United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
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Sacramento, California 95825-1846

In Reply Refer To:
81420-2009-F-0201-1

FEB 24 2011

Memorandum

To: Regional Planning Officer, U.S. Bureau of Reclamation, Mid Pacific Regional Office, Sacramento, California (Attn: Sharon McHale)

From: Field Supervisor, U.S. Fish and Wildlife Service, Sacramento, California

Subject: Biological Opinion on the Los Vaqueros Reservoir Expansion Project, Contra Costa County, California

This memorandum represents the U.S. Fish and Wildlife Service's (Service) biological opinion on the Los Vaqueros Reservoir Expansion Project in Contra Costa County, California (proposed action). The U.S. Bureau of Reclamation (Reclamation) requested formal consultation for this project on July 12, 2010. Your request was received by us on August 30, 2010. At issue are the effects of this action on the threatened California red-legged frog (*Rana draytonii*), threatened California tiger salamander (*Ambystoma californiense*), threatened Alameda whipsnake (*Masticophis laterals euryxanthus*), endangered San Joaquin kit fox (*Vulpes macrotis mutica*), threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and threatened vernal pool fairy shrimp (*Branchinecta lynchi*). This biological opinion is issued under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. §1531 *et seq.*) (Act).

The Service has determined that the proposed action may affect, but is not likely to adversely affect vernal pool fairy shrimp. Two occurrences of vernal pool fairy shrimp are known to occur within the Los Vaqueros Watershed. However, no suitable habitat occurs within the action area.

This document was prepared based on: (1) information provided in the July 2010 Los Vaqueros Reservoir Expansion Project Terrestrial Action Specific Implementation Plan (Contra Costa Water District [CCWD] 2010); (2) the draft January 2011, Los Vaqueros Watershed 2010 Annual Monitoring Report for California Red-legged Frog, California Tiger Salamander, Western Pond Turtle, and Predator Control (CCWD 2011); (3) visits to the project site on November 8 and 23, 2010, attended by the Service, CCWD, and California Department of Fish and Game (CDFG); (4) numerous meetings, phone conversations, and emails between the Service, CCWD, and CDFG between March, 2010 and February, 2011; and (5) other information available to the Service.

Consultation History:

October 2003 – August 2008:	The Service participated in the Los Vaqueros Reservoir Expansion Project Agency Coordination Work Group (ACWG) meetings. The ACWG received regular project updates and was provided opportunities to provide input on project development and issues.
November 2005 – July 2009:	The Service participated in ACWG Breakout Sessions on Terrestrial Biological Resources. Terrestrial breakout sessions included discussions of impact analyses and proposed mitigation for the project, and development of the Action Specific Implementation Plan (ASIP).
May 12, 2008:	The Service participated in a meeting with CDFG, CCWD and Environmental Science Associates (ESA) to discuss the effects of the expansion project on existing conservation easements in the Los Vaqueros Watershed.
August 25, 2008:	The Service received the Administrative Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) from ESA.
November 24, 2008:	The Service participated in a review of the Administrative Draft EIS/EIR with Reclamation, CCWD, CDFG and ESA.
January 7, 2009:	The Service submitted comments on the Administrative Draft EIS/EIR.
February 21, 2009:	The Service received the Draft EIS/EIR.
August 31, 2009:	The Service met with CCWD, CDFG, and ESA to discuss mitigation land acquisition strategies and opportunities.
March 18, 2010:	The Service received the Final EIS/EIR.
May 12, 2010:	The Service met with CCWD, CDFG and ESA to discuss CCWD's proposed compensatory mitigation plan.
June 3, 2010:	The Service attended a pre-application meeting for the project at the U.S. Army Corps of Engineers.
June 9, 2010:	The Service and CDFG provided a joint letter responding to CCWD's proposed compensatory mitigation plan.
June 16, 2010	The Service received a revised proposed compensatory mitigation plan from CCWD.

June 24, 2010:	The Service met with Reclamation, CCWD, CDFG, and ESA to discuss the revised proposed compensatory mitigation plan.
June 30, 2010:	The Service notified CCWD by e-mail that the former Mountain House Golf Course is approved as part of the compensation package for the project.
July 23, 2010:	CCWD submitted a revised compensatory mitigation proposal in a letter to CDFG.
August 6, 2010:	The Service, CDFG, and CCWD toured the Tracy Ranch property proposed by CCWD as part of the compensation package.
August 11, 2010:	The Service and CDFG met to discuss CCWD's July 23, 2010 proposal.
August 17, 2010:	On behalf of the Service and CDFG, the Service provided comments via e-mail on CCWD's July 23 proposal.
August 30, 2010:	The Service received a request for formal consultation and a copy of the draftASIP from Reclamation.
August 30, 2010:	The Service met with CCWD and CDFG to review a compensatory mitigation proposal revised to reflect the agencies' August 17 comments.
September 1, 2010:	As a follow-up to the meeting on August 30, CCWD submitted via e-mail a further revised compensatory mitigation proposal.
September 27, 2010:	On behalf of the Service and CDFG, the Service provided comments via e-mail on CCWD's September 1 proposal.
November 8, 2010:	Site visit with representatives from the Service, CDFG, and CCWD.
November 10, 2010:	The Service provided comments on the draft ASIP to Reclamation and CCWD.
November 23, 2010:	Site visit with representatives from the Service, CDFG, and CCWD.
December 6, 2010:	Reclamation and CCWD submitted revisions to the ASIP including revised conservation measures, the final compensatory mitigation package, and responses to Service comments.

March 2010 – February 2011:	Reclamation, CCWD, CDFG, ESA, and the Service engaged in various meetings and e-mail and telephone correspondences to discuss project impacts and the proposed compensation package.
December 15, 2010- February 9, 2010:	The Service and CCWD corresponded in numerous emails to finalize the project description and conservation measures.

Description of the Proposed Action

Overview

The Los Vaqueros Reservoir is located in southeastern Contra Costa County, California. The proposed action will include the expansion of the Los Vaqueros Reservoir from its current capacity of 100 thousand acre-feet (TAF) to 160 TAF, and will include replacement and enhancement of recreation facilities affected by the expansion as well as minor modifications to the existing CCWD Transfer Facility to accommodate the increased capacity. Other components of the Los Vaqueros Reservoir system, including the intakes and transmission pipelines, will not be expanded or modified as part of the proposed action.

The Los Vaqueros Reservoir provides off-stream storage of water that is diverted from the San Joaquin/Sacramento River Delta (Delta) by CCWD at the Old River Intake or the new Middle River Intake when source water quality meets CCWD's standards. From the reservoir, CCWD can deliver water to the Contra Costa Canal, via the Transfer and Los Vaqueros pipelines, for blending with other CCWD supplies. The proposed action will expand the reservoir to 160 TAF by raising the existing dam. This will raise the water surface level 35 feet for a maximum reservoir water surface elevation of 507 feet mean sea level (msl) and increase the inundation area by about 340 acres from 1,500 acres to 1,840 acres.

The expanded reservoir will be operated similarly to the existing reservoir. Delta water will be diverted and pumped through existing facilities for transmission through existing pipelines to fill the expanded reservoir; stored water will be released for direct use or for water quality blending during times when Delta pumping is restricted or water quality is poor.

Construction and operations and maintenance of the existing reservoir are covered under the following Biological Opinions from the Service: (1) the 1993 *Endangered Species Consultation on Effects of the Proposed Los Vaqueros Reservoir Project on San Joaquin kit fox and bald eagle* (Service file # 1-1-93-F-48); (2) the 1993 *Los Vaqueros Reservoir Project Effects on Delta Smelt* (Service file # 1-1-93-F-35); (3) the 1993 *Conference Opinion for the Longhorn Fairy Shrimp and for the Vernal pool fairy shrimp* amended and adopted as a biological opinion in 1995, (Service file # 1-1-95-F-117); (4) the 1996 *Formal Consultation Concerning the Effects of the Los Vaqueros Project on the California Red-Legged Frog, and Conference on Effects on the Alameda Whipsnake* as amended (Service file #'s 1-1-96-F-151, 1-1-03-F-0055, 1-1-03-F-0307, 1-1-04-F-0133, and 1-1-04-F-0208); and (5) the 2008 *Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP)* (Service file # 81420-2008-F-1481-5). In addition, a 1993 National

Oceanic and Atmospheric Administration (NOAA) Fisheries Biological Opinion and a 2009 CDFG Incidental Take Permit (ITP # 2081-2009-013-03) govern operations at the existing reservoir. A 30-day No-Diversion period and a 75 to 90-day No-Fill period during fish sensitive periods and state of the art fish screens are among key protective measures incorporated into current operations as required under these permits. Current operations and maintenance activities associated with the existing reservoir and related facilities and with managing the Los Vaqueros Watershed are conducted consistent with a Resource Management Plan (CCWD, 1999) required under these permits.

The expanded reservoir will result in greater flexibility to manage diversions for environmental benefit, increase water supply reliability, and improve water quality for CCWD customers and other potential Bay Area water agency participants to which CCWD can deliver water directly through interties or indirectly by exchange in times of emergency shortage. The proposed action will not increase the amount of water delivered to the CCWD service area; the effect of the proposed action on CCWD's existing operations will be to shift diversions from the Delta into wetter periods. For the expanded reservoir, CCWD, Reclamation, and the Department of Water Resources have developed a set of modified operations for CCWD that improves overall coordination of Delta water operations, while maintaining fishery protection measures and water supply and water quality. These modified Delta operations consist of changes to the default timing of the No-Fill and No-Diversion periods described in the biological opinions and permits referenced above. These changes would be allowable under the existing permits with annual approvals from the Service, NOAA fisheries, and CDFG. The Service and NOAA Fisheries have determined these operational modifications are not likely to adversely affect aquatic protected species (Service file # 81410-2011-I-0001; NMFS # 2010/03457). A separate consultation with the Service will be conducted to address the effects of operations and maintenance of the expanded reservoir on terrestrial species and revise the Resource Management Plan.

Reservoir Expansion / Dam Modification

Reservoir expansion involves the dam raise modifications as well as construction of appurtenant facilities including the spillway, the inlet/outlet works, and the reservoir oxygenation system. Construction is scheduled to begin March 1, 2011 and continue for approximately 18 months.

The existing dam will be raised by building on top of the existing dam structure. Like the existing dam, the raised dam will be a central core earthfill embankment. The existing dam footprint will not be affected by raising the dam. The dam will be raised by building on top of the existing shell, mainly on the downstream side. The existing vertical central core and filter/drainage system will be raised and the dam axis will move approximately 20 feet downstream. The dam will be 230 feet high and have a crest elevation of 523 feet msl. The reservoir water surface elevation will be 507 feet msl when expanded to the 160-TAF capacity. The crest will be 30 feet wide and about 1,300 feet long. The downstream and upstream slopes will be approximately 2.25:1 and 3.0:1, respectively. The new embankment fill would add about 1 million cubic yards to the current dam volume of 2.8 million cubic yards for a total of approximately 3.8 million cubic yards of embankment fill.

The raised dam will include monitoring and recording instrumentation, similar to the existing equipment, to measure internal water pressures within and seepage from the dam and foundation, settlement of the dam, and earthquake-induced accelerations and deformations. The instruments will include foundation and embankment piezometers, internal and surface settlement and movement sensors, a seepage measurement weir and a series of strong motion acceleragraphs.

Appurtenant Facilities

The spillway (a channel over the dam that allows for overflow from the reservoir) will be an extension of the existing spillway on Los Vaqueros Dam. The new portion of the spillway will be about 375 feet long and, like the existing chute, will have a rectangular cross-section of 15 feet. The existing stilling basin (an impoundment to slow the water conveyed through the spillway) at the base of the chute and a riprap-lined discharge channel to Kellogg Creek will be retained. The spillway will have the capacity to convey the Probable Maximum Flood to ensure that even in the most extreme storm conditions, water levels in the reservoir will not overtop the dam.

The existing inlet and outlet structure will be extended up above the new maximum storage elevation, but no additional ports will be added. Pumping into and releasing water from the reservoir will occur via the existing facilities through the right abutment. The existing control building will be demolished and a new building constructed at the top of the raised intake structure. No other changes to the outlet structure and associated valves will be necessary. Emergency reservoir drawdown requirements will be met with the current outlet tunnel and valve, although with the increased head, a larger valve may be required. This valve releases water down Kellogg Creek.

The existing reservoir has an oxygenation system that is designed to enhance the quality of water in the hypolimnion (the bottom or lower zone of water within the reservoir). This system will need to be relocated and/or upgraded to accommodate the expanded reservoir. Oxygenating the hypolimnion helps maintain sufficient residual oxygen in the deeper reservoir waters, which improves water quality, reduces tastes and odors so water from this level in the reservoir can be used for consumption, and makes the water habitable for fish. During the oxygenation process, liquid oxygen (LOX) is vaporized, piped to a diffuser grid on the bottom of the reservoir, and then released into the reservoir as oxygenated bubbles.

The existing oxygenation facilities are on the downstream face of the dam and include two horizontal liquid oxygen tanks, ambient vaporizers, control valves, instrumentation and telemetry panel, and site access for LOX delivery and operation personnel. LOX is generated off site and trucked to facility storage tanks. These facilities will be relocated in the same general area as part of the dam modification process and may be upgraded to effectively oxygenate the larger reservoir.

Dam Raise Materials and Borrow Areas

The proposed action will require claystone and sandstone materials to enlarge the dam shell as well as clay material to extend the dam core. To minimize truck trip length and associated emissions and to reduce cost, most of the materials for the dam raise will be obtained from designated borrow areas within the watershed. Materials for sand filters and gravel drains that control seepage through the dam and foundation will be imported from commercial sources within the region. Haul distances will be between 25 and 30 miles. Other materials including gravel, aggregate, bulk cement, steel, pre-fabricated building materials, and mechanical and electrical equipment required for construction of the dam raise and associated facilities will be transported to the project site. Sand, gravel, and rock materials imported to the project site will be tested prior to acquisition and transport to determine the presence of hazardous, corrosive, or other substances that could affect use of the materials, environmental exposure, or disposal options. CCWD's construction specifications require contractors to ensure these materials meet industry standards set forth by the American Society of Testing and Materials, among other groups.

