anticipated to be avoided as a result of Condition 11 (ICF International, 2012, Table 6-5).

The Applicants will mitigate unavoidable direct and indirect effects to least Bell's vireo habitat by preserving modeled habitat. The Plan proposes to acquire a minimum of 460 acres of least Bell's vireo primary modeled habitat. 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 Action Area to approximately 17 percent in Type 1 Open Space and 26 percent in Type 1, 2, or 3 Open Space (ICF International, 2012, Section 5.4.7 and Table 5-17).

In the Pacheco watershed land acquisition 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 also benefit the least Bell's vireo. The only nesting occurrence of least Bell's vireo in Santa Clara County in the past 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. Specific areas of acquisition commitments are listed below (ICF International, 2012, Section 5.4.7):

- 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, 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

enhancement of riparian woodland on Coyote Creek may also benefit least Bell's vireo if the species expands its range to the north, into the Coyote Creek watershed (ICF International, 2012, Section 5.4.7).

In addition to habitat preservation and enhancement, the Implementing Entity will restore 50-339 acres of willow riparian forest and scrub or mixed riparian forest and woodland, depending on the level of effects incurred during the permit term. Regardless of effects however, a minimum of 50 acres of willow riparian forest and scrub or mixed riparian forest and woodland will be restored. Most of this restoration would occur in the southern portion of the Action Area, which has the most restoration opportunity (ICF International, 2012, Section 5.4.7 and Table 5-12).

Several riparian restoration and enhancement techniques will be employed to 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 will maintain an array of successional stages of riparian vegetation, which will increase the total acreage of suitable nesting habitat available for the species. In many cases these restoration efforts will include replacing concrete channels to restore geomorphic and ecological 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) (ICF International, 2012, Section 5.4.7).

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 gaps in existing 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. 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 tree girdling, will be implemented to encourage early successional vegetation to grow (STREAM-5) (ICF International, 2012, Section 5.4.7). Least Bell's vireos respond favorably to restoration efforts, particularly when restoration sites are located adjacent to established riparian habitat (Wood *et al*., 2006).

According to Howell *et al*. (2010), the conditions documented at the two breeding occurrences at the San Joaquin River National Wildlife Refuge in Stanislaus County, adjacent to the Action Area, in 2005 and 2006 suggest that least Bell's vireos may be more likely to colonize larger restoration sites as well as restoration sites situated adjacent to mature riparian forest. Howell *et al*. (2010) make four recommendations for the successful management of the species' nesting habitat:

(1) continuing restoration activities to maintain a proportion of appropriate habitat within the landscape; (2) managing (i.e. occasional mowing, burning, flooding, etc.) existing habitat to maintain appropriate successional stages; (3) enhancing and restoring natural ecological processes, such as hydrological and fire regimes, to naturally maintain appropriate successional stages; and (4) designing restoration to promote and prolong early seral to mid-seral riparian vegetation (i.e. planting more shrubby species). The Plan's conservation strategy for this species is consistent with these recommendations.

Nonnative Invasives: As previously indicated in Section 2.4.3.5, Covered Activities will indirectly result in the introduction and spread of nonnative invasives. Brown headed cowbirds are obligate brood parasites that reduce the number of host-young fledglings, cause host-nest failure or abandonment, and prey on host eggs and nestlings. Human altered landscapes (i.e. grazing fields, livestock corrals, feedlots, pack stations, campgrounds, and towns) are strongly correlated with brown headed cowbird parasitism rates (Tewksbury *et al*., 1998; Rothstein *et al*.., 1987; Verner and Ritter, 1983). Brown headed cowbird parasitism may be a major source of nest failure for smaller host species that have relatively long incubation periods and essentially lack effective antiparasite defenses, such as most vireos (*Vireo* spp.) (Ward and Smith, 2000; Oretga and Ortega, 2003. Therefore, Covered Activities may indirectly increase the population and distribution of brown headed cowbirds in the Action Area, which could in turn, adversely affect the least Bell's vireo by precluding or limiting the species' range expansion in the Action Area.

The Plan will minimize the effects of brown-headed cowbirds in the event that they are shown to adversely affect least Bell's vireo in the Action Area during the permit term. A brown-headed cowbird management program will be implemented if least Bell's vireos become regular nesters in the Action Area (i.e. more than 3 nests over at least 2 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 the Wildlife Agencies. The cowbird management program will be terminated if monitoring shows that cowbirds are not reducing the nest success of vireos (ICF International, 2012, Section 5.4.7). If other predators (i.e., feral cats, raccoons, skunks), are shown to adversely affect the nest success of vireos, additional predator control may be necessary (LM-13).

2.6.4.3 Tricolored Blackbird

Mortality, Injury, Harm, and Harassment: Because of the rarity of the species in the Action Area and its high breeding site fidelity, the Plan will avoid direct effects on active tricolored blackbird colonies (ICF International, 2012, Section 4.6.6).

Condition 17, described in Section 6.6.1 of the Plan, describes measures to avoid effects on nesting tricolored blackbird colonies. Under Condition 17, surveys are

required if the project-specific verified land cover map (see Section 6.8.3 of the Plan) shows that the project is within 250 feet of riparian, coastal and valley freshwater marsh, or pond land cover types. If any of these land cover types are present, a qualified biologist will conduct a field investigation to identify and map potential nesting substrate, which generally includes flooded, thorny, or spiny vegetation. 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. If the project proponent does not avoid the potential nesting habitat and the 250-foot buffer, additional nesting surveys will be required. Prior to any ground disturbance a qualified biologist will do the following (ICF International, 2012, Section 6.6.1):

- 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).

- If there is no evidence of nesting in the past 5 years, 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 time of year when nesting is expected to occur. The surveys will document the presence or absence of nesting colonies. Surveys will conclude no more than 2 calendar days prior to construction.

If a colony is present, 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. The Wildlife Agencies will be notified immediately of nest locations (ICF International, 2012, Section 6.6.1).

Condition 17 requires Covered Activities to avoid tricolored blackbird nesting habitat that is currently occupied or has 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 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. Implementing Entity technical staff will coordinate with the Wildlife Agencies to evaluate exceptions to the minimum buffer distance on a case-by-case basis. Conversely, site characteristics, sensitivity of the colony, and surrounding land uses may necessitate a larger buffer (ICF International, 2012, Section 6.6.1).

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.

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 (ICF International, 2012, Section 6.6.1).

Because of the rarity of the species in the Action Area and its high breeding site fidelity, the Applicants are not requesting take authorization for the removal of historic[97] or active breeding habitat. However, the colony located in Morgan Hill will likely relocate due to encroachment of development within foraging radius of the breeding site (ICF International, 2012, Section 4.6.6).

Potential tricolored blackbird breeding sites may be directly affected by Covered Activities that remove or permanently alter riparian land cover types, wetlands, marshes, and vegetated ponds. Effects on tricolored blackbird modeled breeding habitat will occur as a result of in-stream capital improvement projects, in-stream operations and maintenance, and road projects. 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 are expected to remove or degrade modeled tricolored blackbird habitat (ICF International, 2012, Section 4.6.6).

Furthermore, the conversion of native or agricultural land cover to urban use will remove potential foraging habitat for the species. The majority of the potential foraging habitat within the San Jose, 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 affected. Within the San Jose planning limit of urban growth, effects on modeled foraging habitat will be 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 (ICF International, 2012, Section 4.6.6).

The Plan minimizes the effects of Covered Activities on the tricolored blackbird by limiting effects on modeled habitat during the permit term. No more than 276 acres (3 percent) of tricolored blackbird modeled primary habitat and 10,317 acres (8 percent) of modeled secondary habitat will be permanently affected, and no more than an additional 93 acres (1 percent) of modeled primary habitat and 768 acres (less than 1 percent) of modeled secondary habitat will be temporarily affected in the Action Area (ICF International, 2012, Table 4-4).

97 If a pond or wetland has documented breeding within the past 5 years, it will not be directly affected by Covered Activities. Best efforts will be used to determine historic use.

Effects on potential habitat will be further minimized with the implementation of Conditions 11 and 12, both of which were previously described in Section 2.5.3 of this Opinion under the *Mortality, Injury, Harm, and Harassment* subjection. Condition 11 will minimize effects on riparian corridors through the imposition of riparian setbacks while Condition 12 will minimize effects on wetlands and ponds.

Prescribed burns in annual grassland may adversely affect tricolored blackbirds by temporarily reducing foraging opportunities and prey base. To minimize these effects, the Implementing Entity will establish a landowner education program to provide technical assistance to ensure that dry-land farming operations continue to maintain foraging habitat for tricolored blackbird near breeding colonies (POND-15) (ICF International, 2012, Section 5.3.8).

As previously indicated in Section 2.4.3.1 of this Opinion, increased human presence resulting from Covered Activities will indirectly result in the harm and harassment of tricolored blackbirds. The Plan will minimize the effects of increased human presence by requiring a minimum distance between urban development and aquatic land cover types that count toward the Plan's land acquisition and restoration/creation requirements. As indicated in Table 5-15 of the Plan, the following minimum distances are required between potential breeding sites for tricolored blackbirds and dense urban development in order to receive credit under the Plan:

- Coastal and valley freshwater marsh: 750 feet
- Seasonal wetland: 100 feet if the wetland is up-gradient from development and 250 feet if the wetland is down-gradient from development
- Pond: 750 feet
- Stream: 150 feet
- Riparian woodland/scrub: 50 feet

Harm and harassment resulting from increased recreation in the Reserve System will be minimized by Condition 9 of the Plan, which prohibits new trails within 100 feet of wetlands that provide suitable habitat for tricolored blackbirds, unless topography or other landscape characteristics shield these trails from tricolored blackbird habitat or a lack of effect can be otherwise demonstrated (ICF International, 2012, Section 6.4.6).

The Applicants will mitigate unavoidable direct and indirect effects to potential tricolored blackbird habitat by preserving modeled habitat. 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 Action Area to approximately 24 percent in Type 1 Open Space and 35 percent Type 1, 2, or 3 Open Space (ICF International, 2012, Section 5.4.8 and 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. 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 could provide both breeding and foraging habitat for the species. Additional modeled habitat will be preserved, enhanced, and monitored west and south of Chesbro Reservoir (ICF International, 2012, Section 5.4.8).

Furthermore, the Implementing Entity will work to increase the population size of tricolored blackbird in the Action Area 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 habitat and will have at least 200 acres of foraging habitat within 2 miles. If adequate modeled foraging habitat is not 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. 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 (ICF International, 2012, Section 5.4.8).

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 and incentive programs as well as provide supplemental funds in the event that grants are unsuccessful (ICF International, 2012, Section 5.4.8).

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 may 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 Action Area (POND-10), and the estimated 52 acres of ponds created 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 (ICF International, 2012, Section 5.4.8).

In areas with nonnative vegetation (i.e., Himalayan blackberry) that support 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 Wildlife Agencies 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 site 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 could support marsh-like vegetation for the benefit of the species (ICF International, 2012, Section 5.4.8).

Acquisition, enhancement, and restoration/creation conservation actions identified for grasslands (see Plan Section 5.3.3), valley oak woodlands (see Plan Section 5.3.5), riparian forest and scrub (see Plan Section 5.3.6), and wetlands and ponds (see Plan Section 5.3.7) will benefit tricolored blackbirds through breeding, foraging, and year-round habitat conservation and management (ICF International, 2012. Section 5.4.8).

2.6.5 Cumulative Effects

As described in Section 1 of this Opinion, the Plan was developed in response to a biological opinion issued by the Service in 2001 to address the indirect and cumulative effects of several large-scale development and infrastructure projects in Santa Clara County. Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered in this Opinion because they will require separate consultation pursuant to section 7 of the Act. Many of the projects that are reasonably certain to occur in the Action Area will require future Federal actions and separate consultations under the Act and are thus not considered in this Opinion's cumulative effects analysis. Examples of these projects include the SCVWD's Three Creeks HCP, Pacific Gas and Electric Company's Bay Area Operations and Maintenance Habitat Conservation Plan, the California High-Speed Train System, and the SCVWD's Stream Maintenance Program. The remaining non-Federal actions that may occur in the Action Area are considered too speculative to evaluate at this point in time because there is no evidence of State or local approvals (i.e. permits, grants), obligation of venture capital, or initiation of contracts. Examples of these types of projects include rural development in the areas not subject to the Plan (see Plan Figure 2-5) and expansion beyond the City of Gilroy's current planning limit of urban growth. Subsequently, we are unable to analyze the cumulative effects of specific projects in the Action Area at this time.

Although we are unable to analyze cumulative effects associated with specific projects at this time, we do anticipate cumulative effects associated with climate change, as previously described in detail in Section 2.4.6.1 of this Opinion. The Plan's multi-level conservation strategy and monitoring and adaptive management program will minimize the anticipated effects of climate change.