The upstream and downstream dam shell will be constructed of claystone and sandstone obtained from the Shell Borrow Area located just upstream of the left abutment. The Shell Borrow Area will be about 14.52 acres including a new haul road, and will be an extension of the borrow area developed for the construction of the existing dam. Riprap to armor the upstream slope will also be obtained from this borrow area. Use of the Shell Borrow Area will require the removal of 123 oak trees.

The dam core will be constructed using approximately 270,000 cubic yards of clay excavated from naturally occurring alluvial deposits in the watershed. A Primary (41.2 acres) and a Secondary (15 acres) Core Borrow Area have been identified approximately 2.5 miles and 2.0 miles downstream of the dam, respectively. The engineering properties of the alluvial deposits at the Primary Core Borrow Area and the quantity of clay that would be available from this borrow area may be less than needed for construction; therefore, the Secondary Core Borrow Area was identified, but will only be used if additional core material is needed. Access roads to both the Primary and Secondary Core Borrow Areas will be constructed off Walnut Boulevard and will require installation of new temporary bridges over Kellogg Creek.

The specific location and layout of the core borrow areas has yet to be determined within the siting zones. The dimensions and depth of these borrow areas will depend on the location, depth, and quality of the clays available. Topsoil will be removed from the core borrow areas and the underlying clay then extracted. The borrow areas will be restored and revegetated once construction is completed. A 4-acre seasonal wetland will be constructed within the Primary Core Borrow Area starting no later than summer 2012.

Materials and Equipment Stockpile, Staging Areas, and Materials Disposal

Although the dam raise will be constructed in large part from local materials quarried from nearby borrow areas, certain materials will need to be imported and stockpiled near the dam in sufficient quantity to maintain an adequate flow of materials. Some material will be stockpiled adjacent to the existing dam on the downstream side within the construction footprint.

The Secondary Core Borrow Area will also be used as a staging area. This area will provide a location for temporary storage of construction supplies and materials, areas for parking, servicing and repairing construction equipment and vehicles, a site for work crew trailer camp, and possibility as a location for staging construction operations such as concrete batching and rock crushing operations.

Excess earthen materials will be disposed of at the Primary Core Borrow Area site, and used in re-contouring the site. Although not anticipated based on construction of the original dam, any spoils or waste materials not suitable for disposal in the Primary Core Borrow Area site will be hauled to a suitable location for recycling or disposal. The final disposal areas selected would depend on the type and volume of material to be disposed.

Transfer Facility Upgrade

The Transfer Facility is the hub of the Los Vaqueros Reservoir system, regulating flows into and out of the Los Vaqueros Reservoir and into the Contra Costa Canal via the Los Vaqueros Pipeline. The Transfer Facility lifts water from the Old River Pipeline to the Los Vaqueros Reservoir. The existing Transfer Facility is on a fenced 24.3-acre site and is composed of a 4-MG steel storage tank, four 2,100-horsepower pumps capable of delivering 200 cfs up to the reservoir, a motor control building, and transformer yard. A flow control station is located outside this site adjacent to the Los Vaqueros Pipeline. The facility is approximately 2.75 miles west of the community of Byron on Vasco Road between Camino Diablo and Walnut Boulevard. The steel storage tank is a reservoir to balance water movement through the system as operations change to allow reservoir filling and/or releases.

The proposed action does not include any new facilities, but the existing pumps will be upgraded to retain the current pumping capacity under the higher head of the expanded Los Vaqueros Reservoir. The upgrades will consist primarily of changing out electric pump motors and modifying the pumps. All work will be done within the existing footprint of the Transfer Facility. The Transfer Facility upgrade is scheduled to start in spring 2012, and be completed in 8 to 10 months. There will be no change in the operation or maintenance of the upgraded Transfer Facility.

Marina Complex

The existing Marina includes the following facilities that will be relocated upslope to accommodate the higher water level of the Project: (1) a series of docks (30 feet by 16 feet) for 30 aluminum electric-powered boats and two 18-foot pontoon boats; (2) a small dock with boat service equipment; (3) parking for 59 cars; (4) flush restrooms; (5) picnic tables; (6) a Marina building with outdoor amphitheater; (7) miscellaneous facilities including a fish-cleaning station, a pay phone, and drinking fountain; (8) a residence for the Marina Manager; and (9) a boat house for a water quality sampling boat. Just less than half a mile of paved access road to the existing Marina will be inundated and relocated above the perimeter of the expanded reservoir.

Interpretive Center

Construction activities in the vicinity of the existing interpretive center will require that the center be closed during the construction period. During construction, the interpretive center parking lot may be used for construction worker parking, minor staging, and/or materials and equipment storage. A temporary visitor's center will be established off Walnut Boulevard north of the Primary Core Borrow Area. The center will be a 40-foot by 12-foot trailer with a graveled parking area of approximately 2,000 square feet. Power will be extended to the trailer from existing power lines; no other infrastructure will be extended to the trailer. Upon completion of construction, the existing interpretive center will be reopened to the public.

Day-Use Facilities and Fishing Piers

The Project will inundate the existing day-use facilities at the Los Vaqueros staging area (61 parking places, 2 toilets), the Oak Point Picnic Area (7 picnic tables), and the Knoll Picnic Area (21 parking places, 1 toilet and 18 picnic tables). These facilities will be relocated/replaced generally upslope of the existing facilities. In addition, four fishing piers will be relocated generally upslope of the existing piers and one additional fishing pier may be installed.

Hiking Trails and Service Roads

Approximately 7.7 miles of unpaved service roads and trails will be inundated by the project. Most of the impacted facilities are service roads on the west side of the Reservoir that are open to hiking-only public use. Approximately 12 miles of replacement service roads and hiking trails will be installed to provide expanded access to the same areas. Approximately 6 miles of new service roads (17 feet wide) and 6 miles of new trails (6 feet wide) will allow hiking-only public use. Some trails will have vista points with benches. Trail connectivity with regional trails in the East Bay Regional Park District's Morgan Territory and Round Valley Regional Preserves will be maintained.

Southern access to the Westside Trail will be available from Los Vaqueros Road (off Vasco Road) and an Eastside Loop Trail will be constructed along the southern portion of the reservoir, connecting existing access roads (used to access wind power facilities) in the southern portion of the watershed. A new park bench will be installed along the Eastside Trail at a lookout point. A parking lot will be built near the upper inundation limit to provide direct access to the trailhead and will have picnic tables, toilets, and a water station.

Construction Schedule

Construction is estimated to take 18 to 24 months. The dam raise will begin in March, 2011 and is expected to be completed by May, 2012. Because the dam raise can be achieved by constructing on the downstream slope of the existing dam only, some water can remain in the reservoir for emergency storage throughout construction. However, a drawdown to 50 TAF will be necessary during the construction period. The reservoir will be drawn down through normal operations to elevation 430 at the start of dam construction. Construction of recreation facilities will begin in April, 2011 and is also expected to be completed by May, 2012. Modifications to the transfer pump station will begin in June, 2012 and are expected to be completed in November, 2012.

Reservoir refilling is expected to begin in approximately September 2011 and will take one or more years to fill to the expansion elevation. The California Department of Water Resources, Division of Safety of Dams has indicated refilling can begin before dam construction is completed as long as 10 feet of freeboard are maintained. It is estimated that the 100 TAF storage level will be reached between August 2012 (wet hydrology) and May 2013 (dry hydrology), and the full 160 TAF storage level will be reached between September 2013 (wet hydrology) and September 2014 (dry hydrology). At the maximum filling rate (200 cfs), with the reservoir at 100 TAF, the reservoir level would increase at about 0.3 feet per day. The rate of increase in water level would fall as the reservoir level rises or as the rate of filling decreases.

Work Force and Equipment

The construction labor force will consist of as many as six crews of about 50 to 70 workers each, plus construction management personnel, for a total of up to 400 workers present at one time over all work sites. Equipment operations would typically occur over two 8-hour shifts extending from 6 a.m. to 10 p.m. but could extend longer. The equipment specified for clearing/excavation/foundation, building construction, and interior mechanical/electrical activities will generally operate for about 8 to 16 hours a day (up to two shifts per day) over an 18- to 24-month period. During road work, utility, and landscaping activities (which will last for approximately 1 year), equipment will typically be used 8 to 10 hours a day. Some equipment such as backhoes and light-duty trucks would be used during multiple stages of project construction, and overlap of equipment types and duration is therefore expected. The types of equipment to be used will include, scrapers, excavators, backhoes, various types of trucks, loaders, conveyer belts, pile drivers, sheep's foot rollers, paving machines, and cranes. Equipment may be removed from the site when no longer needed for construction activities.

Truck Trips and Haul Routes

Roadways that will be directly affected by project construction traffic include local streets providing access to Los Vaqueros Reservoir and several regional connectors and highways that provide access to this portion of eastern Contra Costa County.

Traffic-generating construction activities will include trucks hauling equipment and materials to and from the work sites and the daily arrival and departure of construction workers. Construction trucks on local roadways will include dump trucks, concrete trucks, and other delivery trucks. Dump trucks will be used for earth-moving and clearing, removal of excavated material, and import of other structural and paving materials. Other trucks will deliver heavy construction equipment, job trailer items, concrete forming materials, piping materials, piles, new facility equipment, and other miscellaneous deliveries.

Based on the locations of the work sites, it is assumed that construction workers will use roads proximate to each day's work site on their daily commute. However, many of the commute trips could use the same major roads (e.g., Vasco Road, Byron Highway, State Route 4 Bypass) to reach the localized roads (e.g., Walnut Boulevard and Camino Diablo).

Habitat Preservation and Enhancement

CCWD will compensate for the loss of habitat resulting from the proposed action (summarized in Table 1) by preserving a minimum of 4,890 acres of habitat in Contra Costa, Alameda, and San Joaquin counties with a minimum of 1,388 acres in Contra Costa County. As much as possible, the acreage in Contra Costa County will be located near the primary area of impact. Lands preserved will be primarily grasslands, but will also contain oak woodland, scrub, stream, and wetland habitat and will support or have the potential to support listed species affected by the project including California red-legged frog, California tiger salamander, Alameda whipsnake and San Joaquin kit fox.

TABLE 1

HABITAT IMPACT SUMMARY BY PROJECT ACTIVITES

Habitat Type	Dam Construction Impacts (acres)	Construction Impacts from Recreational Facilities (acres)	Inundation (acres)	TOTAL (acres)
	permanent	Temporary/Permanent	permanent	
Annual Grassland	75.07	6.14 / 23.15	311.99	**416.35**
Annual Grassland isolated by inundation			284.76	**284.76**
Upland Scrub	2.27	0.08 / 0.08	0.69	**3.12**
Valley/Foothill Woodland and Forest	6.5	2.20 / 3.86	18.98	**31.54**
Valley/Foothill Riparian	0	0.02 / 0.06	4.05	**4.13**
Lacustrine	0	0	0.82	**0.82**
Lacustrine (reservoir)		0 / 0.44		**0.44**
Nontidal Freshwater Permanent Emergent	0	0	1.99	**1.99**
Natural Seasonal Wetland	0.03	0.01 / 0.11	0.39	**0.54**
Intermittent Drainage	0	0.01 / 0.01	1.29	**1.31**
Ephemeral Drainage	0	0.01 / 0.03	0.65	**0.69**
Perennial Drainage	0.07	0	0	**0.07**
TOTAL	**83.94**	**8.47 / 27.74**	**625.61**	**745.76**

The parcels identified for inclusion in the compensation package are listed in Table 2. To the maximum extent possible, omitting a portion of a parcel to be acquired to allow for development will be avoided. More acres than required have been identified to provide a contingency should issues arise in acquiring certain parcels. If CCWD is unable to acquire sufficient acreage, a monetary contribution to the East Contra Costa HCP/NCCP may substitute for direct acquisition of parcels. However, monetary contributions to the HCP will only be used if other alternatives are not available and will not account for more than approximately 100 acres of the mitigation obligation. The final compensation package will be submitted for review and approval by the Service and CDFG. Currently, over 4,300 acres are either owned or under option to CCWD. Prior to inundation, CCWD will either have title, an option to acquire, or have possession and be in legal proceedings to gain title to the remaining acreage necessary to provide a Service-approved compensation package.

TABLE 2
COMPENSATORY MITIGATION PROPERTIES

Property name	Approximate Acreage Available for Mitigation	Ownership Status
Tracy Ranch	3,000	CCWD Ownership
Subtotal San Joaquin County	**3,000**	
Jess	433	CCWD Ownership
Jensen	80	In Discussion
Mountain House	140	CCWD Ownership
Subtotal Alameda County	**653**	
Catholic Church	340	Under Option
Evergreen	424	In Discussion
Bowers	103	CCWD Ownership
Rountree	142	In Discussion
Leonardini	138	Under Option
Green	87	Under Option
Ekenberg-Dawson	80	CCWD Ownership
Vaquero Farms	320	In Discussion
Subtotal Contra Costa County	**1,634**	
TOTAL ACREAGE IDENTIFIED AS AVAILABLE	**5,287**	

CCWD will manage all lands included in the compensation package according to Service-approved Habitat Management Plans (HMP), with annual review to be conducted by third parties agreed to by the Service and CDFG. HMPs will include a long term management plan as well as describe enhancement and restoration activities and plans. CCWD currently manages approximately 20,000 acres of land in the Los Vaqueros and Herdlyn watersheds according to Service and CDFG-approved plans. The proposed conservation lands are located in the vicinity of the Los Vaqueros Watershed, contain similar habitats and species, and will have similar management requirements. CCWD staff is knowledgeable and experienced in managing the Los Vaqueros Reservoir for conservation purposes and has the organizational structure in place to expand responsibility to include the mitigation lands. CCWD will hire additional staff or procure professional consultant services as needed. However, CCWD also retains the option of having some or all of the conservation lands managed by a separate Service- and CDFG– approved land management entity.

<u>Conservation Measures</u>

The applicant proposes to implement the following measures:

General Measures

1. *Prepare and Implement a Storm Water Pollution Prevention Plan (SWPPP).* To prevent or minimize potential contamination of surface waters during construction, CCWD will ensure that a SWPPP is prepared in accordance with the requirements of the Regional

Water Quality Control Board's (RWQCB) National Pollutant Discharge Elimination System (NPDES) General Construction Permit requirements. The SWPPP will be designed to identify and control pollutant sources that could affect the quality of stormwater discharges from construction sites through the development of best management practices (BMPs). BMPs will include those that effectively target pollutants in stormwater discharges to prevent or minimize the introduction of contaminants into surface waters. To protect receiving water quality, the BMPs will include, but are not limited to, the following:

a. Temporary erosion control measures (fiber rolls, staked straw bales, detention basins, check dams, geofabric, sandbag dikes, or temporary revegetation or other ground cover) will be employed for disturbed areas.

b. No disturbed surfaces will be left without erosion control measures in place during the winter and spring months.

c. Sediment will be retained onsite by a system of sediment basins, traps, or other appropriate measures.

d. The construction contractor will prepare standard operating procedures for the handling of hazardous materials on the construction site to prevent discharge of materials to stream or storm drains. This will include the contractor establishing specific fueling areas for construction vehicles and equipment located at least 200 feet from drainages. Grading areas will be clearly marked and equipment and vehicles will remain within graded areas. The contractor will also identify and implement as appropriate specific procedures for handling and containment of hazardous materials, including catch basins and absorbent pads.

e. Wherever construction work is performed near a creek, reservoir, or drainage area (excluding work that is permitted for working in the drainage itself), a 100-foot vegetative or engineered buffer will be maintained between the construction zone and surface water body. Specific water bodies to be protected through implementation of this BMP include but are not limited to: Los Vaqueros Reservoir, Kellogg Creek, and/or other seasonal drainages.

f. Native and annual grasses or other vegetative cover will be established on construction sites immediately upon completion of work causing disturbance.

2. *Hazardous Material Spill Prevention.* To minimize the potential for accidental release of hazardous materials within the watershed during construction, CCWD will require the contractor to enforce strict onsite BMPs. These practices will include, without limitation, designating a central storage area to keep hazardous materials away from all waterways and storm drain inlets; refueling equipment only in designated areas; containing contaminants away from all waterways or storm drain inlets; preparing a Spill Prevention, Control, and Countermeasure Plan; and regularly inspecting construction

vehicles for leaks. All fueling and maintenance of vehicles and other equipment will occur at least 65.6 feet from any wetland, riparian habitat, or water body.

3. *Municipal Stormwater Runoff.* To minimize the potential for substantial additional sources of polluted runoff during operation, CCWD will design facilities with introduced impervious surfaces with stormwater control measures that are consistent with the RWQCB's NPDES municipal stormwater runoff requirements. The stormwater control measures shall be designed and implemented to reduce the discharge of stormwater pollutants to the maximum extent practical. Stormwater controls such as bioretention facilities, flow-through planters, detention basins, vegetative swales, covering pollutant sources, oil/water separators, retention ponds, shall be designed to control stormwater quality to the maximum extent practical.

4. *Protection of Sensitive Plant Communities.* To the extent feasible, CCWD will locate facilities and limit work areas to avoid sensitive plant communities. Exclusion and/or silt fencing will be installed around areas to be avoided.

5. *Restoration and Revegetation Plan.* Areas temporarily impacted by construction will be restored to pre-construction conditions. A Restoration and Revegetation Plan will be completed and submitted to the Service prior to the start of ground disturbing activities. The plan will document pre-construction conditions, require the use of native plants, describe invasive species control measures, identify success criteria, and establish a monitoring program. This plan will include grasslands at the Core Borrow Area and staging areas, upland scrub in the Shell Borrow Area, riparian woodlands along major drainages, elderberry shrub habitat, and oak woodlands west of the reservoir.

Wetlands and Waters

6. *Kellogg Creek.* During construction, water will continue to be released from the reservoir into Kellogg Creek consistent with water rights permits and to ensure sufficient outflow to support downstream wetland vegetation.

7. *Wetland Restoration, Creation, and Mitigation Plan.* To compensate for permanent and temporary impacts to 3.35 acres of wetlands and other waters that cannot be avoided, CCWD will restore, enhance, and create approximately 20.01 acres of wetland features both within the Los Vaqueros Watershed and on compensation lands. Impacts to drainages will be compensated for through onsite restoration and offsite preservation and enhancement at a rate of 6 linear feet for every linear foot impacted.

   CCWD will develop and submit to the Service, the U.S. Army Corps of Engineers, and CDFG for approval a Wetland Mitigation Plan that includes site-specific restoration, enhancement and creation activities, a timeline for implementation that is coordinated with filling the expanded reservoir (most project impacts to wetlands are a result of inundation), success criteria, and monitoring and reporting requirements. The plan will be submitted for approval prior to initiation of ground disturbing activities.

Restoration and creation elements will include the following:

a. Restoration and enhancement of Kellogg Creek and adjacent natural upland environs to improve habitat. Methods of enhancement and restoration could include, but are not limited to, reducing erosion and managing, salvaging, and seeding with grasses, forbs and other species that are native to the site, as well as other measures to increase water quality within the enhancement and restoration reach.

b. Creation of approximately 4 acres of seasonal wetlands on the Primary Core Borrow Area to provide aquatic breeding habitat for California red-legged frog and California tiger salamander and as appropriate, provide habitat elements for western pond turtle. CCWD will submit wetland creation plans to the Service and CDFG for review and approval and shall receive Service and CDFG approval that created wetlands provide functioning habitat.

c. Preservation, restoration and enhancement of approximately 16.1 acres of wetlands will be achieved from among the opportunities identified on compensation lands acquired. If sufficient levels of impacted wetland functions and values are not available on these properties for restoration and enhancement to achieve no net loss, CCWD will create additional wetland acreages on these properties at locations that complement the existing wetland features on these properties at locations that complement the existing wetland features. CCWD will submit a Wetland Mitigation Plan to the Service and CDFG for review and approval.

Listed Species

8. *Conduct Mandatory Biological Resources Awareness Training for All Project Personnel.* Before any ground disturbing work (including vegetation clearing and grading), a Service-approved biologist will conduct a mandatory biological resources awareness training for all construction personnel on listed species that could potentially occur on site (California tiger salamander, California red-legged frog, San Joaquin kit fox, Alameda whipsnake, and valley elderberry longhorn beetle). The training will include at a minimum the natural history, representative photographs, a discussion of the general behavior, information about distribution and habitat needs, the sensitivity to human activities; the conservation measures in this Biological Opinion; and the penalties for not complying with these measures. Proof of personnel attendance will be kept on file at CCWD. Interpretation shall be provided for non-English speaking workers. If new construction personnel are added to the project, CCWD will ensure that the new personnel receive the mandatory training before starting work. The subsequent training of personnel can include videotape of the initial training and/or the use of written materials rather than in-person training by a biologist.

9. *California Red-legged Frog and California Tiger Salamander Relocation Plan.* A detailed relocation plan for sensitive species that identifies specific protocols for

California red-legged frog and California tiger salamander will be prepared and submitted to the Service for approval at least 2 weeks prior to initiation of ground disturbing activities. The purpose of the relocation plan will be to specify criteria for determining when relocation is appropriate, standardize amphibian relocation methods including designating who is qualified to participate in activities related to relocation, identify relocation sites, define monitoring requirements for the relocated individuals, and establish a protocol for reporting results of surveys, monitoring, and relocation activities to the Service.

10. *Construction Monitoring for California red-legged frog and California tiger Salamander.* At least 15 days prior to the onset of activities, the name(s) and credentials of biologists who will conduct preconstruction surveys and construction monitoring activities will be submitted to the Service. No project activities will begin until written approval from the Service that the biologist(s) is qualified to conduct the work has been received. CCWD may designate an on-site biological monitor to assist with work site monitoring for compliance with avoidance and minimization measures. The biological monitor must be trained by a Service-approved biologist and receive written approval from the Service. The monitor will notify the Service-approved biologist if California red-legged frogs or California tiger salamanders are found. To ensure compliance with the Conservation Measures of this Biological Opinion, the Service -approved biologist(s) and monitor(s) shall have authority to immediately stop any activity that is not in compliance with this Biological Opinion, and/or order any reasonable measure to avoid the unauthorized take of an individual of the listed species.

    A Service-approved biologist will conduct a preconstruction survey for California red-legged frogs and California tiger salamanders at each work site two weeks before the start of ground disturbing activities at that site. If juvenile or adult California tiger salamanders or California red-legged frogs are found, the biologist will implement the procedures in the relocation plan (see Measure 9 above). The relocation of eggs or larvae will also follow the procedures in the relocation plan; however, the Service will be contacted for approval prior to relocation of these life stages. Unless otherwise approved by the Service, relocation efforts must be completed at a site before work activities begin. If construction at a particular work site ceases for four weeks or longer, a new preconstruction survey by a Service-approved biologist will be conducted prior to re-initiation of ground disturbing activities.

    Prior to the start of work each work day, the Service-approved biologist or monitor will check under construction equipment and vehicles and their tires to ensure no listed species are utilizing the equipment as temporary shelter. All active work sites will be monitored by a Service-approved biologist or monitor during all ground disturbing activities. If California tiger salamanders or California red-legged frogs are identified at the work site, a Service-approved biologist will implement the procedures in the Relocation Plan. Work that could result in take of the species will be halted at the site until the species can be relocated or otherwise protected according to the Relocation Plan.

11. *Species avoidance measures.* The measures listed below will be implemented in order to avoid injury and mortality to California red-legged frogs and California tiger salamanders:

a. In order to avoid initiating work in areas where high numbers of California red-legged frogs or California tiger salamanders may be present, with the exception of installation of wildlife exclusion fencing around and subsequent construction within the dam construction footprint, CCWD and its contractors will initiate all work in or within 250 feet of potential aquatic breeding habitat for California red-legged frog and California tiger salamander between May 1 and November 1.

b. CCWD and its contractors will install temporary wildlife exclusion fencing around the Primary, Secondary, and Shell Borrow Areas so that these areas are completely enclosed with the exception of vehicle entry points. Exclusion fencing will also be installed along the downstream side of the dam construction area in order to prevent movement of species into the construction area from the Kellogg Creek corridor. For all other work sites, CCWD and its contractors will install exclusion fencing around construction areas that are within 250 feet of potential California red-legged frog or California tiger salamander aquatic breeding habitat; where construction activities will occur during the wet season (November 1 - April 30); or where construction activities will occur at a particular location for a period greater than 48 hours. Initial fencing plans will be provided to the Service for review and approval prior to initiation of ground disturbing activities. The exclusion fence will consist of Service-approved geotextile fabric and posts/stakes shall be placed on the inner side of the fence to ensure the listed species cannot enter the work site by climbing the posts/stakes. The fence will be a minimum of 42-inches tall and the bottom 6 inches will be buried to prevent listed species from crawling under the fence. Holes or burrows, which appear to extend under the fencing, will be blocked to prevent the listed species from accessing work areas. In addition, the fence will include one-way funnels to allow listed species to escape if they become trapped within the site. CCWD will ensure that the temporary fencing is continuously maintained until all construction activities are completed and that construction equipment is confined to the designated work areas.

c. Except within the fenced dam construction area and the Shell Borrow Area, night-time construction activities, including all construction related hauling, will be suspended during rain events. A rain event is defined as a 70 percent or greater probability of rain (based on the nearest National Weather Service forecast) or greater than 75 percent relative humidity when there is a 30 percent or greater probability of rain. In order to avoid mortality and injury from vehicular strikes, a speed limit of 15 mph speed limit will be enforced at night and during rain events for all construction-related traffic.

d. All burrows that cannot be avoided within the dam construction area, Shell Borrow Area, and within a Service-approved 5-acre portion of the Primary Core Borrow Area will be hand excavated and collapsed by, or under the supervision of, a Service-approved biologist before the start of construction and after the perimeter wildlife exclusion fencing has been built. Burrows will not be collapsed until the end of the burrow has been reached and the biologist has verified that there are no California tiger salamanders, California red-legged frogs, or Alameda whipsnakes within the burrow. If a salamander, frog, or snake is found within a burrow to be collapsed, the Service- approved biologist will relocate the animal according to the Service-approved relocation plan for the species. The 5 acres where hand excavation of burrows will be conducted within the Primary Core Borrow Area will contain a representative sample of habitat types and burrow densities available within the core borrow areas. A Service-approved plan regarding the extent and appropriate methods for burrow excavation to be implemented within the remaining portion of the Primary Borrow Area and within the Secondary Borrow Area (if material is borrowed there) will be developed based on the results of this initial 5-acre excavation effort. Until the Service-approved plan is complete, all burrows within these areas will he hand excavated prior to ground disturbance.

e. To avoid entrapment, injury, or mortality of listed species resulting from falling into steep sided holes or trenches, all construction-related holes capable of entrapping wildlife will be provided with one or more escape ramps constructed of earth fill or wooden planks at the end of each workday. If escape ramps cannot be provided, then holes or trenches will be covered with plywood or other hard material at the end of the workday. Because listed species may take refuge in cavity-like and den-like structures such as pipes and may enter stored pipes and become trapped, all construction pipes, culverts, or similar structures that are stored at a construction site for one or more overnight periods will be either securely capped prior to storage or thoroughly inspected by the Service approved biologist or monitor for these animals before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If any individuals have become trapped, the animal will be relocated according to the Service-approved relocation plan.

f. Erosion control materials that use plastic or synthetic mono-filament netting will not be used within the action area in order to prevent California red-legged frogs or California tiger salamanders from becoming entangled, trapped or injured. This includes products that use photodegradable or biodegradable synthetic netting, which can take a full calendar year or more to decompose. Acceptable materials include natural fibers such as jute, coconut, twine or other similar fibers.

g. CCWD will require the contractor to ensure that all trash that may attract predators shall be properly contained, removed from the work site, and disposed of daily. Following construction, the contractor shall remove all trash and construction debris from work areas.

h. Where needed to maintain California red-legged frog and/or California tiger salamander breeding in existing mitigation wetlands currently supplemented with water, CCWD will continue to provide supplemental water to these ponds during and after construction according to the existing terms and conditions for these mitigation sites.