2.6.6 Conclusion

After reviewing the current status of the western burrowing owl, least Bell's vireo, and tricolored blackbird; the environmental baselines for the Action Area; the effects of the proposed action, including all measures to avoid, minimize, and mitigate adverse effects; and the cumulative effects, it is the Service's biological opinion and conference opinion that issuance of an incidental take permit pursuant to section 10(a)(1)(B) of the Act is not likely to jeopardize the continued existence of the western burrowing owl, least Bell's vireo, and tricolored blackbird. Critical habitat for the least Bell's vireo has been designated in six counties in southern California, however, this action does not affect that area and no destruction or adverse modification of that critical habitat is anticipated. Critical habitat has been designated for the western burrowing owl or the tricolored blackbird, therefore, none will be affected.

2.7 San Joaquin Kit Fox

2.7.1 Status of the Species

Refer to the San Joaquin kit fox (*Vulpes macrotis mutica*) 5-Year Review: Summary and Evaluation (U.S. Fish and Wildlife Service, 2010b) for the current status of the species.

2.7.2 Environmental Baseline

The level to which the San Joaquin kit fox uses the Action Area for movement, foraging, or denning is uncertain. The species has been documented moving through the lowlands both east and south of the Action Area, and it is likely that individuals occasionally move into the Action Area. Of the 959 presumed extant occurrences of San Joaquin kit recorded in the CNDDB, 3 occurrences (0.3 percent) are located in the Action Area. These three documented occurrences were recorded between 1972 and 1975 and were derived from San Joaquin kit fox range maps (California Department of Fish and Game, 2012; Rahmig pers. comm, 2012, U.S. Fish and Wildlife Service, 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, including the Action Area. 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 (Swick,1973; 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 habitats appear to be different (Orloff *et al*., 1986). In addition, habitat features such as ground cover, dominant vegetation, land use practices, rainfall, and in some cases slope, are substantially different in the north than in the south, where San Joaquin kit foxes are more abundant and well-studied.

Due to the programmatic nature of the proposed action, the environmental baseline for the San Joaquin kit fox described in this Opinion relies heavily on the habitat model contained in Appendix D of the Plan, as supplemented by the occurrence data summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the San Joaquin kit fox and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Two types of secondary habitat were modeled in the Plan: (1) movement and foraging and (2) low-use movement. All grassland land cover types and seasonal wetlands and ruderal areas that are adjacent to grasslands are modeled as suitable movement and foraging habitat. Furthermore, valley oak/grasslands, blue oak woodland, and coast live oak woodlands within 500-feet of suitable grasslands are included in modeled movement and foraging habitat. These habitat parameters were only considered suitable 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. Modeled low-use movement habitat includes orchards, golf courses/urban parks, and ruderal areas that are connected to modeled movement and foraging habitat described above. Low-use movement habitat was modeled with the intent of capturing areas that individuals may use while moving between more suitable habitat types (ICF International, 2012, Appendix D).

There are 40,892 acres of modeled San Joaquin kit fox habitat (includes secondary and low-use secondary habitat) within the Action Area. Although not specified as such, some of this habitat may also be potential breeding habitat. A total of 6,315 acres (15 percent) of modeled habitat are located in Type 1, 2, or 3 Open Space with 5,067 acres (12 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.9).

The Nature Conservancy's Mount Hamilton Project includes land preservation throughout the southeastern portion of the Action Area. One of their target species for conservation is the San Joaquin kit fox.

The *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service, 1998c) includes a recovery strategy for the San Joaquin kit fox. The goal of the Recovery Plan is to maintain a viable metapopulation of kit foxes on private and public lands throughout the specie's range. The Recovery Plan does not identify conservation areas that overlap the Action Area. Likewise, the San Joaquin Kit Fox (*Vulpes macrotis mutica*) 5-Year Review: Summary and Evaluation (U.S. Fish and Wildlife Service, 2010b) does not identify any core, linkage, or satellite areas in the Action Area.

Despite this however, the Recovery Plan recommends 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. Because habitat fragmentation is a significant threat to the San Joaquin 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 should the species expand its breeding range in the future. Known breeding populations north of the Action Area represent the northernmost extent of the species' range. Maintaining connectivity between those populations and other known breeding populations south of the Action Area is critical to maintaining genetic diversity in the population. The southern portion of the Action Area is critical to maintaining this linkage (ICF International, 2012, Section 4.6.7).

2.7.3 Effects of the Action

Mortality, Injury, Harm, and Harassment: Due to the rarity of the species in the Action Area and the importance of maintaining all individuals that occur, the Applicants are not requesting incidental take authorization for the San Joaquin kit fox in the form of death or injury. Incidental take would be limited to harm or harassment (ICF International, 2012, Section 4.6.7), as discussed further below.

Implementation of Condition 18, described in Section 6.6.1 of the Plan, will avoid death and injury of the San Joaquin kit fox directly related to Covered Activities because it requires a qualified biologist to conduct a field evaluation of suitable breeding or denning habitat for the species for all Covered Activities that occur within modeled habitat. Condition 18 is based on the Service's *Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox prior to or during Ground Disturbance* (2011b). If the project does not fully avoid suitable dens, preconstruction surveys will be required. Suitable breeding habitat is considered to be avoided if the project footprint does not overlap with a suitable den or a 250-foot buffer around the suitable den.

When suitable dens cannot be avoided, a qualified biologist will conduct a preconstruction survey in suitable breeding or denning habitat prior to any ground disturbance. These surveys will document the presence or absence of suitable San Joaquin kit fox den sites and evaluate their use through methods appropriate for the northern portion of the species' range. Surveys will conclude no more than two calendar days prior to construction. The status of all dens will be determined and mapped, and preconstruction survey results will be submitted to the Wildlife Agencies within two

calendar days after survey completion and before the start of ground disturbance (ICF International, 2012, Section 6.6.1).

If preconstruction surveys identify San Joaquin kit foxes and/or suitable dens, avoidance measures described in Condition 18 of the Plan will be implemented to avoid death or injury. In summary, avoidance measures will include monitoring of dens, destroying unoccupied dens, notifying the Wildlife Agencies of natal or pupping dens, implementing construction and operational requirements from the *Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox prior to or during Ground Disturbance* (U.S. Fish and Wildlife Service, 2011b) or the latest guidelines, and demarcating exclusion zones of active or suitable dens.

If construction takes place while dens are occupied, a qualified biologist will be present to ensure compliance with the avoidance measures summarized above. The frequency of monitoring will be reviewed and approved by Wildlife Agencies and will be based on the frequency and intensity of construction activities and the likelihood of disturbance to the active dens (ICF International, 2012, Section 6.6.1).

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 foxes on roadways. This potential indirect effect however, is anticipated to be minimal given the rarity of the species in the Action Area and the minimization measures discussed in Sections 2.4.3.1 and 2.4.3.3 of this Opinion. As previously indicated, the Reserve System will be designed to minimize exposure of Covered Species to adjacent incompatible land uses, including roadways, and includes many conservation measures to increase connectivity throughout the Action Area (i.e. road crossings, median barrier perforation, etc.). Furthermore, the Implementing Entity will identify 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 during the design and construction of future road improvements. Improvements will include removal or perforation of sections of median barriers along roadways to facilitate successful wildlife crossings and, if biologically appropriate, installation of fencing or other features to direct wildlife to those open sections (LM-5) (ICF International, 2012, Section 5.4.9).

Covered Activities may indirectly result in the harm or harassment of the San Joaquin kit fox. Covered Activities that occur along the Pacheco Creek corridor and in the portion of the Action Area south of Henry W. Coe State Park have the most potential to affect the San Joaquin kit fox. For example, Covered Activities that require the excavation of burrows or removal California ground squirrel colonies may degrade kit fox habitat by removing denning opportunities and reducing the prey base. Avoidance measures previously described under Condition 18, may also serve as minimization measures that will greatly reduce the likelihood of harm and harassment to the species.

The Plan further minimizes harm and harassment of the San Joaquin kit fox by limiting effects on modeled habitat during the permit term. A maximum of 198 acres of modeled secondary kit fox habitat (less than 1 percent of modeled habitat in the Action Area) will be permanently removed or degraded and a maximum of 46 acres (less than 1 percent of

modeled habitat in the Action Area) will be temporarily affected by Covered Activities. A maximum of 28 acres of modeled secondary (low use) kit fox habitat (1 percent of modeled habitat in the Action Area) will be permanently removed or degraded and a maximum of 6 acres (less than 1 percent of modeled habitat in the Action Area) will be temporarily affected by Covered Activities (ICF International, 2012, Table 4-4).

To further minimize indirect effects to the San Joaquin kit fox's prey base, the Implementing Entity will cease the use of rodenticides within the Reserve System except when necessary to maintain structures (i.e., 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). This will ensure California ground squirrels and other rodents are as abundant as possible within the Reserve System (ICF International, 2012, Section 5.4.9).

The Applicants will mitigate unavoidable direct and indirect effects to San Joaquin kit fox habitat by preserving modeled habitat. 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 Action Area to approximately 22 percent as Type 1 Open Space and 25 percent as Type 1, 2, or 3 Open Space (ICF International, 2012, Section 5.4.9 and Table 5-17).

The Implementing Entity will protect annual grassland and associated oak woodland land cover types north and south of SR 152, east of the SR 152/156 interchange (LAND-G9). This portion of the Action Area has the highest potential to support the San Joaquin kit fox. Land acquisition along Pacheco Creek would benefit the species by preserving likely movement routes, foraging habitat, and potential denning 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. This will ensure that roadway enhancements intended to increase connectivity in the Action Area will connect suitable habitat on both sides of the intended corridor (ICF International, 2012, Section 5.4.9).

Furthermore, acquisition, enhancement, and restoration of grasslands (see Plan Section 5.3.3), oak woodlands (see Plan Section 5.3.5), riparian forest and scrub (see Plan Section 5.3.6), and seasonal wetlands (see Plan Section 5.3.7) in the southern portion of the Action Area are expected benefit to San Joaquin kit fox through foraging and movement habitat conservation and management.

Several grassland restoration and enhancement techniques will also 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 facilitate colonization by ground squirrels within the Reserve System (GRASS-6) (ICF International, 2012, Section 5.4.9).

The Plan's conservation strategy for the San Joaquin kit fox is consistent with the Recovery Plan (U.S. Fish and Wildlife Service, 1998c). Because the Action Area is outside the three San Joaquin kit fox core areas[98], land acquisition and habitat enhancement focuses on building connections between more isolated satellite populations in order to contribute to the Recovery Plan's *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," (U.S. Fish and Wildlife Service, 1998c). 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, 1998c).

In accordance with the Recovery Plan's (U.S. Fish and Wildlife Service, 1998c) *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. 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 Action Area. Additional Reserve lands will be acquired between Henry W. Coe State Park and San Felipe Lake that may also benefit the species. The Reserve System configuration will ensure that the species is able to fully utilize the lowland hills of the Diablo Range if individuals are able to cross SR 152. Furthermore, consistent with Recovery Plan's *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) (U.S. Fish and Wildlife Service, 1998c).

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, 1998c). The Implementing Entity will work to influence land-uses that are compatible with kit fox movement. To do this, it will conduct a public education campaign in the southeastern portion of the Action to provide landowners with information about management and land use techniques that are compatible with the ecological needs of the San Joaquin kit fox (GRASS-10) (ICF International, 2012, Section 5.4.9).

2.7.4 Cumulative Effects

As described in Section 1 of this Opinion, the Plan was developed in response to a biological opinion issued by the Service in 2001 to address the indirect and cumulative effects of several large-scale development and infrastructure projects in Santa Clara County. Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered in this Opinion because they

98 Carrizo Plain Natural Area, Natural lands of western Kern County, and Fresno and eastern San Benito Counties (U.S. Fish and Wildlife Service 1998c)

will require separate consultation pursuant to section 7 of the Act. Many of the projects that are reasonably certain to occur in the Action Area will require future Federal actions and separate consultations under the Act and are thus not considered in this Opinion's cumulative effects analysis. Examples of these projects include the SCVWD's Three Creeks HCP, Pacific Gas and Electric Company's Bay Area Operations and Maintenance Habitat Conservation Plan, the California High-Speed Train System, and the SCVWD's Stream Maintenance Program. The remaining non-Federal actions that may occur in the Action Area are considered too speculative to evaluate at this point in time because there is no evidence of State or local approvals (i.e. permits, grants), obligation of venture capital, or initiation of contracts. Examples of these types of projects include rural development in the areas not subject to the Plan (see Plan Figure 2-5) and expansion beyond the City of Gilroy's current planning limit of urban growth. Subsequently, we are unable to analyze the cumulative effects of specific projects in the Action Area at this time.

Although we are unable to analyze cumulative effects associated with specific projects at this time, we do anticipate cumulative effects associated with climate change, as previously described in detail in Section 2.4.6.1 of this Opinion. The Plan's multi-level conservation strategy and monitoring and adaptive management program will minimize the anticipated effects of climate change.

2.7.5 Conclusion

After reviewing the current status of San Joaquin kit fox, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the issuance of an incidental take permit pursuant to section 10(a)(1)(B) of the Act, as proposed, is not likely to jeopardize the continued existence of the San Joaquin kit fox. No critical habitat has been designated for this species, therefore, none will be affected.