12. *Habitat Creation and Monitoring for California red-legged frog and California tiger salamander.* The Wetland Compensatory Mitigation Plan (see measure 7 in the Wetlands and Waters section above) will contain a description of the types of habitat to be created (e.g., seasonal ponds, freshwater permanent emergent habitat); the total area, size, location and number of ponds to be created; and success criteria and monitoring and management requirements. To the greatest practicable extent, CCWD or its contractors will construct and manage created habitat prior to project implementation. New ponds will be hydrologically self-sustaining and will not require a supplemental water supply. Prior to the removal and/or inundation of existing California tiger salamander and California red-legged frog aquatic breeding sites, CCWD shall receive Service approval that created ponds are functioning.

13. *Alameda Whipsnake.* CCWD, in coordination with the Service, will develop and implement a relocation plan for sensitive species that includes an Alameda Whipsnake Protection and Monitoring Plan that will outline a program of preconstruction surveys and construction supervision to identify and prevent potential hazards to individual Alameda whipsnakes that could be present during construction. The plan will prohibit or restrict activities that could harm or harass this species. The plan will also cover restoration of impacted habitat and compensatory habitat acquired. The plan will be submitted prior to initiation of ground-disturbing activities and will include the following:

    a. A description of the species habitat requirements and movement patterns applicable to the project area.

    b. A procedure for conducting preconstruction surveys before the onset of initial ground-disturbing activities in areas in and within 2,500 feet of Alameda whipsnake habitat.

    c. A procedure for monitoring construction and/or restoration sites each day before these activities occur.

    d. A requirement for direct monitoring by a Service-approved biologist of the clearing of occupied or potentially occupied coastal scrub in the project area that would be directly affected by project construction (not by inundation). Construction shall not proceed until such areas have been surveyed, and as many Alameda whipsnakes as reasonably possible have been captured and relocated to minimize take.

    e. A protocol for the selection of Service-approved biologists and biological monitors who have experience with Alameda whipsnake to monitor construction activities (such as initial clearing and grading, excavation, and the installation of silt fencing) within and near Alameda whipsnake habitat.

f. Worker education materials and procedures for informing construction crews about the potential presence of Alameda whipsnakes, equipment operation procedures to minimize impacts to whipsnakes, responsibilities of project personnel (such as reporting observations of Alameda whipsnakes within or next to the construction area to the biological monitor), observing speed limits, avoiding use of the haul road until cleared by the biological monitor, and other measures to avoid mortality of whipsnakes during construction and the role of the monitoring staff in advising construction crews of compliance with take-avoidance measures for Alameda whipsnakes.

g. A reporting protocol requiring notification of the Service within 24 hours of observation of whipsnakes within or next to a construction area as well as periodic reporting of general monitoring activities.

h. Measures to limit stockpiling and staging activities and vehicle and equipment refueling and maintenance to nonsensitive areas.

14. *San Joaquin Kit Fox.* To avoid and minimize take of San Joaquin kit fox, CCWD will implement the following measures before and during construction.

a. Preconstruction surveys will be conducted within 200 feet of work areas to identify potential San Joaquin kit fox dens or other refugia in and surrounding work sites. These surveys will follow the methods outlined in the Service Standardized Recommendations for Protection of San Joaquin Kit Fox prior to Ground Disturbance (Service 1999). A Service-approved biologist will conduct the survey for potential kit fox dens 14 to 30 days before initiation of ground disturbing activity in each work area. All identified potential dens will be monitored for evidence of kit fox use by placing an inert tracking medium at den entrances and monitoring for at least 3 consecutive nights. If no activity is detected at these den sites, they will be closed following guidance established in the Service's Standardized Recommendations (Service 1999). The results of the surveys will be provided to the Service within one week of completion of surveys.

b. If construction in a particular work area ceases for four weeks or longer, a new survey by a qualified biologist will be conducted prior to re-initiation of ground disturbing activities.

c. If kit fox occupancy is determined at a given site, the construction manager will be immediately informed and work will be halted within 200 feet of the den and the Service will be contacted. For known occupied dens, a minimum 100-foot exclusion zone shall be demarcated by fencing that encircles each den but does not prevent foxes from accessing the den. Exclusion zone fencing should be maintained until all construction related or operational disturbances have been terminated. At that time, all fencing shall be removed to avoid attracting subsequent attention to dens. If the den is a natal/pupping den, the buffer will be expanded to a minimum of 250 feet, as determined in consultation with the Service.

d. To minimize the possibility of inadvertent kit fox mortality, project-related vehicles will observe a maximum 20 mph speed limit on private roads in kit fox habitat. Nighttime vehicle traffic will be kept to a minimum on nonmaintained roads. Off-road traffic outside the designated project area will be prohibited.

e. As outlined in the Standardized Recommendations for Protection of the San Joaquin Kit Fox (Service 1999), to prevent accidental entrapment of kit fox or other animals during construction, all excavated holes or trenches greater than 2 feet deep will be covered at the end of each work day by suitable materials, fenced, or escape routes constructed of earthen materials or wooden planks will be provided. Before filling, such holes, pipes, culverts and structures will be thoroughly inspected for trapped animals.

f. All food-related trash items (such as wrappers, cans, bottles, and food scraps) will be disposed of in closed containers and removed daily from the project area.

g. To prevent harassment and mortality of kit foxes or destruction of their dens, no pets will be allowed in the project area.

h. CCWD will continue to implement the current kit fox monitoring program for the Los Vaqueros Watershed for an additional 10 years following project completion. An annual report will be submitted to USFWS.

15. *Valley Elderberry Longhorn Beetle*. CCWD will plant 207 elderberry seedlings within the watershed in areas that will not be affected by the proposed action. These new plants will compensate for the loss of 98 stems greater than 1 inch in diameter on 18 plants that will be inundated. New plants will be obtained from local sources. Elderberry plants with evidence of valley elderberry longhorn beetles (e.g. exit holes) will be relocated to Service-approved areas within the watershed.

Monitoring of long-term success of elderberry replacement and relocation plantings will be described in a Service-approved Vegetation Monitoring Plan that will be prepared for the replacement of sensitive vegetation. The plan will describe planting sites, success criteria, monitoring and reporting requirements and long-term maintenance activities. Replacement and relocation plantings will be monitored bi-annually for a 5-year period to document their establishment and any need for adaptive management such as weeding, cattle exclusion or the need for supplemental water.

Habitat Preservation

16. *Compensatory habitat for listed species.* CCWD will develop a Service-approved compensation package that will preserve habitat for listed species. Prior to inundation of the expanded reservoir, a report describing all compensation lands will be provided to the Service and will include a detailed description of the existing habitats for listed species on lands to be preserved and will identify opportunities for habitat restoration and enhancement. The Service-approved compensation package will include the following:

i. To compensate for permanent and temporary impacts to 2.18 acres of occupied California red-legged frog aquatic habitat, of which 0.82 acres is also occupied California tiger salamander aquatic habitat, CCWD will create, restore and/or enhance 6.54 acres of aquatic habitat within the Los Vaqueros Watershed and on compensation lands acquired for the project. Compensation lands will include a minimum of 1,380 acres of upland habitat (grassland and oak woodland) to compensate for permanent and temporary impacts to approximately 460 acres of upland habitat.

j. To compensate for permanent and temporary loss of 3.12 acres of upland scrub habitat that may support Alameda whipsnakes, CCWD will restore and/or enhance 6.24 acres of scrub habitat. Additional scrub habitat will be protected on compensation lands and approximately 147.4 acres of the total grassland and oak woodland habitat on compensation lands will provide linkages between other chaparral and scrub habitat, or will be located within approximately 2,500 feet of scrub habitat in order serve as foraging and movement habitat for Alameda whipsnake.

k. To compensate for permanent impacts to 724.31 acres of San Joaquin kit fox habitat (including 462.39 acres that are within dedicated CDFG conservation easements), CCWD will acquire, restore and/or enhance approximately 4,700 acres of grassland habitat and 89.85 acres of oak woodland. Compensation lands acquired will be strategically located to protect and enhance regional movement opportunities.

17. All lands included in the Service-approved compensation package will be placed in conservation easements to be held by CDFG or an entity approved by the Service and CDFG as soon as possible following issuance of the Biological Opinion but will be recorded no later than 18 months after the start of the ground- or vegetation-disturbing activities. All easements must be approved by the Service and CDFG and shall not allow development of wind resources.

18. To provide financial assurances that CCWD will perform the required land acquisition and management CCWD will provide CDFG with an irrevocable letter of credit in a form approved of by the Service and CDFG for the amount of $7,606,541 prior to commencing dam and recreation facility construction and for the amount of $40,401,097 prior to proceeding with inundation beyond 100,000 acre feet. The portion of the security related to land acquisition costs may be subtracted from the total security amount for each letter of credit if proof that sufficient compensation lands have been acquired to offset impacts associated with relevant Project activity (i.e., construction and inundation) is provided to CDFG prior to initiation of vegetation- and ground-disturbing activities. The Security shall allow CDFG to draw on the principal sum if CDFG determines that CCWD has failed to comply with the Conditions of Approval of their CDFG Incidental Take Permit.

19. Habitat Management Plans (HMP) will be prepared for all properties in the compensation package within 12 months of issuance of this Biological Opinion and submitted to the

Service and CDFG for approval. The HMPs will include enhancement and restoration plans, monitoring and reporting requirements, success criteria, and long-term management activities.

20. Financial assurances for long-term land management will be provided consistent with CDFG's land management endowment program. The endowment may be held by CDFG or a Service- and CDFG- approved third party endowment holder. The final endowment amount will be determined upon completion of the Habitat Management Plans and will be based on a Service approved PAR or PAR-equivalent analysis and will be fully funded prior to inundation.

Analytical Framework for the Jeopardy Analysis

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

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 California red-legged frog's, California tiger salamander's, Alameda whipsnake's, San Joaquin kit fox's, and valley elderberry longhorn beetle's 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 listed species in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the listed species, and the role of the action area in the survival and recovery of the listed species 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.

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." For the purposes of the effects assessment, the action area includes the 120.15 acres to be temporarily and permanently disturbed by construction activities, the 625.61 acres that will be permanently impacted by inundation of the expanded reservoir, and all areas within 0.3 mile of project-related construction activities.

Status of Species

California Red-legged Frog

Listing Status: The California red-legged frog was listed as a threatened species on May 23, 1996 (61 FR 25813). Critical habitat was designated for this species on April 13, 2006 (71 FR 19244) and revisions to the critical habitat designation were published on March 17, 2010 (75 FR 12816). At this time, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer et al. 2010). A recovery plan was published for the California red-legged frog on September 12, 2002 (Service 2002).

Description: 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).

Distribution: 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 (Service 2002). 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 (CDFG 2010).

Status and Natural History: 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 provide 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 with portions narrower and depths greater than 18 inches also 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. Her 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, e.g., 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 3½ to 7 months following hatching and reach sexual maturity 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 animal may temporarily disappear from an area when conditions are stressful (e.g., during periods of drought, disease, etc.).

The diet of California red-legged frogs is highly variable and changes with the life history stage. The diet of the larvae is not well studied, but is likely similar to that of other ranid frogs, feeding on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Fellers 2005; Kupferberg 1996a, 1996b, 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 frogs, 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).

Metapopulation and Patch Dynamics: The direction and type of habitat used by dispersing animals is especially important in fragmented environments (Forys and Humphrey 1996). Models of habitat patch geometry predict that individual animals will exit patches at more "permeable" areas (Buechner 1987; Stamps et al. 1987). A landscape corridor may increase the patch-edge permeability by extending patch habitat (La Polla and Barrett 1993), and allow individuals to move from one patch to another. The geometric and habitat features that constitute a "corridor" must be determined from the perspective of the animal (Forys and Humphrey 1996).

Because their habitats have been fragmented, many endangered and threatened species exist as metapopulations (Verboom and Apeldom 1990; Verboom et al. 1991). A metapopulation is a collection of spatially discrete subpopulations that are connected by the dispersal movements of the individuals (Levins 1970; Hanski 1991). For metapopulations of listed species, a prerequisite to recovery is determining if unoccupied habitat patches are vacant due to the attributes of the habitat patch (food, cover, and patch area) or due to patch context (distance of the patch to other patches and distance of the patch to other features). Subpopulations on patches with higher quality food and cover are more likely to persist because they can support more individuals. Large populations have less of a chance of extinction due to stochastic events (Gilpin and Soule 1986). Similarly, small patches will support fewer individuals, increasing the rate of extinction. Patches that are near occupied patches are more likely to be recolonized when local extinction occurs and may benefit from emigration of individuals via the "rescue" effect (Hanski 1982; Gotelli 1991; Holt 1993; Fahrig and Merriam 1985). For the metapopulation to persist, the rate of patches being colonized must exceed the rate of patches going extinct (Levins 1970). If some subpopulations go extinct regardless of patch context, recovery actions should be placed on patch attributes. Patches could be managed to increase the availability of food and/or cover.