2.8 Loma Prieta Hoita

2.8.1 Status of the Species

Loma Prieta Hoita is not currently listed under the Act nor does it have designated critical habitat. Loma Prieta hoita is an herbaceous plant measuring up to three feet tall with three leaflets per leaf and dense terminal clusters of purple flowers. A detailed description of the species' physical characteristics can be found in Abrams (1944), Munz (1959), and Hickman (1993).

Loma Prieta hoita is endemic to California, where it 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. There are **30** known occurrences of Loma Prieta hoita presumed to be extant in the CNDDB (California Department of Fish and Game, 2012; Gaffney pers. comm., 2012e).

Of the **30** known extant occurrences, **21** have population estimates, most of which are from 2004–2006. They range from 20 to 3,000 individuals and total **approximately 7,850** (California Natural Diversity Database, 2012; ICF International, 2012, Section 4.6.9).

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. The species sometimes occurs in chaparral or on serpentine (California Department of Fish and Game, 2012). It also often occurs in the riparian zone. Populations generally consist of 1 to several stands composed of 100 to 1,000 plants (California Department of Fish and Game, 2012).

Few threats are known for the Loma Prieta hoita. Occurrences located on roadsides or in power line rights-of-ways are subject to vegetation clearing. At least one population is subject to cattle grazing, livestock trampling, and feral pig rooting, and at least one population may be threatened by development.

2.8.2 Environmental Baseline

Of the **30** occurrences of Loma Prieta hoita currently known within its range, approximately 47 percent (14 occurrences) are documented in the Action Area (California Department of Fish and Game, 2012). Three occurrences are located in Almaden Quicksilver County Park (CNDDB occurrences 5[99], 23, and 24). An occurrence consisting of three colonies was reported from Santa Teresa County Park (CNDDB occurrence #6). Two occurrences were reported from the hills east of Coyote Creek, one on private land and one on land of unknown ownership (CNDDB occurrences 10 and 11 respectively). Three occurrences were reported from Rancho Cañada del Oro Open Space Preserve (CNDDB occurrences 13, 25, and 26). One occurrence was reported in the vicinity of Chesbro Reservoir (CNDDB occurrence #16). One occurrence was reported from along Javelina Loop Trail in Calero County Park (CNDDB occurrence #22). **Two new occurrences were added from field data collected by Tom Cochrane and John Falkowski at Santa Clara County Parks in the Rancho San Vicente property at Calero County Park. A third new occurrence was documented in Rancho Cañada del Oro Open Space preserve** (Donovan pers. comm., 2013; ICF International, 2013, Exhibit A).

Although the CNDDB reports that the species sometimes occurs in chaparral (California Department of Fish and Game, 2012), within the Action Area, it seems to occur primarily on serpentine and secondarily on non-serpentine land cover types (Hillman pers. comm., as cited in ICF International, 2012, Appendix D).

Due to the programmatic nature of the proposed action, the environmental baseline for the Loma Prieta hoita described in this Opinion relies heavily on the habitat model

99 CNDDB occurrences 5 and 27 are assumed to be the same occurrence (Gaffney pers. comm., 2012e).

contained in Appendix D of the Plan, as supplemented by the site-specific occurrence information summarized above. The model will be updated and maintained by the Implementing Entity throughout the permit term (ICF International, 2012, Section 8.6). The habitat model was designed to estimate the extent and location of key habitat characteristics of the Loma Prieta hoita and to be repeatable and scientifically defensible, while remaining as simple as possible. The model is a spatially-explicit, GIS-based "expert opinion model" based on the identification of land cover types that provide important habitat for the species (ICF International, 2012, Table 3-5). See Section 3.3.3 of the Plan (ICF International, 2012) for a detailed discussion of the model development methodology, data sources, and uses and limitations. Conservative estimates of habitat parameters were used to account for model limitations (i.e. minimum mapping resolution), which likely resulted in an overestimation of the actual extent of suitable habitat for this species, but this methodology is consistent with current conservation planning practices when data are limited (Noss *et al*., 1997).

Both primary and secondary habitat were modeled in the Fremont-Livermore Hills and Valleys, Leeward Hills, Santa Cruz Mountains, Western Diablo Range, and the Diablo Range ecoregion subsections. Modeled primary habitat is defined as mixed oak woodland and coast live oak forest and woodland between 100 and 2,000 feet on slopes with all degrees of steepness and in all soil types but primarily on serpentine soils. Modeled secondary habitat is defined as northern mixed chaparral/chamise chaparral and mixed serpentine chaparral between 0 and 2,000 feet on slopes with all degrees of steepness. Northern mixed chaparral applies in all soil types (ICF International, 2012, Appendix D). There are 121,871 acres of Loma Prieta hoita modeled habitat (primary and secondary) within the Action Area. A total of 38,667 acres (32 percent) of modeled habitat are located on Type 1, 2, or 3 Open Space with 17,276 acres (14 percent) permanently protected as Type 1 Open Space (ICF International, 2012, Section 5.4.15 and Table 5-17).

There are no known conservation actions in the Action Area targeting the Loma Prieta hoita. Although almost half of the current known occurrences are in the Action Area, preservation of all of the occurrences in the Action Area does not appear to be critical to the species' survival and recovery needs at this time. There is no evidence that they are genetically distinct from other populations in the known range, and they do not define the extent of the species' range.

2.8.3 Effects of the Action

Mortality and Injury: Loma Prieta hoita could be affected by any of the Covered Activities; however, it is most likely to be affected by rural residential development. Rural residential development is expected to remove suitable habitat for this species, particularly in the Santa Cruz Mountains and in some of the low hills east of U.S. 101 that are unprotected. The increase in infrastructure that is associated with rural development (i.e., roads, water conveyance) is expected to permanently remove suitable habitat and could kill individuals if they are not discovered prior to construction. Operations and maintenance activities that require accessing areas off of established roadways could crush individuals. If such activities require vegetation clearing or ground

disturbance, individuals and populations could be removed. Additionally, Plan implementation activities, such as controlled burns and livestock grazing, could temporarily adversely affect the species. The Plan also includes many types of monitoring, which could occasionally affect individual plants through trampling or soil disturbance. In both cases however, benefits from Plan implementation are expected to greatly outweigh any negative effects of implementation.

The Plan minimizes direct effects on the Loma Prieta hoita by limiting the number of occurrences whereby long-term viability is threatened or reduced by Covered Activities (ICF International, 2012, Section 4.4.1 and Table 5-16). For the purposes of this Opinion, we refer to these occurrences as "lost." No occurrences of Loma Prieta hoita will be lost as a result of Covered Activities if additional occurrences are not discovered during the permit term (ICF International, 2012, Table 4-6).

It is possible that newly discovered occurrences of this species could be affected by Covered Activities during Plan implementation. A maximum of two additional new occurrences (i.e., occurrences not yet known) may be affected by Covered Activities if additional occurrences are protected in accordance with Table 6 below and Section 5.3.1 of the Plan, subheading *Incorporating Covered Plant Species*. For each additional occurrence affected, occurrences of equivalent or better condition must be protected within the Reserve System (ICF International, 2012, Section 4.6.8). If additional occurrences are found during the permit term, effects may increase as described in Table 6 below as long as new occurrences are found and protected in the Reserve System before the effects occur (ICF International, 2012, Section 4.4.1), at a 2:1 mitigation ratio. Condition 20 of the Plan requires surveys for Loma Prieta hoita in mixed oak woodland and forest with serpentine soils and coast live oak forest and woodland with serpentine soils, which will assist in detecting new occurrences in the Action Area (ICF International, 2012, Section 6.6.2).

Table 6[1]: Loma Prieta Hoita Occurrences, Plan Impact Limits, and Conservation Requirements

Occurrences in the Action Area During Plan Implementation[2]		Occurrence Impacts and Conservation				Total Occurrences Protected in Reserve System	
Additional Occurrences Found (Relative to Baseline)	Total in Action Area	Total Maximum Permanently Affected[3]	Protected per Mitigation Ratio (2:1)	Protection to Contribute to Recovery[4]	Total Protected in Reserve System[5]	Acquired	Allowable Creation in Lieu of New Occurrence Acquisition[6]
0	14	0	0	4	4	4	-
3	17	1	2		6	6	-
6	20	2	4		8	8	-

[1]Adapted from Table 5-16 (ICF International, 2012)

[2] These columns represent the minimum number of occurrences that must be known in the Action Area before impacts described in the subsequent column can occur. The first row accounts for the occurrences known at the time of permit issuance. Subsequent rows account for additional occurrences found during the permit term. New plant occurrences found in the expanded burrowing owl study are do not count.

[3] Occurrences are considered permanently affected if a qualified biologist determines that occurrence viability will be threatened or reduced as a result of Covered Activities (ICF International, 2012; Section 6.6.2, Condition 20).

[4] Recovery actions will occur regardless of the level of impact.

[5] The first row in this column represents the minimum requirement of acquisition and creation regardless of the number of occurrences affected under the Plan.

[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 for the Coyote Ceanothus (ICF International, 2012, Section 4.6.8). For occurrence preservation, priority will always be given to acquisition, however, if acquisition is infeasible, creation is allowed as stipulated in Section 5.4 of the Plan. The decision to focus conservation efforts on occurrence creation will be made jointly with the Wildlife Agencies. Creation will be completed by Year 40, and acquisition will be completed by Year 45.

Regardless of the level of effect, 4 occurrences will be acquired or added to the Reserve System. Of these, three occurrences will be permanently protected by the inclusion of portions of Santa Teresa, Almaden Quicksilver, and Calero County Parks (see Plan 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 the County Motorcycle Park (ICF International, 2012, Section 5.4.15).

As described in Chapter 4 of the Plan, the Plan's 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 2 occurrences have to be acquired prior to any newly discovered occurrence being affected. In other words, a minimum of 2 occurrences will be acquired and protected in the Reserve System before the 1st occurrence is affected and a minimum of 4 occurrences will be acquired and protected in the Reserve System before the 2nd occurrence is affected. "Minimums" are referenced here because the Implementing Entity will protect 4 occurrences, regardless of effects. The timing of these recovery efforts are not linked to effects. When accounting for the 1 occurrence that is currently protected in the Action Area (ICF International, 2012, Table 4-6), 5-9 occurrences will be protected in the Action Area after the Plan is fully implemented.

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) (ICF International, 2012, Section 5.4.15).

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 (ICF International, 2012, Section 5.4.15).

Plant Habitat Loss and Degradation: Operations and maintenance activities that require accessing areas off of established roadways could alter and degrade suitable habitat for this species. Vegetation clearing or ground disturbance, could remove suitable habitat.

In addition to the occurrence-level effects allowed under the Plan, a maximum of 2,117 acres (2 percent) of primary modeled habitat may be permanently affected and 413 acres (less than 1 percent) may be temporarily affected. A maximum of 266 acres (1 percent) of modeled secondary habitat may be permanently affected and 60 acres (less than 1 percent) may be temporarily affected (see Plan Table 4-4). The Plan's impact limits will minimize the extent of habitat loss and degradation.

In addition to the mitigation of plant occurrences described in Table 6 above, the Applicants will mitigate unavoidable direct and indirect effects on Loma Prieta hoita habitat by preserving 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 Action Area to approximately 26 percent in Type 1 Open Space and 40 percent in Type 1, 2, or 3 Open Space (ICF International, 2012, Section 5.4.15 and Table 5-17).

Loma Prieta hoita is also expected to benefit from the 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 Plan Section 5.3.4), oak and conifer woodlands (see Plan Section 5.3.5), and mixed riparian forest and woodland (see Plan Section 5.3.6).

2.8.4 Cumulative Effects

As described in Section 1 of this Opinion, the Plan was developed in response to a biological opinion issued by the Service in 2001 to address the indirect and cumulative effects of several large-scale development and infrastructure projects in Santa Clara County. Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered in this Opinion because they will require separate consultation pursuant to section 7 of the Act. Many of the projects that are reasonably certain to occur in the Action Area will require future Federal actions and separate consultations under the Act and are thus not considered in this Opinion's cumulative effects analysis. Examples of these projects include the SCVWD's Three Creeks HCP, Pacific Gas and Electric Company's Bay Area Operations and Maintenance

Habitat Conservation Plan, the California High-Speed Train System, and the SCVWD's Stream Maintenance Program. The remaining non-Federal actions that may occur in the Action Area are considered too speculative to evaluate at this point in time because there is no evidence of State or local approvals (i.e. permits, grants), obligation of venture capital, or initiation of contracts. Examples of these types of projects include rural development in the areas not subject to the Plan (see Plan Figure 2-5) and expansion beyond the City of Gilroy's current planning limit of urban growth. Subsequently, we are unable to analyze the cumulative effects of specific projects in the Action Area at this time.

Although we are unable to analyze cumulative effects associated with specific projects at this time, we do anticipate cumulative effects associated with climate change, as previously described in detail in Section 2.4.6.1 of this Opinion. The Plan's multi-level conservation strategy and monitoring and adaptive management program will minimize the anticipated effects of climate change.