Movements and dispersal corridors likely are critical to California red-legged frog population dynamics, particularly because the animals likely currently persist as metapopulations with disjunct population centers. Movement and dispersal corridors are important for alleviating over-crowding and intraspecific competition, and also they are important for facilitating the recolonization of areas where the animal has been extirpated. Movement between population centers maintains gene flow and reduced genetic isolation. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects. The survival of wildlife species in fragmented habitats may ultimately depend on their ability to move among patches to access necessary resources, retain genetic diversity, and maintain reproductive capacity within populations (Hilty and Merenlender 2004; Petit et al. 1995; Buza et al. 2000).

Threats: 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 mosquitofish (Moyle 1976; Barry 1992; Hunt 1993; 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 (Storer 1933) 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 (mounted on) with both male and female bullfrogs (Jennings and Hayes 1990; Twedt 1993; Jennings 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 threatened amphibian. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks dispersal, and the introduction of predatory fishes and bullfrogs. Diseases 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 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). Human activities can facilitate the spread of disease by encouraging the further 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.

Status of the Species: The recovery plan for the California red-legged frog identifies eight recovery units (Service 2002). 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. The status of the California red-legged frog was considered within the small scale recovery units as opposed to their overall range. These recovery units are delineated by major watershed boundaries as defined by U.S. Geological Survey hydrologic units and the limits of its range. The goal of the recovery plan is to protect the long-term viability of all extant populations within each recovery unit. 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, will allow for the long term viability within existing populations. This management strategy 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 California red-legged frogs

California Tiger Salamander

Listing Status: On May 23, 2003, the Service proposed to list the Central California Distinct Population Segment (DPS) of the California tiger salamander as threatened. At this time reclassification of the Santa Barbara County DPS and Sonoma County DPS from endangered to threatened was also proposed (68 FR 28647). In the same notice the Service 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 the Central California population of the California DPS of the California tiger salamander was threatened (69 FR 47211), the Service determined that the Santa Barbara and Sonoma County populations were threatened as well, and reclassified the California tiger salamander as threatened throughout its range (69 FR 47211), 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 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, vacated the 2004 rule with regard to the Santa Barbara and Sonoma DPSs, and reinstated their prior listing as endangered. The List of Endangered and Threatened Wildlife in part 17, subchapter B of Chapter I, title 50 of the Code of Federal Regulations (CFR) has not been amended to reflect the vacatures contained in this order, and continues to show the range-wide reclassification of the California tiger salamander as a threatened species with a special rule. We are currently in the process of correcting the CFR to reflect the current status of the species throughout its range.

Description: 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; Stebbins 2003). Tiger salamanders exhibit sexual dimorphism (differences in body appearance based on gender) with males tending to be larger than females. Tiger salamander coloration generally consists of random white or yellowish markings against 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.

Distribution: 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 et al. 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 Santa Maria area within Santa Barbara County, the Santa Rosa Plain in Sonoma County, and vernal pool/grassland habitats throughout the Central Valley.

Status and Natural History: The 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 1998a). Although ground squirrels have been known to eat tiger salamanders, the relationship with their burrowing hosts is primarily commensal (an association that benefits one member while the other is not affected) (Loredo et al. 1996; Semonsen 1998).

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 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. 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 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. A recent study has found that 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 tiger salamanders are feeding while underground. Recent direct observations have confirmed this (Trenham 2001; Van Hattem 2004). Thus, "upland habitat" is a more accurate description of the terrestrial areas used by tiger salamanders.

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 1989, 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 salamander 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 remained in the breeding ponds for an average of 44.7 days while females remained 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 then the females lay their eggs in the water (Twitty 1941; Shaffer et al. 1993; Petranka 1998). Egg laying typically reaches a peak 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). Clutch sizes from a Monterey County study had an average of 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 1998a). 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). 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 treefrogs, western spadefoot toads, and California red-legged frogs (J. Anderson 1968; P. Anderson 1968). 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 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 1998b). 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; Scott 1994; 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 1998b). With such low recruitment, isolated populations are susceptible to unusual, randomly occurring natural events as well 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 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. At a study in Monterey County, it was 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 tiger salamanders return to upland habitats, where they may live for one or more years before attempting to breed again (Trenham et al. 2000).

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 tiger salamanders in Santa Barbara County have been recorded dispersing up to 1.3 miles (2.1 kilometers) from their breeding ponds (Sweet 1998). Tiger salamanders are also known to travel between breeding ponds. One study found that 20 to 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 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. Preliminary results from the 2003-04 trapping efforts at the same study site detected juvenile tiger salamanders at even further distances, with a large proportion of the captures at 2,297 feet (700 meters) from the breeding pond (Trenham et al., unpublished data). Surprisingly, most juveniles captured, even those at 2,100 feet (640 meters), were still moving away from ponds (Ben Fitzpatrick, University of California at Davis, personal communication, 2004). In Santa Barbara County, juvenile California tiger salamanders have been trapped approximately 1,200 feet (366 meters) away while dispersing from their natal pond (Science Applications International Corporation, unpublished data). 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 sited 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.

Threats: Documented or potential tiger salamanders predators include coyotes, raccoons, striped skunks, opossums, egrets, great blue herons, crows, ravens, garter snakes, bullfrogs, California red-legged frogs, mosquito fish, and crayfish.

The California tiger salamander is imperiled throughout its range due to a variety of human activities (Service 2004). 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). Other threats include disease, predation, interspecific competition, urbanization and population growth, exposure to contaminants, rodent and mosquito control, road-crossing mortality, and hybridization with non-native salamanders. Currently, these various primary and secondary threats are largely not being offset by existing federal, state, or local regulatory mechanisms. The tiger salamander is also prone to chance environmental or demographic events, to which small populations are particularly vulnerable.

Movements and dispersal corridors likely are critical to California tiger salamander population dynamics, particularly because the animals likely currently persist as metapopulations with disjunct population centers. Movement and dispersal corridors are important for alleviating over-crowding and intraspecific competition, and also they are important for facilitating the recolonization of areas where the animal has been extirpated. Movement between population centers maintains gene flow and reduced genetic isolation. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects. The survival of wildlife species in fragmented habitats may ultimately depend on their ability to move among patches to access necessary resources, retain genetic diversity, and maintain reproductive capacity within populations (Hilty and Merenlender 2004; Petit et al. 1995; Buza et al. 2000).

Status of the Species: 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 (Buckingham in litt. 2003; CDFG 2010; Service 2004). The California Department of Fish and Game (2010) now considers 13 of these records from the Bay Area region as extirpated or likely to be extirpated.

Of the 140 reported California tiger salamander localities where wetland habitat was identified, only 7 percent were located in vernal pools (CDFG 2010). The Bay Area is located within the Central Coast and Livermore vernal pool regions (Keeler-Wolf et al. 1998). Vernal pools within the Coast Range are more sporadically distributed than vernal pools in the Central Valley (Holland 2003). This rate of loss suggests that vernal pools in these counties are disappearing faster than previously reported (Holland 2003). Most of the vernal pools in the Livermore Region in Alameda County have been destroyed or degraded by urban development, agriculture, water diversions, poor water quality, and long-term overgrazing (Keeler-Wolf et al. 1998). During the 1980s and 1990s, vernal pools were lost at a 1.1 percent annual rate in Alameda County (Holland 1998).

Due to the extensive losses of vernal pool complexes and their limited distribution in the Bay Area region, many California tiger salamander breeding sites consist of artificial water bodies. Overall, 89 percent (124) of the identified water bodies are stock, farm, or berm ponds used by cattle grazing and/or as a temporary water source for small farm irrigation (CDFG 2010). This places the California tiger salamander at great risk of hybridization with non-native tiger salamanders, especially in Santa Clara and San Benito counties. Without long-term maintenance, the longevity of artificial breeding habitats is uncertain relative to naturally occurring vernal pools that are dependent on the continuation of seasonal weather patterns (Shaffer et al. 2004).

Shaffer et al. (1993) found that the East Bay counties of Alameda and Contra Costa supported the greatest concentrations of California tiger salamander. California tiger salamander populations in the Livermore Valley are severely threatened by the ongoing conversion of grazing land to subdivisions and vineyards (Stebbins 1989; 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 Parks District 2003). Other proposed projects located within the California tiger salamander's distribution 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 and urbanization, 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 makes it particularly susceptible to habitat loss, fragmentation, urbanization, and construction related harm and mortality. Most of the California tiger salamander 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 (CDFG 2010).

<u>Alameda Whipsnake</u>

Listing Status: The Alameda whipsnake was federally listed as threatened on December 5, 1997 (Service 1997). Approximately 406,598 acres within Contra Costa, Alameda, Santa Clara, and San Joaquin counties were previously designated critical habitat for the Alameda whipsnake on October 3, 2000 (Service 2000). The final rule was vacated and remanded on May 9, 2003. Critical habitat was re-proposed on October 18, 2005 (Service 2005b). A final rule on critical habitat was released on October 2, 2006 (Service 2006a). A draft recovery plan was published in November 2002 (Service 2002a).

Description: The Alameda whipsnake is described as a slender, fast-moving, diurnal snake with a narrow neck and a relatively broad head with large eyes. The dorsal surface is colored sooty black with a distinct yellow-orange stripe down each side. The anterior portion of the ventral surface is orange-Rufus colored, the midsection is cream colored, while the posterior and tail are pinkish. Adults range in length from 3 to 4 feet (Service 1997). The Alameda whipsnake is one of two subspecies of the California whipsnake. The Alameda whipsnake is distinguished from the chaparral whipsnake by its sooty black dorsum, by wider yellow-orange stripes that run laterally down each side, the lack of a dark line across the rostral, an uninterrupted light stripe between the rostral and eye, and the virtual absence of spotting on the venter of the head and neck.

Distribution: Urban development has fragmented the originally continuous range of the Alameda whipsnake into five primary populations. These populations include (1) Sobrante Ridge, Tilden/Wildcat Regional Parks to the Briones Hills, in Contra Costa County (Tilden-Briones population); (2) Oakland Hills, Anthony Chabot area to Las Trampas Ridge, in Contra Costa County (Oakland-Las Trampas population); (3) Hayward Hills, Palomares area to Pleasanton Ridge, in Alameda County (Hayward-Pleasanton Ridge population); (4) Mount Diablo vicinity and the Black Hills, in Contra Costa County (Mount Diablo-Black Hills population); and (5) Wauhab Ridge, Del Valle area to the Cedar Mountain Ridge, in (Sunol-Cedar Mountain population) (Service 1997). However, additional, yet undiscovered populations may also exit.

Status and Natural History: Alameda whipsnakes retreat into winter hibernacula in November and emerge in March. The species breeds from March through June, with mating appearing to occur near the hibernacula of the female (Swaim 1994). During the mating season females remain near their retreat sites while males disperse throughout their home ranges. Swaim (1994) found the mean home range size for four males was 13.6 acres, and 8.4 acres for 2 females. Alameda whipsnakes lay a clutch of 6 to 11 eggs, May through July (Stebbins 2003), and the young hatch and emerge in the late-summer to early-fall (Swaim 1994). The Alameda whipsnake holds its head high off the ground to peer over grass or rocks for potential prey and is an active diurnal predator. Its diet includes lizards, skinks, frogs, small mammals, snakes, and nesting birds. The open habitat in which the Alameda whipsnake occurs may afford prey-viewing opportunities, perhaps aiding this sight-hunting snake when it forages (Swaim 1994). Small mammal burrows, rock outcrops, and talus provide shelter from predators, egg-laying sites, over-night retreats, and winter hibernacula (Swaim 1994) and are associated with increased numbers of lizards. Lizards, especially the western fence lizard, appear to be the most important prey item for the Alameda whipsnake (Stebbins 2003, Swaim 1994).

The Alameda whipsnake is known to inhabit chemise-redshank chaparral, mixed chaparral, coastal scrub, annual grassland, blue oak-foothill pine, blue oak woodland, coastal oak woodland, valley oak woodland, eucalyptus, redwood, and riparian communities (Mayer and Laudenslayer, Jr. 1988). McGinnis (1992) has documented Alameda whipsnakes using oak woodland/grassland habitat as a corridor between stands of northern coastal scrub. Grassland habitats were used by male Alameda whipsnakes most extensively during the spring mating season (Swaim 1994). Females used these areas most extensively after mating (Swaim 1994), possibly looking for egg-laying sites or dispersing to scrub habitat (Swaim pers. comm. 2002). Egg-laying sites have been found close to scrub communities in grassland with scattered shrubs (Swaim 1994) and in true scrub communities which indicates that rock outcrops, talus, and burrows (mating habitats) need to be within dispersal range of scrub and grassland habitat (egg-laying habitats) (Swaim pers. comm. 2002). Swaim (1994) also observed Alameda whipsnakes mating in rock outcrops.

Scrub and chaparral habitat communities are essential for providing space, food, and cover necessary to sustain all life stages of the Alameda whipsnake. This habitat consists of Diablan sage scrub, coyote bush scrub, and chemise chaparral (Swaim 1994), also classified as coastal scrub, mixed chaparral, and chemise-redshank chaparral (Mayer and Laudenslayer, Jr. 1988). Swaim (1994) found that core areas (areas of concentrated use by Alameda whipsnakes, based on telemetry and trapping data) had the greatest occurrences on east, southeast, south or southwest facing slopes and were characterized by open or partially-open canopy or grassland within 500 feet of scrub. However, grassland and oak woodland habitat independent of chaparral habitat may also be important for Alameda whipsnake populations. A recent examination of recorded whipsnake observations revealed that the species has been found 32 percent of the time in grass- or woodland habitats on slopes of varying aspects (Alvarez 2006). Additional data on habitat use gathered from incidental observations of free-ranging Alameda whipsnakes and recapture data from trapping surveys showed regular use of these habitats at distances greater than 600 feet from scrub and chaparral and included observations of the species more than 3.7 miles from scrub and chaparral communities (Swaim pers. comm. 2004).