2.8.5 Conclusion

After reviewing the current status of the Loma Prieta hoita; the environmental baseline for the Action Area; the effects of the proposed action, including all measures to avoid, minimize, and mitigate adverse effects; and the cumulative effects, it is the Service's conference opinion that issuance of an incidental take permit pursuant to section 10(a)(1)(B) of the Act is not likely to jeopardize the continued existence of the Loma Prieta Hoita.

3. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan and its associated documents clearly identify anticipated effects on Covered Species and the measures that will be taken to minimize those effects. The Plan's conservation strategy (Chapter 5), Conditions on Covered Activities (Chapter 6), and monitoring and adaptive management

program (Chapter 7), together with the terms and conditions described in the Implementing Agreement and the section 10(a)(1)(B) permit issued with respect to the proposed Plan, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR §402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the Applicants fail to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The anticipated amount or extent of the incidental take and associated reporting requirements are described in the Plan and its accompanying section 10(a)(1)(B) permit.

Section 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

3.1 Amount or Extent of Take

The Service anticipates incidental take of the following Covered Species, currently listed under the Act, during the 50-year permit term: Bay checkerspot butterfly, California tiger salamander, California red-legged frog, least Bell's vireo, and San Joaquin kit fox. Incidental take in terms of numbers of individuals may be difficult to detect because of population dynamics, small body size, seasonal fluctuations in populations, and habitat type (i.e. underground burrows). However, take of these listed species can be anticipated by loss or degradation of suitable habitat modeled under the Plan, as summarized in Table 7 below. Anticipated take of the Bay checkerspot butterfly, California tiger salamander, and California red-legged frog will be in the forms of death, injury, harm, and harassment. Take of the least Bell's vireo and San Joaquin kit fox will be limited to harm and harassment. No take in the form of direct death or injury is anticipated for these two species, as indicated in Sections 2.6.4.2 and 2.7.3 of this Opinion, respectively.

Similarly, the Service anticipates incidental take of the following Covered Species, currently not listed under the Act, during the 50-year permit term: foothill yellow-legged frog, western pond turtle, western burrowing owl, and tricolored blackbird. Incidental take in terms of numbers of individuals may be difficult to detect because of population dynamics, small body size, seasonal fluctuations in populations, and habitat type (i.e. flowing streams). However, take of these non-listed species can be anticipated by loss or degradation of suitable habitat modeled under the Plan, as summarized in Table 7 below. Anticipated take of the foothill yellow-legged frog and western pond turtle will be in the forms of death, injury, harm, and harassment. As indicated in Section 2.6.4.1 of this Opinion, until a positive growth trend is achieved in the western burrowing owl's population, take will be primarily limited to loss and degradation of modeled habitat, as described in Table 7 below. The Service anticipates that direct take of individual owls, in the form of mortality and injury, will occur once the positive growth trend goal is achieved. The number of individuals anticipated to be taken, in excess of those necessary to maintain the positive growth trend, will be based on the best available scientific data and determined by the Wildlife Agencies and the Implementing Entity on an annual basis during Plan implementation. See Section 2.6.4.1 of this Opinion for more details. Take of the tricolored

blackbird will be limited to harm and harassment. No take in the form of direct death or injury is anticipated for the tricolored blackbird, as indicated in Section 2.6.4.3 of this Opinion. Take for this species will be limited to harm and harassment.

Table 7. Maximum Allowable Permanent and Temporary Effects on Covered Species Modeled Habitat[1]

Species and Habitat Type	Maximum Allowable Permanent Effect on Modeled Habitat from Covered Activities (acres)	Maximum Allowable Temporary Effect on Modeled Habitat from Covered Activities (acres)
Bay checkerspot butterfly		
Primary	300	54
California tiger salamander (Central California DPS)		
Breeding	77	14
Non-Breeding	12,855	1,529
Total	12,932	1,543
California red-legged frog		
Primary	299	116
Secondary	12,937	1,489
Total	13,236	1,605
Foothill yellow-legged frog (length in miles)		
Primary	1.9	0.7
Secondary	4.8	1.3
Total	6.7	2.0
Western pond turtle		
Primary	1,824	440
Secondary	7,825	986
Total	9,649	1,426
Western burrowing owl[2]		
Occupied Nesting	198	20
Potential Nesting	4,000	604
Overwintering	9,671	762
Total	13,869	1,385
Least Bell's vireo[3]		
Primary	72	43
Tricolored blackbird[2]		
Primary	276	93
Secondary	10,317	768
Total	10,593	861

Species and Habitat Type	Maximum Allowable Permanent Effect on Modeled Habitat from Covered Activities (acres)	Maximum Allowable Temporary Effect on Modeled Habitat from Covered Activities (acres)
San Joaquin kit fox		
Secondary	198	46
Secondary (Low Use)	28	6
Total	226	52

1 Adapted from Plan Table 4-4 (ICF International, 2012)
2 Since the western burrowing owl and tricolored blackbird are not currently listed, take prohibitions pursuant to the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712) (MBTA) will apply until such time that these species are listed during the permit term. If listed during the permit term, the section 10(a)(1)(B) permit will serve as a Special Purpose Permit under the MBTA for a 3-year term, subject to renewal. The Service will not refer the incidental take of these migratory birds for the prosecution under the MBTA, if such take is in compliance with the permit, Implementing Agreement, and Plan.
3 The least Bell's vireo is currently listed under the Act, therefore, the section 10(a)(1)(B) permit will serve as a Special Purpose Permit under the MBTA for a 3-year term, subject to renewal. The Service will not refer the incidental take of the least Bell's vireo for the prosecution under the MBTA, if such take is in compliance with the permit, Implementing Agreement, and Plan.

3.2 Effect of the Take

The Service has determined that the anticipated level of take is not likely to result in jeopardy to the Plan's Covered Species or destruction or adverse modification of critical habitat.

3.3 Reasonable and Prudent Measures

The Service believes that implementation of the entire Santa Clara Valley Habitat Plan constitutes reasonable and prudent measures necessary and appropriate to minimize take of the following Covered Species, currently listed under the Act: Bay checkerspot butterfly, California tiger salamander, California red-legged frog, least Bell's vireo, and San Joaquin kit fox. The following chapters of the Plan will specifically minimize the take of Covered Species:

- Conservation Strategy (Chapter 5)
- Conditions on Covered Activities and Application Process (Chapter 6)
- Monitoring and Adaptive Management Program (Chapter 7)

The Service believes these reasonable and prudent measures are also necessary and appropriate to minimize take of the following Covered Species, currently not listed under the Act: foothill yellow-legged frog, western pond turtle, western burrowing owl, and tricolored blackbird.

3.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the following terms and conditions must be followed, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

The Service must be notified within one (1) working day of finding any injured or dead listed species or within one (1) working day of any unanticipated damage to habitat. Injured animals shall be cared for by a licensed veterinarian or other qualified person. Notification must include the date, time, and precise location of the individual/incident clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. Dead individuals must be sealed in a Zip-lock® plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it. The bag containing the specimen must be frozen in a freezer located in a secure site. The Service contact persons are the Conservation Planning Division Chief of the Endangered Species Program at the Sacramento Fish and Wildlife Office at (916) 414-6600; and the Resident Agent-in-Charge of the Service's Division of Law Enforcement, 5622 Price Avenue, Building #1040, McClellan, California 95652, at (916) 569-8444. The CDFW contact is the Bay Delta Region at (707) 944-5500.

The Applicants shall conduct monitoring and adaptive management as described in Chapter 7 of the Plan and submit an annual report to the Service in accordance with Section 8.11 of the Plan. 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. The report shall be submitted to the Chief of the Conservation Planning Division, at the Sacramento Fish and Wildlife Office, Endangered Species Division, 2800 Cottage Way, Room W-2605, Sacramento, 95825-1846.

4. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service has no conservation recommendations for the proposed action considered in this Opinion.

5. REINITIATION NOTICE

This concludes formal consultation and conference on the proposed issuance of a section 10(a)(1)(B) permit to implement the Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan in Santa Clara County, California and small portions of Alameda and San Mateo Counties, California to implement the Plan's western burrowing owl conservation strategy. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that

may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any activities causing such take must cease, pending reinitiation. A reinitiated consultation shall take into consideration the assurances that the Applicants will receive in accordance with the "No Surprises" regulations [50 CFR §17.22(b)(5) and §17.32(b)(5)].

The Service may confirm the conference opinion as a biological opinion issued through formal consultation if currently non-listed Covered Species are listed or critical habitat is designated. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference opinion, the Service will confirm the conference opinion as a biological opinion on the project and no further section 7 consultation will be necessary.

The Incidental Take Statement provided in this conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the foothill yellow-legged frog, western pond turtle, western burrowing owl, or tricolored blackbird has occurred. Modifications of the Opinion and incidental take statement may be appropriate to reflect that take. No take of the foothill yellow-legged frog, western pond turtle, western burrowing owl, and tricolored blackbird may occur between the listing of these species and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

If you have any questions regarding this Opinion, please contact Cori Mustin, Senior Fish and Wildlife Biologist, or Mike Thomas, Conservation Planning Division Chief, at the letterhead address, by telephone (916) 414-6600, or by electronic mail at Cori_Mustin@fws.gov or Mike_Thomas@fws.gov.

cc:
Scott Wilson, California Department of Fish and Wildlife, Napa, California

6. LITERATURE CITED

Abrams, L. 1944. Illustrated Flora of the Pacific States, Volume II: Polygonaceae to Krameriaceae. Stanford: Stanford University Press.

_____. 1951. Illustrated Flora of the Pacific States, Volume III: *Geraniaceae* to *Scrophulariaceae*. Stanford, CA: Stanford University Press.

Abrams, L. and R.M. Ferris. 1960. Illustrated Flora of the Pacific States, Washington, Oregon, and California, Volume IV: *Bignoniaceae* to *Compositae*. Stanford: Stanford University Press.

Adger, P., Aggarwal, S. Agrawala, J.Alcamo, A. Allali, O. Anisimov, N. Arnell, M. Boko, O.Canziani, T. Carter, G. Cassa, U. Confalonieri, R. Cruz, E.de Alba Alcaraz, W. Eastreling, C. Field, A. Fischlin, B. Fitzharris, C.G. Garcia, C. Hanson, H. Harasawa, K. Hennessy, S.Huq, R. Jones, L. K. Bogataj, D. Karoly, R. Kliein, Z. Kundzewicz, M. Lal, R. Lasco, G. Love, X. Lu, G. Magrin, L.J. Mata, R. McLean, B. Menne, G. Midgley, N. Mimura, M.Q. Mirza, J. Moreno, L. Mortsch, I. Niang-Diop, R. Nichols, B. Novaky, L. Nurse, A. Nyon, M. Oppenheimer, J. Palutikof, M. Parry, A. Patwardhan, P.R. Lankao, C. Rosenzweig, S. Schneider, S. Semenov, J. Smith, J. Stone, J van Ypersele, D. Vaughan, C. Vogel, T. Wilbanks, P.Wong, S. Wu, and G. Yohe. 2007. Working Group II Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report. Climate Change 2007: Climate change impacts, adaptation and vulnerability. Brussels, Belgium. Available at http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg2_report_impacts_adaptation_and_vulnerability.htm

Agrawal S.B. and M. Agrawal. 1991. Effect of Sulphur Dioxide Exposure on Chlorophyll Content and Nitrogenase Activity of *Vicia faba* L. Plants. Environmental Contamination and Toxicology, 47, 770-774.

Albion Environmental, Inc. 2000. Burrowing Owl Status in the City of San Jose in 2000. Unpublished report.

_____. 2008. 2008 Nesting Burrowing Owl Survey. Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP). Unpublished report.

_____. Unpublished data. Summary of Burrowing Owl Surveys in the Santa Clara Valley HCP/NCCP Area in 2009.

Anderson, J.D. 1968. A Comparison of the Food Habits of Ambystoma Macrodactylum Sigillatum, Ambystoma Macrodactylum Croceum, and Ambystoma Tigrinum Californiense. Herpetologica, 24(4), 273-284.

Anderson, P.R. 1968. The Reproductive and Developmental History of the California Tiger Salamander. Fresno State College.

Ashley, E.P. and J.T. Robinson. 1996. Road Mortality of Amphibians, Reptiles and Other Wildlife on the Long Point Causeway, lake Erie, Ontario. Canadian Field-Naturalist, 110(3), 403-412.

Auerbach, N.A, M.D. Walker, and D.A. Walker. 1997. Effects of Roadside Disturbance on Substrate and Vegetation Properties in Arctic Tundra. Ecological Applications, 7, 218-235.

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.

_____. 2008. A Simple Artificial Burrow Design for Burrowing Owls. Journal of Raptor Research, 42, 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.

Barclay, J.H., N.M. Korfanta, and M.J. Kauffman. 2011. Long-Term Population Dynamics of a Managed Burrowing Owl Colony. The Journal of Wildlife Management, 75, 1295-1306.