Threats: Fragmentation of habitat throughout the range of the Alameda whipsnake, presently allows for little or no genetic exchange to occur between the five corps populations. Interchange between Alameda whipsnakes in the Tilden-Briones, Oakland-Las Trampas, and Hayward-Pleasanton Ridge populations depends on dispersal over the Caldecott Tunnel in Contra Costa County and under the Highway 580 in Alameda County at the Eden Canyon interchange, the Dublin Boulevard undercrossing, or where San Lorenzo Creek passes under the highway (Service 1997). Interchange between the Hayward-Pleasanton Ridge and Sunol-Cedar Mountain populations depends on dispersal along Alameda Creek in Alameda County and crossing under I-680 where the creek passes under the highway, or crossing under the highway at Scott's Corner along Vallecitos Creek, or where two unnamed tributaries to Arroyo de la Laguna cross under I-680 north of Scott's Corner (Service 1997). The Mount Diablo-Black Hills population has no path for dispersal to any of the other populations (Service 1997).

The past and ongoing fragmentation of Alameda whipsnake habitat makes some populations of this species more vulnerable to extinction. Habitat patches with high ratios of edge to interior are known to provide less value for some species than round or square patches provide (Jimerson and Hoover 1991; Saunders et al. 1991). In fragmented habitats, species most prone to extinction are those that depend on native vegetation, require combinations of different habitat types, require large territories, and exist at low densities (Saunders et al. 1991). Alameda whipsnakes have been shown to be associated with native Diablan sage scrub, to forage in adjacent grasslands, and to migrate long distances along riparian corridors and over upland habitat. Few individuals have been captured during trapping studies conducted over thousands of trap days, indicating that Alameda whipsnakes may be sparse even in suitable habitat (Swaim 1994). These factors may combine to cause Alameda whipsnakes to be vulnerable to extinction in small habitat patches resulting from habitat fragmentation.

The breeding of closely related individuals can cause genetic problems in small populations, particularly the expression of deleterious genes (known as inbreeding depression). Alameda whipsnakes tend to be relatively rare even in suitable habitat as indicated by trapping studies that show low capture rates and relatively high recapture rates (about 3 captures, 1 recapture per 1,000 trap days) (Swaim 1994). Individuals and populations possessing deleterious genetic material are less able to adapt to changes in environmental conditions, even relatively minor changes. Further, small populations are vulnerable to the effects of genetic drift (the loss of genetic variability). This phenomenon also reduces the ability of individuals and populations to successfully respond to environmental stresses. Overall, these factors influence the survivability of smaller, genetically isolated populations.

A number of native and exotic mammals and birds are known or likely to be predators of the Alameda whipsnake including the California kingsnake, raccoon, striped skunk, opossum, coyote, gray fox, and hawks. Urbanization can lead to increased numbers and access to habitat by native predators, leading to increased levels of predation on native fauna (Goodrich and Buskirk 1995). In situations where Alameda whipsnake habitat has become fragmented, isolated, and otherwise degraded by human activities, increased predatory pressure may become excessive, especially where alien species, such as rats, feral pigs, and feral and domestic cats and dogs are introduced. These additional threats become particularly acute where urban development immediately abuts Alameda whipsnake habitat. A growing movement to maintain feral cats in parklands is an additional potential threat from predation on wildlife (Coleman et al.

1997; Roberto 1995). Although the actual impact of predation on Alameda whipsnakes under such situations has not been studied, feral cats are known to prey on reptiles, including yellow racers (Hubbs 1951), a fast, diurnal snake closely related to the Alameda whipsnake (Stebbins 2003).

McGinnis (1992) has suggested that grazing has impacted the habitat of the Alameda whipsnake in many areas east of the Coast Range. Overgrazing by livestock that significantly reduces or eliminates shrub and grass cover can be detrimental to this snake, and is suspected of being a primary cause in the reduction of several core populations. Many snake species, including the Alameda whipsnake, avoid such open areas because of the increased danger from predators and the lack of prey (McGinnis 1992). Non-native plants may also replace native vegetation in areas that have been overgrazed or otherwise degraded. This may reduce the habitat suitability for the Alameda whipsnake by precluding the traditional prey base or altering canopy structure. Radiotelemetry data indicate that Alameda whipsnakes tend to avoid dense stands of eucalyptus (Swaim 1994).

Alameda whipsnakes have a higher mean active body temperature (92.1 degrees Fahrenheit) and a higher degree of body temperature stability (stenothermy) than has been documented in any other species of snake under natural conditions (Swaim 1994). Alameda whipsnakes can maintain this high, stable body temperature by using open and partially open and/or low growing shrub communities that provide cover from predators while providing a mosaic of sunny and shady areas between which Alameda whipsnakes can move to regulate their body temperatures (Swaim 1994). Tall, shaded stands of vegetation, such as poison oak, coyote brush, or other vegetation may not provide the optimum temperature gradient for Alameda whipsnakes. Hammerson (1979) observed Alameda whipsnakes emerging from burrows in the morning, basking in the sun, and retreating into burrows when the soil surface temperatures began to fall.

San Joaquin Kit Fox

Listing Status: The San Joaquin kit fox was listed as an endangered species on March 11, 1967 (Service 1967) and it was listed by the State of California as a threatened species on June 27, 1971.

Distribution: In the San Joaquin Valley before 1930, the range of the San Joaquin kit fox extended from southern Kern County north to Tracy in San Joaquin County, on the west side, and near La Grange in Stanislaus County, on the east side (Grinnell et al. 1937; Service 1998). Records are currently documented north to the Antioch area of Contra Costa County.

Status and Natural History: Historically, San Joaquin kit fox occurred in several San Joaquin Valley native plant communities. In the southernmost portion of the range, these communities included valley sink scrub, valley saltbush scrub, upper Sonoran subshrub scrub, and annual grassland. The species seems to prefer more gentle terrain and decreases in abundance as terrain ruggedness increases (Grinnell *et al.* 1937; Morrell 1972; Warrick and Cypher 1999). San Joaquin kit foxes also exhibit a capacity to utilize habitats that have been altered by man and have been observed in oil fields, grazed pasturelands, and "wind farms" (Cypher 2000). Kit foxes can inhabit the margins and fallow lands near irrigated row crops, orchards, and vineyards, and may forage occasionally in these agricultural areas (Service 1998).

Adult San Joaquin kit foxes are usually solitary during late summer and fall. In September and October, adult females begin to excavate and enlarge natal dens (Morrell 1972), and adult males join the females in October or November (Morrell 1972). Typically, pups are born between February and late March (Egoscue 1962; Morrell 1972; Spiegel and Tom 1996; Service 1998). Mean litter sizes reported for San Joaquin kit foxes include 2.0 on the Carrizo Plain (White and Ralls 1993), 3.0 at Camp Roberts (Spencer et al. 1992), 3.7 in the Lokern area (Spiegel and Tom 1996), and 3.8 at the Naval Petroleum Reserve (Cypher et al. 2001). Pups appear above ground when they are approximately 3-4 weeks old, and are weaned at 6-8 weeks. Reproductive rates, the proportion of females bearing young, vary annually with environmental conditions, particularly food availability. Annual rates range from 0 to 100 percent, and reported mean rates include 61 percent at the Naval Petroleum Reserve (Cypher et al. 2001), 64 percent in the Lokern area (Spiegel and Tom 1996), and 32 percent at Camp Roberts (Spencer et al. 1992). Although some yearling female kit foxes will produce young, most do not reproduce until 2 years of age (Spencer et al. 1992; Spiegel and Tom 1996; Cypher et al. 2000). Some young of both sexes, but particularly females may delay dispersal, and may assist their parents in raising the following year's litter of pups (Spiegel and Tom 1996). The young kit foxes begin to forage for themselves at about four to five months of age (Koopman et al. 2000; Morell 1972). San Joaquin kit foxes may live to ten years in captivity (McGrew 1979) and 8 years in the wild (Berry et al. 1987), but most kit foxes do not live past 2-3 years of age.

Although most young kit foxes disperse less than 5 miles (Scrivner et al. 1987), dispersal distances of up to 76.3 miles have been documented for the San Joaquin kit fox (Service 1998). Dispersal can be through disturbed habitats, including agricultural fields, and across highways and aqueducts. The age at dispersal ranges from 4-32 months (Cypher 2000). Among juvenile kit foxes surviving to July 1 at the Naval Petroleum Reserve, 49 percent of the males dispersed from natal home ranges while only 24 percent of the females dispersed (Koopman et al. 2000). Among dispersing kit foxes, 87 percent did so during their first year of age. Some kit foxes delay dispersal and may inherit their natal home range.

San Joaquin kit foxes dens are usually located in areas with loose-textured, friable soils (Morrell 1972; O'Farrell 1983). Some studies have suggested that where hardpan layers predominate, kit foxes create their dens by enlarging the burrows of California ground squirrels or badgers (Jensen 1972; Morrell 1972; Orloff et al. 1986). In parts of their range, particularly in the foothills, kit foxes often use ground squirrel burrows for dens (Orloff et al. 1986). Kit fox dens are commonly located on flat terrain or on the lower slopes of hills with average slope at den sites reported to range from 0 to 22 degrees (CDGF 1980; O'Farrell 1983; Orloff et al. 1986). Natal and pupping dens are generally found in flatter terrain. Common locations for dens include washes, drainages, and roadside berms. Kit foxes also commonly den in human-made structures such as culverts and pipes (O'Farrell 1983; Spiegel et al. 1996).

Natal and pupping dens of the San Joaquin kit fox may include from two to 18 entrances and are usually larger than dens that are not used for reproduction (O'Farrell et al. 1980; O'Farrell and McCue 1981). Natal dens may be reused in subsequent years (Egoscue 1962). It has been speculated that natal dens are located in the same location as ancestral breeding sites (O'Farrell 1983). Active natal dens are generally 1.2 to 2 miles from the dens of other mated kit fox pairs (Egoscue 1962; O'Farrell and Gilbertson 1979). Natal and pupping dens usually can be identified by the presence of scat, prey remains, matted vegetation, and mounds of excavated soil (i.e. ramps) outside the dens (O'Farrell 1983). However, some active dens in areas outside the valley floor often do not show evidence of use (Orloff et al. 1986). During telemetry studies of kit foxes in the northern portion of their range, 70 percent of the dens that were known to be active showed no sign of use (e.g., tracks, scats, ramps, or prey remains)(Orloff et al. 1986). In another more recent study in the Coast Range, 79 percent of active kit fox dens lacked evidence of recent use other than signs of recent excavation (Jones and Stokes Associates 1997).

A San Joaquin kit fox can use more than 100 dens throughout its home range, although on average, an animal will use approximately 12 dens a year for shelter and escape cover (Cypher et al. 2001). Hall (1983) reported individual animals using up to 70 different dens. Kit foxes typically use individual dens for only brief periods, often for only one day before moving to another den (Ralls et al. 1990). At the Naval Petroleum Reserve, individual kit foxes used an average of 11.8 dens per year (Koopman et al. 1998). Den switching by the San Joaquin kit fox may be a function of predator avoidance, local food availability, or external parasite infestations (e.g., fleas) in dens (Egoscue 1956). Reasons for changing dens include infestation by ectoparasites, local depletion of prey, or avoidance of coyotes. Kit foxes tend to use dens that are located in the same general area, and clusters of dens can be surrounded by hundreds of hectares of similar habitat devoid of other dens (Egoscue 1962).

The diet of the San Joaquin kit fox varies geographically, seasonally, and annually, based on temporal and spatial variation in abundance of potential prey. Known prey species of the kit fox include white-footed mice, insects, California ground squirrels, kangaroo rats, San Joaquin antelope squirrels, black-tailed hares, and chukar (Jensen 1972; Archon 1992). Kit foxes also prey on desert cottontails, ground-nesting birds, and pocket mice.

The diets and habitats selected by coyotes and San Joaquin kit foxes living in the same areas are often quite similar. Hence, the potential for resource competition between these species may be quite high when prey resources are scarce such as during droughts, which are quite common in semi-arid, central California. Competition for resources between coyotes and kit foxes may result in kit fox mortalities. Coyote-related injuries accounted for 50-87 percent of the mortalities of radio collared kit foxes at Camp Roberts, the Carrizo Plain Natural Area, the Lokern Natural Area, and the Naval Petroleum Reserve (Cypher and Scrivner 1992; Standley et al. 1992).

San Joaquin kit foxes are primarily nocturnal, although individuals are occasionally observed resting or playing (mostly pups) near their dens during the day (Grinnell et al. 1937). Kit foxes occupy home ranges that vary in size. White and Ralls (1993) reported average home ranges of 4.47 square miles, while others have reported home ranges of up to 12 square miles (Service 1998). A mated pair of kit foxes and their current litter of pups usually occupy each home range (White and Ralls 1993, Spiegel 1996; White and Garrott 1997). Other adults, usually offspring from previous litters, also may be present (Koopman et al. 2000), but individuals often move independently within their home range (Cypher 2000). Individual home ranges can overlap considerably, at least outside core activity areas (Morrell 1972; Spiegel et al. 1996).
Average distances traveled each night range from 5.8 to 9.1 miles and are greatest during the breeding season (Cypher 2000).

The territorial spacing behavior exhibited by the San Joaquin kit fox eventually limits the number of foxes that can inhabit an area owing to shortages of available space and per capita prey. Hence, as habitat is fragmented or destroyed, the carrying capacity of an area is reduced and a larger proportion of the population is forced to disperse. Increased dispersal generally leads to lower survival rates and, in turn, decreased abundance because greater than 65 percent of dispersing juvenile foxes die within 10 days of leaving their natal range (Koopman et al. 2000).

Estimates of kit fox density vary greatly throughout its range, and have been reported as high as 3.11 per square mile in optimal habitats in good years (Service 1998). At the Elk Hills in Kern County, density estimates varied from 0.7 animals per square kilometer (1.86 animals per square mile) in the early 1980s to 0.01 animals per square kilometer (0.03 animals per square mile) in 1991 (Service 1998).