Barratt, D.G. 1997. Home Range Size, Habitat Utilization and Movement Patterns of Suburban and Farm Cats *Felis Catus*. Ecography, Vol. 20, Number 3, 271-280.

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, 159-164.

Beedy, E.C. and W.J. Hamilton III. 1997. Tricolored Blackbird Status Update and Management Guidelines. Jones & Stokes Associates, Inc.

_____. 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.

Bell, H. 1994. Analysis of Habitat Characteristics of San Joaquin Kit Fox in Its Northern Range. Master's Thesis, California State University, Hayward.

Bell, J.L., L.C. Sloan, and M.A. Snyder. 2004. Regional Changes in Extreme Climate Events: A Future Climate Scenario. American Meteorological Society, 17, 81-87.

Bent, A. 1938. Life Histories of North American Birds of Prey: Hawks, Falcons, Caracaras, Owls. New York: Dover Publications, Inc.

Bevill, R.L, S.M. Louda, and L.M. Stanforth. 1999. Protection from Natural Enemies in Managing Rare Plant Species. Conservation Biology, 1323-1331.

Bird, B.L., L.C. Branch, and D.L. Miller. 2004. Effects of Coastal Lighting on Foraging Behavior of Beach Mice. Conservation Biology, 1435-1439.

Bourque, R. 2008. Spatial Ecology of an Inland Population of the Foothill Yellow-Legged Frog (*Rana boylii*) in Tehama County, California. Master's Thesis. Humboldt State University.

Bousman, B. and K. Smith. 2006. Santa Clara County Bird List. Retrieved January 12, 2012, from South Bay Birders Unlimited: http://www.stanford.edu/~kendric/birds/SCLists/SCList06.html

Bousman, W. 2007. Breeding Bird Atlas of Santa Clara County, California. Cupertino, CA: Santa Clara Valley Audubon Society.

Bowles, A.E. 1995. Responses of Wildlife to Noise. In R.A. Knight (Ed.), Wildlife and Recreationists: Coexistence Through Management and Research (pp. 109-156). Covelo, California: Island Press.

Buchanan, B.W. 1993. Effects of Enhanced Lighting on the Behavior of Nocturnal Frogs. Animal Behavior, Vol 45, 893-899.

Buck, R.E., D.W. Taylor, and A.R. Kruckeberg. 1993. *Streptanthus*. In J. H. (Ed.). The Jepson Manual: Higher Plants of California (pp. 439-444). Berkeley: University of California Press.

Buckingham, J. 2003. Biological Resources Studies Conducted for Carnegie State Vehicle Recreation Area in 2003.

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.

Burger, J. and M. Gochfeld. 1998. Effects of Ecotourists on Bird Behavior at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation, 25, 13-21.

Bury, B. 1986. Reptiles Feeding Ecology of the Turtle, *Clemmys marmorata*. Journal of Herpetology, 20, 515-521.

Bury, R.B and J.A. Whelan. 1984. Ecology and Management of the Bullfrog. Fish and Wildlife Service Resource Publication 155.

California Department of Fish and Game. 1990. California's Wildlife (Vol. II. Birds). D. Zeiner, W. Laudenslayer, K. Mayer , and M. White (Eds.).

_____. 2012. California Natural Diversity Database: Rarefind4. Retrieved 2012, from http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp

California Native Plant Society. 2010. Inventory of Rare and Endangered Plants. Retrieved December 23, 2011, from CNPS California Native Plant Society: http://www.rareplants.cnps.org/

Carpenter S.R., N.F. Caraco, D.L. Correll, R.W. Howarth, A.N. Sharpley, V.H. Smith. 1998. Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen. Ecological Applications, Vol. 8, No. 3, 559-568.

Carr, L.W. and L. Fahrig. 2001. Effect of Road Traffic on Two Amphibian Species of Differing Vagility. Conservation Biology, 15(4), 1071-1078.

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 CA Endangered Species Act.

Center for Watershed Protection. 2003. Impacts of Impervious Cover on Aquatic Systems.

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.

_____. 2008. Scoping Report: Santa Clara County Environmental Impact Report/Environmental Impact Statement.

Chin A. and K.J. Gregory. 2001. Urbanization and Adjustment of Ephemeral Stream Channels. Annals of the Association of American Geographers, Vol. 91, No. 4, 595-608.

City of Gilroy. 2002. General Plan. Retrieved January 12, 2012, from City of Gilroy: http://www.cityofgilroy.org/cityofgilroy/city_hall/community_development/planning/general_plan/default.aspx

City of San Jose. 2001. Subject: Letter of Commitment for Preparation of a Habitat Conservation Plan and a Natural Community Conservation Plan. June 25, 2001.

_____. 2007. Coyote Valley Specific Plan: Draft Environmental Impact Report (DEIR). Retrieved from City of San Jose - Capital of Silicon Valley: http://www.sanjoseca.gov/coyotevalley/publications_deir.htm

City of San Jose, County of Santa Clara, Santa Clara Valley Water District, and Santa Clara Valley Transportation Authority. 2004. Memorandum of Understanding by and among the City of San Jose, the County of Santa Clara, the Santa Clara Valley Water District, and the Santa Clara Valley Transportation Authority Regarding Preparation of a Habitat Conservation Plan/Natural Community Conservation Plan and Related Environmental Documents.

Clayton, K. 1997. Post-Fledging Ecology of Burrowing Owls in Alberta and Saskatchewan: Dispersal, Survival, Habitat Use, and Diet. M.S. Thesis. University of Saskatchewan, Saskatoon.

Collier, G. 1968. Annual Cycle and Behavioral Relationships in the Red-Winged and Tricolored Blackbirds of Southern California. Ph.D. dissertation. Los Angeles, California: University of California.

Commission for Environmental Cooperation. 2005. North American Conservation Action Plan, Western Burrowing Owl. Montreal, Canada: Commission for Environmental Cooperation.

Cook, L. 1996. Nesting adaptations of Tricolored Blackbirds (*Agelaius tricolor*). Master's thesis. Davis, CA: University of California Davis.

Corelli, T. and Z. Chandik, .1995. The Rare and Endangered Plants of San Mateo and Santa Clara County. Half Moon Bay, CA: Monocot Press.

Coulombe, H. 1971. Behavior and Population Ecology of the Burrowing Owl, *Speotyto cunicularia*, in the Imperial, Speotyto cunicularia, in the Imperial Valley of California. Condor, 73, 162-176.

County of Santa Clara. 2001. Subject: U.S. Widening Project, Route 85/U.S. 101 South Interchange Improvements Project, and Measure B Transportation Improvement Program Consolidated Biological Mitigation Program. June 27, 2001.

County of Santa Clara, City of San Jose, City of Morgan Hill, City of Gilroy, Santa Clara Valley Water District, Santa Clara Valley Transit Authority, California Department of Fish and Game, U.S. Fish and Wildlife Service, and CH2MHILL. 2012. Santa Clara Valley Habitat Plan Final Environmental Impact Report/Environmental Impact Statement, Santa Clara County, California.

County of Santa Clara, Santa Clara Valley Water District, City of Gilroy, City of Morgan Hill, City of San Jose, Santa Clara Valley Transportation Authority, California Department of Fish and Game, and U.S. Fish and Wildlife Service. 2005. Planning Agreement regarding the Santa Clara Valley Natural Community Conservation Plan and Habitat Conservation Plan. September 2005. Planning Agreement No. 2810-2003-003-03.

Crase, F.T. and R.W. Dehaven. 1977. Food of Nestling Tricolored Blackbirds. Condor, 79(2), 265-269.

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.

Davidson, C., H.B. Shaffer, and M.R. Jennings. 2002. Spatial Test of Pesticide Drift, Habitat Destruction, UV-B, and Climate-Change Hypotheses for Drift, California Amphibian Declines. Conservation Biology, 16, 1588-1601.

Davidson, E.W., M. Parris, J.P. Collins, J.E. Longcore, A.P. Pessier, J. Brunner. 2003. Pathogenicity and Transmission of Chytridiomycosis in Tiger Salamanders (*Ambystoma tigrinum*). Copeia 2003(3):601–607.

Dawson, W. 1923. The Birds of California: Volume I. San Francisco. San Francisco: South Moulton Company.

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, P.A. Rabie, and B.R. Euliss. 1999. Effects of Management Practices on Grassland Birds: Burrowing Owl. Jamestown, ND: Northern Prairie Wildlife Research Center.

DeHaven R.W., F.T. Crase, and P.P. Woronecki. 1975. Movements of Tricolored Blackbirds Banded in the Central. Bird Banding, 46, 220-229.

Delevoryas, P. 1997. Relocation of Burrowing Owls During Courtship Period. In J. Lincer and K. Steenhof (Eds.), The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium, (pp. 138-144).

deMaynadier, P.G. and M.L. Hunter Jr. 1995. The Relationship Between Forest Management and Amphibian Ecology: A Review of the North American Literature. Environ, 230-261.

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.

Dieringer, G. 1991. Naturalists Pollination Ecology of *Streptanthus bracteatus* (*Brassicaceae*): A Rare Central Texas Endemic. The Southwestern Naturalist, 341-343.

Dobson A. and J. Foufopoulos. 2001. Emerging Infectious Pathogens of Wildlife. Philosophical Transactions: Biological Sciences, Vol. 356, Number 1411, 1001-1012.

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.

Dunning, J.J. 2001. Significant Encounters: 1998–1999. North American Bird Bander, 26, 170-178.

East Bay Regional Park District. 2003. Development Activities in East Contra Costa County and Alameda Counties (Map).

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, Vol. 289, No. 5487. pp. 2068–2074.

Eller, B.M. 1977. Road Dust Induced Increase of Leaf Temperature. Environmental Pollution, 13, 99-107.

Emlen, S.T. 1977. "Double Clutching" and its Possible Significance in the Bullfrog. Copeia 1977(4):749-751.

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 hammondi* Girard. Master's thesis, Department of Biology, Fresno State College, Fresno, CA.

Feeney, L. 1997. Burrowing Owl Site Tenacity Associated with Relocation Efforts. In J. Lincer, and K. Steenhof (Eds.), The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium (pp. 132–137). The Raptor Research Foundation, Inc.

Fellers, G.M. 1994. California/Nevada Declining Amphibian Working Group. Newsletter 1, p. 10. May 1, 1994.

_____. 2005. *Rana draytonii* Baird and Girard, 1852b California Red-Legged Frog. Pages 552-554 in M. Lannoo (Ed.). Amphibian Declines the Conservation Status of United States Species. University of California Press. Berkeley, CA.

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, A. Bytnerowicz. 2010. Nitrogen Critical Loads and Management Alternatives for N-Impacted Ecosystems in California. Journal of Environmental Management, 2404-2423.

Fisher, R.N. and H.B. Schaffer. 1996. The Decline of Amphibians in California's Great Central Valley. Conservation Biology 10(5):1387-1397.

Fitch, H. 1936. Amphibians and Reptiles of the Rogue River Basin, Oregon. American Midland Naturalist, 17, 634-652.

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, 176.

Fitzpatrick, B.M., J.R. Johnson, D.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, pp. 3606–3610.

Fitzpatrick, B.M. and H.B. Shaffer. 2004. Environmental-Dependent Admixture Dynamics in a Tiger Salamander Hybrid Zone. Evolution, 58(6), 1282-1293.

Forister M.L. and A.M. Shapiro. 2003. Climatic Trends and Advancing Spring Flight of Butterflies in Lowland California. Global Change Biology, 9(7), 1130-1135.

Forman R.T.T and L.E. Alexander. 1998. Road and Their Major Ecological Effects. Annual Review of Ecology and Systematics, 29, 207-231.

Forman, R.T.T, B. Reineking, and A.M. Hersperger. 2002. Road Traffic and Nearby Grassland Bird Patterns in a Suburbanizing Landscape. Environmental Management Vol. 29, No. 6, 782-800.

Franklin A.B, B.R. Noon, and T.L. George. 2002. What is Habitat Fragmentation? Studies in Avian Biology, No. 25, 20-29.

Frayer, 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: US Fish and Wildlife Service, Region 1.

Galli, J. 1990. Thermal Impacts Associated with Urbanization and Stormwater Management Best Management Practices. Metropolitan Washington Council of Governments, Department of Environmental Programs, Washington, D.C.

Garner, T.W.J., M.W. Perkins, P. Govindarajulu, D. Seglie, S. Walker, A.A. Cunningham, and M.C. Fisher. 2006. The Emerging Amphibian Pathogen *Batrachochytrium dendrobatidis* Globally Infects Introduced Populations of the North American Bullfrog, *Rana catesbeiana*. Biology Letters 2:455-459.

Gelder, J.V. 1973. A Quantitative Approach to the Mortality Resulting from Traffic in a Population of *Bufo bufo* L. Oecologia, 13(1), 93-95.

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. (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. Western Field Ornithologists, Camarillo, California and California Department of Fish and Game, Sacramento.

Gibbs, J.P. and D.A. Steen. 2005. Trends in Sex Ratios of Turtles in the United States: Implications of Road Mortality. Conservation Biology, 19, 552-556.