Arid systems are characterized by unpredictable fluctuations in precipitation, which lead to high frequency, high amplitude fluctuations in the abundance of mammalian prey for kit foxes (Goldingay et al. 1997; White and Garrott 1999). Because the reproductive and neonatal survival rates of kit foxes are strongly depressed at low prey densities (White and Ralls 1993; White and Garrott 1997, 1999), periods of prey scarcity owing to drought or excessive rain events can contribute to population crashes and marked instability in the abundance and distribution of kit foxes (White and Garrott 1999).

Historically, kit foxes may have existed in a metapopulation structure of core and satellite populations, some of which periodically experienced local extinctions and recolonization (Service 1998). Today's populations exist in an environment drastically different from the historic one, however, and extensive habitat fragmentation will result in geographic isolation, smaller population sizes, and reduced genetic exchange among populations; all of which increase the vulnerability of kit fox populations to extirpation. Populations of kit foxes are extremely susceptible to the risks associated with small population size and isolation because they are characterized by marked instability in population density. For example, the relative abundance of kit foxes at the Naval Petroleum Reserves, California, decreased 10-fold during 1981 to 1983, increased 7-fold during 1991 to 1994, and then decreased 2-fold during 1995 (Cypher and Scrivner 1992; Cypher and Spencer 1998).

Preliminary genetic assessments indicate that historic gene flow among populations was quite high, with effective dispersal rates of at least one to 4 dispersers per generation (M. Schwartz, pers. comm. to P. J. White, March 23, 2000). This level of genetic dispersal should allow for local adaptation while preventing the loss of any rare alleles. Based on these results, it is likely that northern populations of kit foxes were once panmictic (i.e., randomly mating in a genetic sense), or nearly so, with southern populations. In other words, there were no major barriers to dispersal among populations.

Current levels of gene flow also appear to be adequate, however, extensive habitat loss and fragmentation continues to form more or less geographically distinct populations of foxes, which could potentially reduce genetic exchange among them. An increase in inbreeding and the loss of genetic variation could increase the extinction risk for small, isolated populations of kit foxes by interacting with demography to reduce fecundity, juvenile survival, and lifespan (Lande 1988; Frankham and Ralls 1998; Saccheri et al. 1998).

Threats: Land conversions contribute to declines in kit fox abundance through direct and indirect mortalities, displacement, reduction of prey populations and denning sites, changes in the distribution and abundance of larger canids that compete with kit foxes for resources, and reductions in carrying capacity. Kit foxes may be buried in their dens during land conversion activities (C. Van Horn, Endangered Species Recovery Program, Bakersfield, personal communication to S. Jones, Fish and Wildlife Service, Sacramento, 2000), or permanently displaced from areas where structures are erected or the land is intensively irrigated (Jensen 1972; Morrell 1975). Furthermore, even moderate fragmentation or loss of habitat may significantly impact the abundance and distribution of kit foxes. Capture rates of kit foxes at the Naval Petroleum Reserve in Elk Hills were negatively associated with the extent of oil-field development after 1987 (Warrick and Cypher 1999). Likewise, the California Energy Commission found that the relative abundance of kit foxes was lower in oil-developed habitat than in nearby undeveloped habitat on the Lokern (Spiegel 1996).

Pesticides and rodenticides pose a threat to kit foxes through direct or secondary poisoning. Kit foxes may be killed if they ingest rodenticide in a bait application, or if they eat a rodent that has consumed the bait. Even sublethal doses of rodenticides may lead to the death of these animals by impairing their ability to escape predators or find food. Pesticides and rodenticides may also indirectly affect the survival of kit foxes by reducing the abundances of their staple prey species.

Several species prey upon San Joaquin kit foxes. Predators such as coyotes, bobcats, non-native red foxes, badgers, and golden eagles will kill kit foxes. Badgers, coyotes, and red foxes also may compete for den sites (Service 1998). The diets and habitats selected by coyotes and kit foxes living in the same areas are often quite similar (Cypher and Spencer 1998). Hence, the potential for resource competition between these species may be quite high when prey resources are scarce such as during droughts, which are quite common in semi-arid, central California. Land conversions and associated human activities have led to changes in the distribution and abundance of coyotes, which compete with kit foxes for resources.

Wildlife diseases do not appear to be a primary mortality factor that consistently limits kit fox populations throughout their range (McCue and O'Farrell 1988; Standley and McCue 1992). However, central California has a high incidence of wildlife rabies cases (Schultz and Barrett 1991), and high seroprevalences of canine distemper virus and canine parvovirus indicate that kit fox populations have been exposed to these diseases (McCue and O'Farrell 1988; Standley and McCue 1992). Hence, disease outbreaks could potentially cause substantial mortality or contribute to reduced fertility in seropositive females, as was noted in the closely-related swift fox. There are some indications that rabies virus may have contributed to a catastrophic decrease in kit fox abundance at Camp Roberts, San Luis Obispo County, California, during the early 1990's.

Status of the Species: The status (i.e., distribution, abundance) of the kit fox has decreased since its listing in 1967. This trend is reasonably certain to continue into the foreseeable future unless measures to protect, sustain, and restore suitable habitats, and alleviate other threats to their survival and recovery, are implemented.

Less than 20 percent of the habitat within the historical range of the kit fox remained when the animal was listed as federally-endangered in 1967, and there has been a substantial net loss of habitat since that time. Historically, San Joaquin kit foxes occurred throughout California's Central Valley and adjacent foothills. Extensive land conversions in the Central Valley began as early as the mid-1800s with the Arkansas Reclamation Act. By the 1930's, the range of the kit fox had been reduced to the southern and western parts of the San Joaquin Valley (Grinnell et al. 1937). The primary factor contributing to this restricted distribution was the conversion of native habitat to irrigated cropland, industrial uses (e.g., hydrocarbon extraction), and urbanization (Laughrin 1970; Jensen 1972; Morrell 1972, 1975). Approximately one-half of the natural communities in the San Joaquin Valley were tilled or developed by 1958 (Service 1983).

This rate of loss accelerated following the completion of the Central Valley Project and the State Water Project, which diverted and imported new water supplies for irrigated agriculture (Service 1995). Approximately 1.97 million acres of habitat, were converted in the San Joaquin region between 1950 and 1980 (Service 1998). The counties specifically noted as having the highest wildland conversion rates included Kern, Tulare, Kings, and Fresno, all of which are occupied by kit foxes. From 1959 to 1969 alone, an estimated 34 percent of natural lands were lost within the then-known kit fox range (Laughrin 1970). By 1979, only approximately 370,000 acres out of a total of approximately 8.5 million acres on the San Joaquin Valley floor remained as non-developed land (Williams 1985; Service 1983). Virtually all of the documented loss of essential habitat was the result of conversion to irrigated agriculture.

During 1990 to 1996, a gross total of approximately 71,500 acres of habitat were converted to farmland in 30 counties (total area 23.1 million acres) within the Conservation Program Focus area of the Central Valley Project. This figure includes 42,520 acres of grazing land and 28,854 acres of "other" land, which is predominantly comprised of native habitat. During this same time period, approximately 101,700 acres were converted to urban land use within the Conservation Program Focus area (California Department of Conservation 1998). This figure includes 49,705 acres of farmland, 20,476 acres of grazing land, and 31,366 acres of "other" land, which is predominantly comprised of native habitat. Because these assessments included a substantial portion of the Central Valley and adjacent foothills, they provide the best scientific and commercial information currently available regarding the patterns and trends of land conversion within the kit fox's geographic range. More than one million acres of suitable habitat for kit foxes have been converted to agricultural, municipal, or industrial uses since the listing of the kit fox. In contrast, less than 500,000 acres have been preserved or are subject to community-level conservation efforts designed, at least in part, to further the conservation of the kit fox (Service 1998).

Extensive habitat destruction and fragmentation have contributed to smaller, more-isolated populations of kit foxes. Small populations have a higher probability of extinction than larger populations because their low abundance renders them susceptible to stochastic (i.e., random) events such as high variability in age and sex ratios, and catastrophes such as floods, droughts, or disease epidemics (Lande 1988; Frankham and Ralls 1998; Saccheri et al. 1998). Similarly, isolated populations are more susceptible to extirpation by accidental or natural catastrophes because their recolonization has been hampered. These chance events can adversely affect small, isolated populations with devastating results. Extirpation can even occur when the members of a small population are healthy, because whether the population increases or decreases in size is less dependent on the age-specific probabilities of survival and reproduction than on raw chance (sampling probabilities). Owing to the probabilistic nature of extinction, many small populations will eventually lose out and go extinct when faced with these stochastic risks (Caughley and Gunn 1995).

This risk has been prominently illustrated during recent, drastic declines in the populations of kit foxes at Camp Roberts and Fort Hunter Liggett. Captures of kit foxes during annual live trapping sessions at Camp Roberts decreased from 103 to 20 individuals during 1988 to 1991. This decrease continued through 1997 when only three kit foxes were captured (White et al. 2000). A similar decrease in kit fox abundance occurred at nearby Fort Hunter Liggett, and only 2 kit foxes have been observed on this installation since 1995 (L. Clark, Wildlife Biologist, Fort Hunter Liggett, pers. comm. to P. J. White, February 15, 2000). It is unlikely that the current low abundances of kit foxes at Camp Roberts and Fort Hunter Liggett will increase substantially in the near future owing to the limited potential for recruitment. The chance of substantial immigration is low because the nearest core population on the Carrizo Plain is distant (greater than 16 miles) and separated from these installations by barriers to kit fox movement such as roads, developments, and irrigated agricultural areas. Also, there is a relatively high abundance of sympatric predators and competitors on these installations that contribute to low survival rates for kit foxes and, as a result, may limit population growth (White et al. 2000). Hence, these populations may be on the verge of extinction.

Coyotes occur in most areas with abundant populations of kit foxes and, during the past few decades, coyote abundance has increased in many areas owing to a decrease in ranching operations, favorable landscape changes, and reduced control efforts (Orloff et al. 1986; Cypher and Scrivner 1992; White and Ralls 1993; White et al. 1995). Coyotes may attempt to lessen resource competition with kit foxes by killing them. Coyote-related injuries accounted for 50-87 percent of the mortalities of radio collared kit foxes at Camp Roberts, the Carrizo Plain Natural Area, the Lokern Natural Area, and the Naval Petroleum Reserves (Cypher and Scrivner 1992; Standley et al. 1992; Ralls and White 1995; Spiegel 1996). Coyote-related deaths of adult foxes appear to be largely additive (i.e., in addition to deaths caused by other mortality factors such as disease and starvation) rather than compensatory (i.e., tending to replace deaths due to other mortality factors; White and Garrott 1997). Hence, the survival rates of adult foxes decrease significantly as the proportion of mortalities caused by coyotes increase (Cypher and Spencer 1998; White and Garrott 1997), and increases in coyote abundance may contribute to significant declines in kit fox abundance (Cypher and Scrivner 1992; Ralls and White 1995; White et al. 1996). There is some evidence that the proportion of juvenile foxes killed by coyotes increases as fox density increases (White and Garrott 1999). This density-dependent relationship would provide a feedback mechanism that reduces the amplitude of kit fox population dynamics and keeps foxes at lower densities than they might otherwise attain. In other words, coyote-related mortalities may dampen or prevent fox population growth, and accentuate, hasten, or prolong population declines.

Efforts have been underway to reduce the risk of rodenticides to kit foxes (Service 1993). The Federal government began controlling the use of rodenticides in 1972 with a ban of Compound 1080 on Federal lands pursuant to Executive Order. Above-ground application of strychnine within the geographic ranges of listed species was prohibited in 1988. A July 28, 1992, biological opinion regarding the Animal Damage Control (now known as Wildlife Services) Program by the U.S. Department of Agriculture found that this program was likely to jeopardize the continued existence of the kit fox owing to the potential for rodent control activities to take the fox. As a result, several reasonable and prudent measures were implemented, including a ban on the use of M-44 devices, toxicants, and fumigants within the recognized occupied range of the kit fox. Also, the only chemical authorized for use by Wildlife Services within the occupied range of the kit fox was zinc phosphide, a compound known to be minimally toxic to kit foxes (Service 1993).

A September 22, 1993, biological opinion issued by the Service to the Environmental Protection Agency (EPA) regarding the regulation of pesticide use (31 registered chemicals) through administration of the Federal Insecticide, Fungicide, and Rodenticide Act found that use of the following chemicals would likely jeopardize the continued existence of the kit fox: (1) aluminum and magnesium phosphide fumigants; (2) chlorophacinone anticoagulants; (3) diphacinone anticoagulants; (4) pival anticoagulants; (5) potassium nitrate and sodium nitrate gas cartridges; and (6) sodium cyanide capsules (Service 1993). Reasonable and prudent alternatives to avoid jeopardy included restricting the use of aluminum/magnesium phosphide, potassium/sodium nitrate within the geographic range of the kit fox to qualified individuals, and prohibiting the use of chlorophacinone, diphacinone, pival, and sodium cyanide within the geographic range of the kit fox, with certain exceptions (e.g., agricultural areas that are greater than 1 mile from any kit fox habitat)(Service 1999a).

Despite these efforts, the use of other pesticides and rodenticides still pose a significant threat to the kit fox, as evidenced by the death of two kit foxes at Camp Roberts in 1992 owing to secondary poisoning from chlorophacinone applied as a rodenticide, (Berry et al. 1992; Standley et al. 1992). Also, the livers of three kit foxes that were recovered in the City of Bakersfield during 1999 were found to contain detectable residues of the anticoagulant rodenticides chlorophacinone, brodifacoum, and bromadiolone (CDFG 1999).

The primary goal of the recovery strategy for kit foxes identified in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998) is to establish a complex of interconnected core and satellite populations throughout the species' range. The long-term viability of each of these core and satellite populations depends partly upon periodic dispersal and genetic flow between them. In the northern range, from the Ciervo Panoche core population in Fresno County northward, kit fox populations are small and isolated, and have exhibited significant decline. Therefore, kit fox movement corridors between these populations must be preserved and maintained.