Gleason, R. and D.R. Johnson. 1985. Factors Influencing Nesting Success of Burrowing Owls in Southeastern Idaho. Great Basin Naturalist, 45, 81-84.

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.

Green, G.A. 1983. Ecology of Breeding Burrowing Owls in the Columbia Basin, Oregon. M.S. Thesis, Oregon State University. Corvallis, OR.

Green, G.A. and R.G. Anthony. 1989. Nesting Success and Habitat Relationships of Burrowing Owls in the Columbia Basin, Oregon. Condor, 91, 347-354.

Green, M. and L. Edson. 2004. The 2004 Tricolored Blackbird April Survey. Central Valley Bird Club Bulletin, 7.

Grinnell, J. and A.H. Miller. 1944. The Distribution of the Birds of California (Vol. 27). Berkeley, California: Cooper Ornithological Club.

Gutzwiller K.J, R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects of Human Intrusion on Song Occurrence and Singing Consistency in Subalpine Birds. The Auk, Vol. 111, 28-37.

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, W.J. 1998. Tricolored Blackbird Itinerant Breeding in California. Condor, 100, 218-226.

_____. 2004a. Management Implications of the 2004 Tricolored Blackbird Survey. Central Valley Bird Club Bulletin, 7.

_____. 2004b. Tricolored Blackbird (*Agelaius tricolor*). In The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian-Associated Birds in California. California Partners in Flight.

Harrison, S.P., J.F. Quinn, J.F. Baughman, D.D. Murphy, and P.R. Ehrlich. 1991. Estimating the Effects of Scientific Study on Two Butterfly Populations. American Naturalist, 137(2), 227-243.

Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. The Burrowing Owl (*Speotyto cunicularia*). (A.P. Gill, Ed.) Washington, D.C.: The American Ornithologists' Union.

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.

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, 490-509.

_____. 1988. Habitat Correlates of Distribution of the California Red-Legged Frog (*Rana aurora draytonii*) and the Foothill Yellow-Legged Frog (*Rana boylii*): Implications for Management. Pages 144-158 in R. Sarzo, 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. United States Department of Agriculture, Forest Service, Rocky Mountain Range and Experiment Station, Fort Collins, Colorado. General Technical Report (RM-166): 1-458.

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.M. Miyamoto. 1984. Biochemical, Behavioral and Body Size Differences between *Rana aurora aurora* and *R. a. draytonii*. Copeia 1984(4):1018-1022.

Hayes, M.P., and M.R. Tennant. 1985. Diet and Feeding Behavior of the California Red-Legged Frog, *Rana aurora draytonii* (*Ranidae*). Southwestern Naturalist 30(4): 601-605.

Hayhoe, K., D. Cayan, C.B., Field, P.C. Frumhoff, E.P. Maurer, N.L. Miller, S.C. Moser, S.H. Schneider, K.N. Cahill, E.E. Cleland, L. Dale, R. Drapek, 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, pp. 12422-12427.

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.

Helm Biological Consulting. 2007. Dry-Season Sampling for Federally-Listed Large Branchiopods at the Proposed Lucky Day Conservation /Mitigation Bank. Prepared for WRA, Inc.

Hels, T. and E. Buchwald. 2001. The Effect of Road Kills on Amphibian Populations. Biological Conservation, 99, 331-340.

Herr, J. 2000. Evaluating Non-Target Effects: The Thistle Story. In M. Hoddle (Ed.), Proceedings of the Second California Conference on Biological Control (pp. 12-17). Riverside, California: University of California.

Hickman, J. (Ed.). 1993. The Jepson Manual: Higher Plants of California. Berkeley, CA: University of California Press.

Hodson, N. 1966. A Survey of Road Mortality in Mammals (and Including Data for the Grass Snake and Common Frog). J. Zool., 148, 576-579.

Hogan D.M. and M.R. Walbridge. 2007. Urbanization and Nutrient Retention in Freshwater Riparian Wetlands. Ecological Applications, Vol. 17, No. 4, 1142-1155.

Holland, D.C. 1994. The Western Pond Turtle: Habitat and History. Prepared for U.S. Department of Energy Bonneville Power Administration. Portland, OR: Wildlife Diversity Program, Oregon Department of Fish and Wildlife.

Holland, R.F. 1998. No Net Loss? Changes in Great Valley Vernal Pool Distribution from 1989 to 1997.

_____. 2003. Distribution of Vernal Pool Habitats in Five Counties of California's Southern Coast Ranges.

Howell, C.A., J.K. Wood, M.D. Dettling, K. Griggs, C.C. Otte, L. Lina, and T. Gardali. 2010. Least Bell's Vireo Breeding Records in the Central Valley Following Decades of Extirpation. Western North American Naturalist, 70, 105-113.

H.T. Harvey and Associates. 1997. Red-Legged Frog Distribution and Status – 1997. Prepared for Santa Clara Valley Water District, CA.

_____. 1999. Santa Clara Valley Water District Foothill Yellow-Legged Frog Distribution and Status-1999. Prepared for Santa Clara Valley Water District, San Jose, CA.

Huenneke, L.F., S.P. Hamburg, R. Koide, H.A. Mooney, and P.M. Vitousek. 1990. Effects of Soil Resources on Plant Invasion and Community Structure in Californian Serpentine Grassland. Ecology, 71(2), 478-491.

Hunt, G.L. 1972. Influence of Food Distribution and Human Disturbance on the Reproductive Success of Herring Gulls. Ecology, Vol. 53, No. 6, 1051-1061.

ICF International. 2012. Final Santa Clara Valley Habitat Plan, Santa Clara County, California.

_____. 2013. Final Santa Clara Valley Habitat Plan, Santa Clara County, California. Exhibit A: Corrections, Clarifications and Updates to the Santa Clara Valley Habitat Plan (HCP/NCCP), April 4, 2013.

Intergovernmental Panel on Climate Change. 2001. Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change in Houghton, J.T., Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, and C.A. Johnson (Eds.). Cambridge University Press, Cambridge, United Kingdom and New York, New York. 881 pp. Available at http://www.ipcc.ch/

_____. 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 [Alley, R., T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, P. Friedlingstein, J. Gregory, G. Hegerl, M. Heimann, B. Hewitson, B. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, M. Manning, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, D. Qin, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, S. Solomon, R. Somerville, T.F. Stocker, P. Stott, R.F. Stouffer, P. Whetton, R.A. Wood, D. Wratt. 21 pages. Available at http://www.ipcc.ch/

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.

Jennings, M.R. 1988. Natural History and Decline of Native Ranids in California. In H. DeLisle, P. Brown, B. Kaufman, and B. McGutry (Eds.), Proceedings of the Conference on California Herpetology (pp. 61-72). Southwestern Herpetologists Society.

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 31(1):94-103.

_____. 1990. Final Report of the Status of the California Red-Legged Frog (*Rana aurora draytonii*) in the Pescadero Marsh Natural Preserve. Final report prepared for the California Department of Parks and Recreation, Sacramento, California, through Agreement (4-823-9018). Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, CA. 30 pages.

_____. 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.

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.

Johnsgard, P. 1988. North American Owls: Biology and Natural History. Washington D.C.

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.Jones & Stokes. 2004. Western Pond Turtle Habitat Management Plan. July. (J&S 04254.04.) San Jose, CA. Prepared for NASA Ames Research Center, Moffet Field, CA.

Kaiser M.S and E.K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. The Journal of Wildlife Management, Vol. 48, No. 2, 561-567.

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.

Keeler-Wolf, T., D.R. Elam, K. Lewis, and S.A. Flint. 1998. California Vernal Pool Assessment Preliminary Report.

Kelsey, R. 2008. Results of the Tricolored Blackbird 2008 Census. Audubon California, Winters, CA.

Klein, M.L. 1993. Waterbird Behavioral Responses to Human Disturbance. Wildlife Society Bulletin, Vol. 21, Number. 1, 31-39.

Kruckeberg, A.R. 1957. Variation in Fertility of Hybrids between Isolated Populations of the Serpentine Species, *Streptanthus glandulosus* Hook. Evolution, 11, 185-211.

Kruse, K.C. and M.G. Francis. 1977. A Predation Deterrent in Larvae of the Bullfrog, *Rana catesbeiana*. Transactions of the American Fisheries Society 106(3):248-252.

Kupferberg, S.J. 1996. Hydrologic and Geomorphic Factors Affecting Conservation of a River-Breeding Frog (*Rana Boylii*). Ecological Applications, 6, 1332-1344.

_____. 1997. Bullfrog (*Rana Catesbeiana*) Invasion of a California River: The Role of Larval Competition. Ecology, 78, 1736-1751.

Kupferberg, S.J., A.J. Lind, and W.J. Palen. 2009. Pulsed Flow Effects on the Foothill Yellow-Legged Frog (*Rana boylii*): Population Modeling, Final Report.

Kyle, K. and R. Kelsey. 2011. Results of the 2011 Tricolored Blackbird Statewide Survey. Sacramento, CA: Audubon California.

Lane, M. 1993. The Jepson Manual: Higher Plants of California. Berkeley: University of California Press.

Laughrin, L. 1970. San Joaquin Kit Fox, Its Distribution and Abundance. California Department of Fish and Game, Wildlife Management Branch. Administrative Report 70-2, Sacramento. 20 pp.

Launer A.E. and D.D. Murphy. Umbrella Species and the Conservation of Habitat Fragments: A Case of a Threatened Butterfly and a Vanishing Grassland Ecosystem. Biological Conservation, Vol 69, 145-153.

Le Corre M., A. Ollivier, S. Ribes, P. Jouventin. 2002. Light-Induced Mortality of Petrels: a 4-Year Study from Reunion Island (Indian Ocean). Biological Conservation, Vol 105, 93-102.

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), pp. 1667–1681.

Lenth, B.A., R.L. Knight, and W.C. Gilgert. 2006. Conservation Value of Clustered Housing Developments. Conservation Biology, Vol. 20, Issue 5, 1445-1456.

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.

Leyse, K. E. 2005. Intentional Introductions and Biodiversity in Fishless Waters: the Effects of Introduced Fish on Native Aquatic Species. Dissertation.

Lima, S.L and L.M. Dill. 1990. Behavioral Decisions Made Under the Risk of Predation: A Review and Prospectus. Canadian Journal of Zoology, 68, 619-640.

Lind, A.J. 2005. Reintroduction of a Declining Amphibian: Determining and Ecologically Feasible Approach for the Foothill Yellow-legged Frog (*Rana Boylii*) Through Analysis of Decline Factors, Genetic Structure, and Habitat Associations. Ph.D 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 boylii) in Northwestern California. Herpetological Review, 62–67.

Lips, K.R., F. Brem, R. Brenes, J.D. Reeve, R.A. Alford, J. Voyles, C. Carey, L. Livo, A.P. Pessier, and J.P. Collins. 2006. Emerging Infectious Disease and the Loss of Biodiversity in a Neotropical Amphibian Community. Proceedings of the National Academy of Sciences 103(9):3165-3170.

Loredo, I. and D. Van Vuren. 1996. Reproductive Ecology of a Population of the California Tiger Salamander. Copeia, 895-901.

Loredo, I., D. Van Vuren, and M.L. Morrison. 1996. Habitat Use and Migration Behavior of the California Tiger Salamander. Journal of Herpetology, 30(2), 282-285.

Louda, S.M. 2002. Unexpected Ecological Effects of Distributing the Exotic Weevil, *Larinus Planus* (F.), for the Biological Control of Canada Thistle. Conservation Biology, 717-727.

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.

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, 152-154.

Maestas J.D., R.L. Knight, and W.C. Gilgert. 2003. Biodiversity Across a Rural Land-Use Gradient. Conservation Biology, Vol 17, No. 5, 1425-1434.

Martin, D. 1973. Selected Aspects of Burrowing Owl Ecology and Behavior. The Condor, 75, 446-456.

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, 82, 1288-1299.

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.

Millsap, B.A. and C. Bear. 2000. Density and Reproduction of Burrowing Owls along an Urban Development Gradient. Journal of Wildlife Management, 64, 33-41.

Moldenke, A. 1976. California Pollination and Vegetation Types. Phytologia, 42, 223-282.

Morey, S. 2005. Foothill Yellow-Legged Frog: California Wildlife Habitat Relationships System California Department of Fish and Game California Interagency Wildlife Task Group. Retrieved December 16, 2011, from http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=1500&inline=1

Morey, S.R. 1998. Pool Duration Influences Age and Body Mass at Metamorphosis in the Western Spadefoot Toad: Implications for Vernal Pool Conservation. Pages 86-91 in Witham, C.W., E.T. Bauder, D. Belk, W.R. Ferren Jr., and R. Ornduff (Eds.). Ecology,

Conservation, and Management of Vernal Pool Ecosystems - Proceedings from a 1996 Conference. California Native Plant Society. Sacramento, CA. 1998.

Morrell, S. 1975. San Joaquin Kit Fox Distribution and Abundance in 1975. Administrative Report 75-3, California Department of Fish and Game, Sacramento CA. 28 pp.

Munz, P.A. 1959. A California Flora. Berkeley, CA: University of California Press.

Munz, P.A., and D.D. Keck. 1959. A California Flora. Berkeley: University of California Press.

Murphy D.D and P.R. Ehrlich. 1980. Two California Checkerspot Butterfly Subspecies: One New, One on the Verge of Extinction. Journal of the Lepidopterists' Society, 316-320.

Murphy, D.D. and S.B Weiss. 1988. Ecological Studies and the Conservation of the Bay Checkerspot Butterfly, *Euphydryas editha bayensis*. Biological Conservation 46, 183-200.

_____. 1992. Global Warming and Biological Diversity. (R. Peters, and T. Lovejoy, Eds.) Castleton, New York: Hamilton Printing.

Murray, G. 1976. Geographic Variation in the Clutch Size of Seven Owl Species. Auk, 602-613.

National Geographic Society. 2002. Field Guide to the Birds of North America (Fourth ed.). Washington, D.C.: National Geographic Society.

NatureServe Explorer. 2011. Retrieved December 16, 2011.http://www.natureserve.org/explorer/

Ndibalema, V.G., S.Mduma, S.Stokke, and E. Roskaft. 2008. Relationship between Road Dust and Ungulate Density in Serengeti National Park, Tanzania. African Journal of Ecology, 46, 397-423.

Neff, J. 1937. Nesting Distribution of the Tri-Colored Red-Wing. Condor, 39, 61-81.

Newton, I. 1979. Population Ecology of Raptors. Vermillion, SD: Buteo Books.

Niederer, C. 2009a. California Native Species Field Survey Form: *Castilleja affinis* ssp. *neglecta*. Date of Field Work: May 8, 2009.

_____. 2009b. California Native Species Field Survey Form. *Castilleja affinis* ssp. *neglecta*. Date of Field Work: May 12, 2009.

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.

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University Press of Idaho.

Odell E.A and R.L. Knight. 2001. Songbird and Medium-Sized Mammal Communities Associated with Exurban Development in Pitkin County, Colorado. Conservation Biology, Vol. 15, Number 4, 1143-1150.

Oldfield, M.L. 1988. Threatened Mammals Affected by Human Exploitation of the Female-Offspring Bond. Conservation Biology, Vol. 2, No. 3, 260-274.

Orians, G.H. 1961. The Ecology of Blackbird (*Agelaius*) Social Systems. Ecological Monographs, 31, 285-312.

Orians, G.H. and G. Collier. 1963. Competition and Blackbird Social Systems. Evolution, 17, 449-459.

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. Transactions Western Section the Wildlife Society. 22: 60–70.

Ortega, C.P. and J.C. Ortega. 2003. Brown-Headed Cowbird (*Molothrus ater*) Parasitism on Warbling Vireos (*Vireo gilvus*) in Southwest Colorado. The Auk, 120, 759-764.

Parmesan, C. 2006. Ecological and Evolutionary Responses to Recent Climate Change. Annual Review of Ecology, Evolution, and Systematics, 37, 637-669.

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.

Paul M.J. and J.L. Meyer. 2001. Streams in the Urban Landscape. Annual Review of Ecology and Systematics, Vol. 32 , 333-365.

Pechmann, J.H.K., D.E. Scott, J. Whitfield Gibbons, and R.D. Semlitsch. 1989. Influence of Wetland Hydroperiod on Diversity and Abundance of Metamorphosing Juvenile Amphibians. Wetlands Ecology and Management, 1(1), 3-11.

Petranka, J.W. 1998. Salamanders of the United States and Canada. Washington and London: Smithsonian Institution Press.

Pimm, S.L. 2001. Entrepreneurial Insects. Nature. 411, 531–532.

Poulin, R.G. and L.D. Todd. 2006. Sex and Nest Stage Differences in the Circadian Foraging Behavior of Nesting Burrowing Owls. Condor, 108, 856-864.

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. Sanchez-

Azofeifa, C.J. Still, and B.E. Young. 2006. Widespread Amphibian Extinctions from Epidemic Disease Driven by Global Warming. Nature. 439: 161-167.

Preston, R. 1991. Intrafloral Phenology of *Streptanthus tortuosus*. American Journal of Botany, 78, 1044-1053.

Rathbun, G.B., N.J. Scott, and T.G. Murphey. 2002. Terrestrial Habitat Use by Pacific Pond Turtles in a Mediterranean Climate. The Southwestern Naturalist, 47, 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.

Reijnen R., R. Foppen, C.T. Braak, and J.Thissen. 1995. The Effects of Car Traffic on Breeding Bird Populations in Woodland. III. Reduction of Density in Relation to the Proximity of Main Roads. Journal of Applied Ecology, Vol. 32, No. 1, 187-202.

Rich, T. 1984. Monitoring Burrowing Owl Populations: Implications of Burrow Re-Use. Wildlife Society Bulletin, 12, 178-180.

Ricks, G.R. and R.J.H. Williams. 1974. Effects of Atmospheric Pollution on Deciduous Woodland Part 2: Effects of Particulate Matter Upon Stomatal Diffusion Resistance in Leaves of Quercus Petraea. Environmental Pollution, 6, 87-109.

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.

Ringelberg, J. 1999. The Photobehaviour of *Daphnia* ssp. as a Model to Explain Diel Vertical Migration in Zooplankton. Biological Reviews of the Cambridge Philosophic, 74, 397-423.

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.

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 in the Agroecosystem of the Imperial Valley, California. Studies in Avian Biology, 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, 155, 162-167.

Rothstein S.I., J. Verner, E. Stevens, and L.V. Ritter. 1987. Behavioral Differences Among Sex and Age Classes of the Brown-Headed Cowbird and their Relation to the Efficacy of a Control Program. The Wilson Bulletin, Vol. 99, Number 3, 322-337.

Safina C. and J. Burger. 1983. Effects of Human Disturbance on Reproductive Success in the Black Skimmer. The Condor, Vol. 85, Number 2, 164-171.

Santa Clara County Open Space Authority. 2011. Retrieved March 1, 2011, from http://www.openspaceauthority.org/

Santa Clara County Parks & Recreation Department, Environmental Resources Agency; 2M Associates; Harison & Associates, Terrell Watt, AICP; Jones & Stokes Associates. 2003. Strategic Plan: Santa Clara County Parks and Recreation System, Santa Clara County Parks and Recreation Department.

Santa Clara Valley Habitat Agency, County of Santa Clara, City of San Jose, Santa Clara Valley Water District, Santa Clara Valley Transportation Authority, City of Gilroy, City of Morgan Hill, and Santa Clara County Open Space Authority. 2012. Santa Clara Valley Habitat Plan Memorandum of Understanding.

Santa Clara Valley Water District. June 27, 2001. Subject: Countywide HCP.

_____. 2002. Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-2. San Jose, CA.

_____. 2003. Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-2. San Jose, CA.

_____. 2004. Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-2. San Jose, CA.

_____. 2011. Biological Assessment: Santa Clara Valley Water District Stream Maintenance Program, Santa Clara County, California. Covering the Tiburon Paintbrush, Coyote Ceanothus, Santa Clara Valley Dudleya, Metcalf Canyon Jewel-flower, Bay Checkerspot Butterfly, California Tiger Salamander, California Red-legged Frog, California Condor, California Clapper Rail, Western Snowy Plover, California Least Tern, Least Bell's Vireo, Salt Marsh Harvest Mouse, and San Joaquin Kit Fox.

_____. 2013. Anderson Dam Seismic Retrofit Mitigation Project Operations Project Plan, FY 2013, Project Number: 91864005.

Saunders, P. 1971. Modification of the Leaf Surface and its Environment by Pollution. In T.A. Preece (Ed.), Ecology of Leaf Surface Micro-organisms (pp. 81-89). London, UK: Academic Press.

Schlesinger M.D., P.N. Manley, and M. Holyoak. 2008. Distinguishing Stressors Acting on Land Bird Communities in an Urbanizing Environment. Ecology, Vol. 89, No. 8, 2302-2314.

Schueler, T. 1994. The Importance of Imperviousness. Watershed Protection Techniques, Vol. 1, No 3, 100-111.

Seeliger, L. 1945. Variation in the Pacific Mud Turtle. Copeia, 1945, 150-159.

Semlitsch, R.D., D.E. Scott, and J.H.K. Pechmann. 1988. Time and Size at Metamorphosis Related to Adult Fitness in *Ambystoma talpoideum*. Ecology, 69(1), 184-192.

Shaffer, H.B. 2003. Correspondence to U.S. Fish and Wildlife Service.

Shaffer, H.B., R.N. Fisher, and S.E. Stanley. 1993. Status Report: The California Tiger Salamander, *Ambystoma californiense*.

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, 3033-3049.

Shaffer, H.B. and P.C. Trenham. 2004. Family *Ambystomatidae*: *Ambystoma californiense* Gray, 1853, California Tiger Salamander.

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.

Shapiro, A. 1981. Egg-Mimics of Streptanthus (*Cruciferae*) Deter Oviposition by *Pieris sisymbrii* (*Lepidoptera: Pieridae*). Oecologia, 48, 142-143.

Sibley, D. 2000. National Audubon Society: The Sibley Guide to Birds. New York: Knopf.

Singer, M.C. 1972. Complex Components of Habitat Suitability within a Butterfly Colony. Science 176: 75–77.

Singh S.N., M. Yunus, K. Kulshreshtha, K. Srivastava, and K.J. Ahmad. 1988. Effect of SO_2 on Growth and Development of *Dahlia rosea Cav*. Environmental Contamination and Toxicology, 40, 743-751.

Skagen S.K., R.L. Knight, and G.H. Orians. 1991. Human Disturbance of an Avian Scavenging Guild. Ecological Applications, Vol. 1, No. 2, 215-225.

Skinner, M.W. and B.M. Pavlik. 1994. California Native Plant Society Inventory of Rare and Endangered Plants of California. 5th edition. Special Publication No. 1. Sacramento: California Native Plant Society.

Skorupa, J.P., R.L. Hothem, R.W. Dehaven. 1980. Foods of Breeding Tricolored Blackbirds in Agricultural Areas of Merced County, California. Condor, 82, 465-467.

Slater, J. 1962. Variations and New Range of *Clemmys Marmorata*. Occasional Papers of the Department of Biology, 20, 204-205.

Spatt, P.D. and M.C. Miller. 1981. Growth Conditions and Vitality of *Sphagnum* in a Tundra Community along the Alaska Pipeline Haul Road. Arctic, 34(1), 48-54.

Spellerberg, I. 1998. Ecological Effects of Roads and Traffic: A Literature Review. Ecology and Biogeography Letters, 7, 317-333.

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.

Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston, Massachusetts.

Stebbins, R.C. and N.W. Cohen. 1995. A Natural History of Amphibians. Princeton: Princeton University Press.

Stefanescu, C., J. Penuelas, and I. Filella. 2003. Effects of Climate Change on the Phenology of Butterflies in the Northwest Mediterranean Basin. Global Change Biology, 9, 1494-1506.

Stirling, I. 1988. Attraction of Polar Bears *Ursus Maritimus* to Off-Shore Drilling Sites in the Eastern Beaufort Sea. Polar Record, 24(148), 1-8.

Storer, T. 1925. A Synopsis of the Amphibia of California. Zoology, 27, 1-342.

Strang, C.A. 1980. Incidence of Avian Predators near People Searching for Waterfowl Nests. The Journal of Wildlife Management, Vol. 44, No. 1, 220-222.

Swarthout, E.C.H. and R.J. Steidl. 2001. Flush Responses of Mexican Spotted Owls to Recreationists. The Journal of Wildlife Management, Vol. 65, No. 2, 312-317.

Sweet, S. 1998. Letter to Dwight Harvey, U.S. Fish and Wildlife Service with a report titled "Vineyard Development Posing an Imminent Threat to Ambystoma californiense in Santa Barbara County, California." University of California, Santa Barbara, CA.

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. Standiford, D. McCreary, and K. Purcell (Eds.), Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape. San Diego, CA.

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, CA. 14 pp.

Tamm, C.O. and T. Troedsson. 1955. An Example of the Amounts of Plant Nutrients Supplied to the Ground in Road Dust. Oikos, 6, 61-70.

Tatarian, P.J. 2008. Movement Patterns of California Red-Legged Frogs (*Rana draytonii*) in an Inland California Environment. Herpetological Conservation and Biology 3(2):155-169.

Taylor A.R. and R.L. Knight. 2003. Wildlife Responses to Recreation and Associated Visitor Perceptions. Ecological Applications, Vol. 13, No. 4, 951-963.

Tewksbury J.T., S.J. Hejl, and T.E. Martin. 1998. Breeding Productivity Does not Decline with Increasing Fragmentation in a Western Landscape. Ecology, Vol. 79, Number 8, 2890-2903.

Thomsen, L. 1971. Behavior and Ecology of Burrowing Owls on the Oakland Municipal Airport. The Condor, 73, 177-192.

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.

Trenham, P.C. 1998b. Demography, Migration, and Metapopulation Structure of Pond Breeding Salamanders. Ph.D. dissertation. University of California, Davis, CA

_____.1998a. Radio Tracking Information. University of California, Davis, CA.

_____. 2001. Terrestrial Habitat Use by Adult California Tiger Salamanders. Journal of Herpetology, 35(2), 343-346.

Trenham, P.C., W.D. Koenig, and H.B. Shaffer. 2001. Spatially Autocorrelated Demography and Interpond Dispersal in the Salamander *Ambystoma Californiense*. Ecology, 82(12), 3519-3530.

Trenham, P.C. and H.B. Shaffer. 2005. Amphibian Upland Habitat Use and its Consequences for Population Viability. Ecological Applications, 15(4), 1158-1168.

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, 365-377.

Tricolored Blackbird Working Group. (2007 (updated 2009)). Conservation Plan for the Tricolored Blackbird (*Agelaius tricolor*). San Francisco, CA: Sustainable Conservation.

Trulio, L.A. 1995. Passive Relocation: A Method to Preserve Burrowing Owls on Disturbed Sites. Journal of Field Ornithology, 66, 99-106.

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.

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.

Twedt, B. 1993. A Comparative Ecology of *Rana aurora* Baird and Girard and *Rana catesbeiana* Shaw at Freshwater Lagoon, Humboldt County, California. Master of Science thesis. Humboldt State University, Arcata, CA. 53 pages plus appendix.

Twitty, V.C. 1941. Data on the Life History of *Ambystoma tigrinum californiense* Gray. Copeia, 1-4.

U.S. Department of Agriculture. 1992. Guidelines for Evaluating Air Pollution Impacts of Class I Wilderness Areas in California.

U.S. Environmental Protection Agency. August 3, 2011. Community Multiscale Air Quality (CMAQ) Model. Retrieved March 3, 2011, from http://www.epa.gov/AMD/CMAQ/cmaq_model.html

U.S. Fish and Wildlife Service. 1987. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Bay Checkerspot Butterfly (*Euphydryas editha bayensis*). **Federal Register** 52: 35366-35378.

_____. 1994. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Least Bell's Vireo. **Federal Register** 59: 4845-4867.

_____. 1996. Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the California Red-Legged Frog. **Federal Register** 61: 25813 - 25833.

_____. 1998a. Draft Recovery Plan for the Least Bell's Vireo (*Vireo bellii pusillus*).

_____. 1998b. Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area.

_____. 1998c. Recovery Plan for Upland Species of the San Joaquin Valley, California. Portland, OR: U.S. Fish and Wildlife Service. Region 1.

_____. 2000. Biological Opinion for Interim Water Contract Renewal Consultation. Reference number: 1-1-00-F-0056.

_____. 2001. Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for the Bay Checkerspot Butterfly (*Euphydryas editha bayensis*). **Federal Register** 66: 21449-21489.

_____. 2001. Formal Endangered Species Consultation on the U.S. Highway 101 Widening, Route 85/U.S. 101 South Interchange, Riparian and Wetland Consolidated Biological Mitigation Project, Bailey Avenue Extension/U.S. 101 Interchange, and Coyote Valley Research Park Projects, San Jose and Santa Clara County, California (Corps files 25619S, 25901S, 25833S, 24877S, and 24366S). Reference number 1-1-01-F-186.

_____. 2002a. Biological Opinion, Interim Water Contract Renewals, March 1, 2002-February 29, 2004. Reference number 1-1-02-F-0070.

_____. 2002b. Recovery Plan for the California Red-legged Frog (*Rana Aurora draytonii*).

_____. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States: Biological Technical Publication BTP-R6001-2003.

_____. 2004. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the California Tiger Salamander; and Special Rule Exemption for Existing Routine Ranching Activities. **Federal Register** 69: 47212-47248.

_____. 2004. Memorandum. Subject: Interim Water Contract Renewal Consultation for the Period March 1, 2004 through February 28, 2006. Reference number 1-1-04-F-0360.

_____. 2005. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the California Tiger Salamander, Central Population Endangered and Threatened Wildlife and Plants; Listing of the Central California Distinct Population Segment of the California Tiger Salamander; Reclassification of the Sonoma County and Santa Barbara County Distinct Populations From Endangered to Threatened; Special Rule. **Federal Register** 68: 28647-28670.

_____. 2005. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the California Tiger Salamander, Central Population. **Federal Register** 70: 49379-49458.

_____. 2005a. Recovery Plan for the Tidewater Goby (*Eucyclogobius newberryi*).

_____. 2005b. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.

_____. 2006. 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. **Federal Register** 71: 19244-19346.

_____. 2006. Least Bell's Vireo (*Vireo bellii pusillus*): 5-Year Review Summary and Evaluation. Carlsbad, CA.

_____. 2007. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the Bay Checkerspot Butterfly (*Euphydryas editha bayensis*). **Federal Register** 72: 48178-48218.

_____. 2007. Habitat Conservation Plan for the Santa Clara Valley, Santa Clara, CA. **Federal Register** 72: 51247-51248.

_____. 2007. Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*).

_____. 2008. Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for the Bay Checkerspot Butterfly (*Euphydryas editha bayensis*). **Federal Register** 73: 50405-50425.

_____.2009. Bay Checkerspot Butterfly (*Euphydryas editha bayensis*) 5-Year Review: Summary and Evaluation.

_____.2010a. Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California.

_____. 2010. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the California Red-Legged Frog. **Federal Register** 75: 12816-12959.

_____. 2010b. San Joaquin Kit Fox (*Vulpes macrotis mutica*). 5-Year Review: Summary and Evaluation.

_____. 2010. Santa Clara Valley Habitat Conservation Plan and Natural Community Conservation Plan, CA; Availability of Draft Environmental Impact Statement, Public Meeting, and Receipt of Applications. **Federal Register** 75: 79013-79015.

_____. 2011a. *Ceanothus ferrisiae* (Coyote ceanothus) 5-Year Review: Summary and Evaluation.

_____. 2011. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Sonoma County Distinct Population Segment of California Tiger Salamander. **Federal Register** 76: 54346-54372.

_____. 2011b. Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance.

_____. 2012. 5-Year Review: *Castilleja affinis* ssp. *neglecta* (Tiburon paintbrush).

_____. 2012. Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan, Environmental Impact Statement, and Implementing Agreement; California. **Federal Register** 77: 53221-53223.

_____. 2013a. *Dudleya setchellii* (Santa Clara Valley Dudleya) 5-Year Review: Summary and Evaluation

_____. 2013b. *Sreptanthus albidus* ssp. *albidus* (Metcalf Canyon Jewelflower) 5-Year Review: Summary and Evaluation

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 2000. Notice of Availability of a Final Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process. **Federal Register** 65: 35242-35257.

van Hattem, M.G. 2004. Underground Ecology and Natural History of the California Tiger Salamander. San Jose State University.

Verner J. and L.V. Ritter. 1983. Current Status of the Brown-Headed Cowbird in the Sierra National Forest. The Auk, Vol. 100, Number 2, 355-368.

Vitousek, P.M. 1990. Biological Invasions and Ecosystem Processes: Towards an Integration of Population Biology and Ecosystem Studies. Oikos, 57, 7-13.

Walker, D.A and K.R. Everett. 1987. Dust and its Environmental Impact on Alaskan Taiga and Tundra. Arctic and Alpine Research, Restoration and Vegetation Succession in Circumpolar Lands: Seventh Conference of the Comité Arctique International, 19, 479-489.

Walther G., E. Post, P. Convey, A. Menzel, C. Parmesank, T.J.C. Beebee, J. Fromentin, O. Hoegh-Guldberg, and F. Bairlein. 2002. Ecological Responses to Recent Climate Change. Nature, 416, pp. 389–395.

Ward, D. and J.N.M. Smith. 2000. Brown-Headed Cowbird Parasitism Results in a Sink Population in Warbling Vireos. The Auk, 117, 337-344.

Weiss, S.B. 1999. Cars, Cows, and Checkerspot Butterflies: Nitrogen Deposition and Management of Nutrient-Poor Grasslands for a Threatened Species. Conservation Biology, Vol. 13, No. 6, 1476-1486.

_____. 2006. Impacts of Nitrogen Deposition on California Ecosystems and Biodiversity. California Energy Commission, PIER Energy-Related Environmental Research. CEC-500-2005-165.

_____. 2010. Reintroduction of the Bay Checkerspot Butterfly (*Euphydryas editha bayensis*) at Edgewood Natural Preserve, San Mateo County in 2011-2015.

_____. 2012. Bay Checkerspot Reintroduction: Coyote Ridge to Edgewood Natural Preserve.

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. Niederer. 2007. Serpentine Vegetation Management Project Final Report. Unpublished report submitted to the U.S. Fish and Wildlife Service, Sacramento, CA.

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. and G.L. Holroyd. 2001. The Second International Burrowing Owl Symposium: Background and Context. The Journal of Raptor Research, 35, 269-273.

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 (Eds.). 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.

Werschkul, D.F. and M.T. Christensen. 1977. Differential Predation by *Lepomis macrochirus* on Eggs and Tadpoles of *Rana*. Herpetologica 33:237–241.

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, (Eds.). Integrating Man and Nature in the Metropolitan Environment. Proceedings of the National Symposium on Urban Wildlife, National Institute for Urban Wildlife, Columbia, Maryland, USA.

Whittall, J.B. 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.

Wilbur, H.M. and J.P. Collins. 1973. Ecological Aspects of Amphibian Metamorphosis. Science, 182, 1305-1314.

Winchell, C. 1994. Natural History and Protection of Burrowing Owls. Proceedings of the Sixteenth Vertebrate Pest Conference (1994), pp. 83-86.

Wissmar, R.C., R.K. Timm, and M.G. Logsdon. 2004. Effects of Changing Forest and Impervious Land Covers on Discharge Characteristics of Watersheds. Environmental Management Vol. 34, No. 1, 91-98.

Wood, J.K., C.A. Howell, and G.R. Geupel. 2006. Least Bell's Vireo Breeds in Restored Riparian at San Joaquin River National Wildlife Refuge: 2005 Final Report.

WRA. 2008. Vernal Pool Branchiopod Wet Season Survey, Winter 2007-2008, Lucky Day Property. Santa Clara County California.

Wright, A.H. and A.A. Wright. 1949. Handbook of Frogs and Toads of the United States and Canada (Third ed.). Ithica: Comstock Publishing Company.

Zarn, M. 1974. Burrowing Owl (*Speotyto cunicularia hypugaea*). Habitat Management Series for Unique or Endangered Species, Report. No. 11, T-N-250. Denver: Bureau of Land Management.

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.

Zweifel, R. 1955. Ecology, Distribution, and Systematics of Frogs of the *Rana boylii* Group (Vol. 54). Berkeley: University of California Publications.

7. PERSONAL COMMUNICATIONS

Donovan, T. ICF International. 2013. Email to Cori Mustin, U.S. Fish and Wildlife Service. Email subject: County Parks' Comment RE: Biological Edit in HCP Addenda & Corrections Document. March 20, 2013.

Gaffney, K. ICF International. 2012a. Email to Cori Mustin, U.S. Fish and Wildlife Service. Email subject: SCV plants_occurrence data. November 21, 2012.

_____. 2012b. Email to Cori Mustin, U.S. Fish and Wildlife Service. Email subject: smooth lessingia_Section 4.6.8. November 29, 2012.

_____. 2012c. Email to Cori Mustin, U.S. Fish and Wildlife Service. Email subject: SCV_exception to 3% cap in BCB core/satellite pops. December 13, 2012.

_____. 2012d. Email to Cori Mustin, U.S. Fish and Wildlife Service. Email subject: SCV_lessingia. December 13, 2012.

_____. 2012e. Email to Cori Mustin, U.S. Fish and Wildlife Service. Email subject: Loma Prieta Hoita count. December 17, 2012.

Gonsolin, E. 2010. San Jose State Graduate Student. Telephone Record with Cori Mustin, U.S. Fish and Wildlife Service, regarding yellow-legged frog impacts and conservation strategy. March 25, 2010.

Niederer, C. 2012. Creekside Science. Email to Elizabeth Warne, U.S. Fish and Wildlife Service. Email subject: Fountain thistle question etc. July 13, 2012.

Rahmig, T. 2012. ICF International. Email to Cori Mustin, U.S. Fish and Wildlife Service. Email subject: SCV_kit fox clarification. December 20, 2012.

Weiss, S.B. 2011. Creekside Center for Earth Observation. Request to the U.S. Fish and Wildlife Service for a Section 10(a)(1)(A) Permit for the Reintroduction of the Bay Checkerspot

Butterfly (*Euphydryas editha bayensis*) at Edgewood Natural Preserve, San Mateo County in 2011-2015. November 30, 2011.

Weiss, S.B., C. Niederer, and J. Spaulding. 2011. Creekside Center for Earth Observation. Status update to the U.S. Fish and Wildlife Service regarding Bay Checkerspot Larvae Reintroduction Project: Coyote Ridge to Edgewood Natural Preserve 2011. February 14, 2011.