The small size of the northernmost kit fox population and its isolation from other established populations make it vulnerable to extinction owing to predation and competition from coyotes and red foxes, inbreeding, catastrophic events, and disease epidemics (White et al. 2000). Genetic studies conducted by Schwartz et al. (2000) found that individuals in the Los Banos population near San Luis Reservoir only breed with animals in the northern population in Alameda and Contra Costa counties. Thus, projects in Alameda and Contra Costa County that significantly reduce travel corridors and population size could potentially impact the Los Banos kit fox population. The long term viability of both populations depends, at least in part, on periodic immigration and gene flow from between the populations.

Habitat in the northern range is highly fragmented by highways, canals, and development. Interstate 580 runs southeast to northwest as it splits from Interstate 5, and turns west through the Altamont Pass area; thus it impedes both north-south and west-east movement of San Joaquin kit foxes. Although the canal system facilitates north-south migration along its length, it also impedes lateral east-west kit fox travel. Additional development in these areas will further impede the movement of kit fox and isolate the northern population from more southern populations. The protection of the remaining travel corridor, including grasslands west of Interstate 580, and lands between the California aqueduct and the Delta Mendota Canal, is vital to the survival of this population.

Valley Elderberry Longhorn Beetle

Listing Status: The beetle was listed as a threatened species under the Act on August 8, 1980 (Service 1980). Critical habitat for the species was designated and published in 50 CFR §17.95. Two areas along the American River in the Sacramento metropolitan area have been designated as critical habitat for the beetle. The first area designated as critical habitat for this species is along the lower American River at River Bend (Goethe) and Ancil Hoffman parks (American River Parkway Zone). The second area is at the Sacramento Zone, an area about a half mile from the American River, downstream from the American River Parkway Zone. In addition, an area along Putah Creek, Solano County, and the area west of Nimbus Dam along the American River Parkway, Sacramento County, are considered essential habitat, according to *The Valley Elderberry Longhorn Beetle Recovery Plan* (Recovery Plan) (Service 1984). These critical habitat areas and essential habitat areas within the American River parkway and Putah Creek support large numbers of mature elderberry shrubs with extensive evidence of use by the beetle.

Distribution: When the beetle was listed in 1980, the species was known from less than ten localities along the American River, the Merced River, and Putah Creek. By the time the Recovery Plan was prepared in 1984; additional occupied localities had been found along the American River and Putah Creek. By 2005, the California range-wide distribution extended from the Sacramento River in Shasta County, southward to an area along Caliente Creek in Kern County with the California Natural Diversity Database (CNDDB) reporting 190 occurrences for this species in 44 drainages throughout the Central Valley. However, the number of records should be viewed with caution as a record does not necessarily indicate a unique population. In many cases, there are multiple records within close proximity to one another within the same watershed or river.

The beetle is considered a poor disperser based on the spatial distribution of occupied shrubs (Barr 1991; Collinge et al. 2001). Huxel and Hastings (1999) used computer simulations of colonization and extinction patterns based on differing dispersal distances, and found that the short dispersal simulations best matched the 1997 census data in terms of site occupancy. This suggests that dispersal and colonization are limited to nearby sites. At spatial scales greater than 6.2 miles, such as across drainages, beetle occupancy appears to be strongly influenced by regional extinction and colonization processes, and colonization is constrained by limited dispersal (Collinge et al. 2001; Huxel and Hastings 1999). Except for one occasion, drainages examined by Barr that were occupied in 1991, remained occupied in 1997 (Collinge et al. 2001; Huxel and Hastings 1999). The one exception was Stoney Creek, which was occupied in the year 1991, but not in the year 1997. All drainages found by Barr (1991) to be unoccupied in the year 1991, were also unoccupied in the year 1997. Collinge et al. (2001) further found that while the proportions of occupancy were similar, the number of sites examined containing elderberry and the density of elderberry at sites had decreased since Barr (1991), resulting in fewer occupied sites and groups. Studies suggest that the beetle is unable to re-colonize drainages where the species has been extirpated, because of its limited dispersal ability (Barr 1991; Collinge et al. 2001). This data suggests that drainages unoccupied by the beetle remain unoccupied.

Status and Natural History: The elderberry shrub is the sole host plant for the valley elderberry longhorn beetle. Elderberries are locally common components of the remaining riparian forest and savannah landscapes, and to a lesser extent the mixed chaparral-foothill woodlands, of the Central Valley. The occupancy rates of the beetle are reduced in non-riparian habitats (e.g., Talley et al. 2007), indicating that riparian elderberry habitat an important habitat type for the beetle.

Use of elderberry shrubs by the beetle, a wood borer, is rarely apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an exit hole created by the larva emerging just prior to the pupal stage. Observations of elderberry shrubs along the Cosumnes River and in the Folsom Lake area indicate that larval beetles can be found in elderberry stems with no apparent exit holes; the larvae either succumb prior to constructing an exit hole or not developed sufficiently to construct one. Larvae appear to be distributed in stems which are one inch or greater in diameter at ground level and can occur in non-living stems. The Recovery Plan (Service 1984) and Barr (1991) further describe the beetle's life history.

The beetle is a specialist on elderberry plants, and tends to have small population sizes and occurs in low densities (Barr 1991; Collinge et al. 2001). It has been observed feeding upon both blue and red elderberry (Service 1984, Barr 1991) with stems greater than or equal to one inch in diameter (Barr 1991). Sightings of the beetle are rare and in most circumstances, evidence of the beetle is derived from the observation of the exit holes left when adults emerge from elderberry stems. The beetle tends to occur in areas with higher elderberry densities, but has lower exit hole densities than a closely related species, the California elderberry longhorn beetle (Collinge et al. 2001).

Threats : The beetle continues to be threatened by habitat loss and fragmentation, predation by non-native Argentine ants (Holway 1998; Huxel 2000; Huxel and Hastings 1999; Huxel et al. 2001; Ward 1987), and possibly other factors such as pesticide drift, non-native plant invasion, improper burning regimes, off-road vehicle use, rip-rap bank protection projects, wood cutting, and over-grazing by livestock.

Habitat destruction is one of the most significant threats to the beetle. Riparian forests, the primary habitat for the beetle, have been severely depleted throughout the Central Valley over the last two centuries as a result of expansive agricultural and urban development (Huxel et al.

2001; Katibah 1984; Roberts et al. 1977; Thompson 1961). As of the year 1849, the rivers and larger streams of the Central Valley were largely undisturbed. They supported continuous bands of riparian woodland four to five miles in width along some major drainage, such as the lower Sacramento River, and generally about two miles wide along the lesser streams (Thompson 1961). Most of the riverine floodplains supported riparian vegetation to about the 100-year flood line (Katibah 1984).

A large human population influx occurred after the year 1849, however, and much of the Central Valley riparian habitat was rapidly converted to agriculture and used as a source of wood for fuel and construction to serve a wide area (Thompson 1961). The clearing of riparian forests for fuel and construction made this land available for agriculture (Thompson 1961). Natural levees bordering the rivers, once supporting vast tracts of riparian habitat, became prime agricultural land (Thompson 1961). As agriculture expanded in the Central Valley, needs for increased water supply and flood protection spurred water development and reclamation projects. Artificial levees, river channelization, dam building, water diversion, and heavy groundwater pumping further reduced riparian habitat to small, isolated fragments (Katibah 1984).

Destruction of riparian habitat in central California has resulted not only in a significant acreage loss, but also has resulted in beetle habitat fragmentation. Fahrig (1997) states that habitat fragmentation is only important for habitats that have suffered greater than 80 percent loss. Riparian habitat in the Central Valley, which has experienced greater than 90 percent loss by most estimates, would meet this criterion as habitat vulnerable to effects of fragmentation. Existing data suggests that beetle populations, specifically, are affected by habitat fragmentation. Barr (1991) found that small, isolated habitat remnants were less likely to be occupied by beetles than larger patches, indicating that beetle subpopulations are extirpated from small habitat fragments. Barr (1991) and Collinge et al. (2001) consistently found beetle exit holes occurring in clumps of elderberry bushes rather than isolated bushes, suggesting that isolated shrubs do not typically provide long-term viable habitat for this species.

Habitat fragmentation can be an important factor contributing to species declines because: (1) it divides a large population into two or more small populations that become more vulnerable to direct loss, inbreeding depression, genetic drift, and other problems associated with small populations; (2) it limits a species' potential for dispersal and colonization; and (3) it makes habitat more vulnerable to outside influences by increasing the edge:interior ratio (Primack 1998). Small, isolated subpopulations are susceptible to extirpation from random demographic, environmental, and/or genetic events (Shaffer 1981; Lande 1988; Primack 1998). While a large area may support a single large population, the smaller subpopulations that result from habitat fragmentation may not be large enough to persist over a long time period. As a population becomes smaller, it tends to lose genetic variability through genetic drift, leading to inbreeding depression and a lack of adaptive flexibility. Smaller populations also become more vulnerable to random fluctuations in reproductive and mortality rates, and are more likely to be extirpated by random environmental factors. When a sub-population becomes extinct, habitat fragmentation reduces the chance of recolonization from any remaining populations. The effect of habitat fragmentation likely is exacerbated by the poor dispersal abilities of the beetle (Collinge et al 2001; Talley 2005).

Habitat fragmentation not only isolates small populations, but also increases the interface between habitat and urban or agricultural land, increasing negative edge effects such as the invasion of non-native species (Huxel et al. 2001; Huxel 2000) and pesticide contamination (Barr 1991). Several edge effect-related factors may be related to the decline of the beetle.

The invasive Argentine ant is a potential threat to the beetle (Huxel 2000). This ant is both an aggressive competitor and predator on native fauna that is spreading throughout riparian habitats in California and displacing assemblages of native arthropods (Ward 1987; Human and Gordon 1997; Holway 1998). The Argentine ant requires moisture and it may thrive in riparian or irrigated areas. A negative association between the presence of the ant and beetle exit holes was observed along Putah Creek in 1997 (Huxel 2000). This aggressive ant could interfere with adult mating or feeding behavior, or prey on eggs and larvae (e.g., Way et al. 1992). Surveys along Putah Creek found beetle presence where Argentine ants were not present or had recently colonized, but the beetle was absent from otherwise suitable sites where Argentine ants had become well-established (Huxel 2000). The Argentine ant has been expanding its range throughout California since its introduction around 1907, especially in riparian woodlands associated with perennial streams (Holway 1998; Ward 1987). Huxel (2000) concluded that, given the potential for Argentine ants to spread with the aid of human activities such as movement of plant nursery stock and agricultural products, this species may come to infest most drainages in the Central Valley along the valley floor, where the beetle is found.

The beetle is also likely preyed upon by insectivorous birds, lizards, and European earwigs (Klasson et al. 2005). These three predators move freely up and down elderberry stems searching for food. The European earwig is a scavenger and omnivore that was often found feeding on tethered mealworm larvae. The earwig may be common in riparian areas and it may lay its eggs in dead elderberry shrubs. The earwig, like the Argentine ant, requires moisture and is often found in large numbers in riparian and urban areas. Earwig presence and densities tended to be highest in mitigation sites likely because of the irrigation, although this needs to be statistically tested (Klasson et al. 2005).

Direct spraying with pesticides and related pesticide drift is a potentially harmful factor for the beetle. A wide range of such spraying is done to control mosquitoes, crop diseases, and undesirable plants and insects. Although there have been no studies specifically focusing on the direct and indirect effects of pesticides on the beetle, evidence suggests that the species may be adversely affected by some pesticide applications. Commonly used pesticides within the range of the beetle include insecticides, most of which are broad-spectrum and likely toxic to the beetle; herbicides, which may harm or kill its host elderberry plants; and broad-spectrum pesticides toxic to many forms of life. The greatest pesticide use occurs in the San Joaquin Valley. Four counties in this region had the highest use: Fresno, Kern, Tulare, and San Joaquin (California Department of Pesticide Regulation (CDPR) 2006). The peak timing of application depends on the chemical agent and other factors including the activity period of the targeted pest insects; the use of the agents may coincide with the most vulnerable period of beetle adult activity, egg-laying and initial larval exposure on the outside of elderberry stems (Talley et al. 2006). The CDPR in the year 1997 listed 239 pesticide active ingredients applied in proximity to locations of beetle (same square mile per Marovich and Kishaba 1997 cited in Talley et al.

2006). Pesticide active ingredients sold in California have averaged on the order of 600 million pounds per year since about 1998 (CDPR 2006).

Pesticide use reported to the CDPR is only a fraction of the pesticides sold in California each year. About two-thirds of the active ingredients sold in a given year are not subject to use reporting, including home-use pesticide products. Recent studies of major rivers and streams documented that 96 percent of all fish, 100 percent of all surface water samples and 33 percent of major aquifers contained one or more pesticides at detectable levels (Gilliom 1999). Pesticides were identified as one of the 15 leading causes of impairment for streams included on the Clean Water Act section 303(d) lists of impaired waters. Because the beetle occurs primarily in riparian habitat, the contamination of rivers and streams likely has affects on this species and its habitat. Given the amount and scope of pesticide use, along with unreported household and other uses, and the proximity of agriculture to riparian vegetation in the Central Valley, it appears likely that pesticides are affecting the beetle and its elderberry habitat.

Invasive exotic plant species may significantly alter the habitat of the beetle. Without adequate eradication and control measures these non-native species may eliminate elderberry shrubs and other native plants. Pest plants of major importance in Central Valley riparian systems include black locust, giant reed, red sesbania, Himalaya blackberry, tree of heaven, Spanish broom, Russian olive, edible fig, and Chinese tallowtree. Non-woody invasives such as ripgut brome, foxtail barley, and starthistle/knapweed also may impair elderberry germination or establishment, or elevate the risk of fire. Invasive plant control efforts often are limited by funding, labor, coordination with landowners, and the resilience and spread of their target plants. No rangewide assessment has been completed on the overall degree of impact of invasive plants on the beetle and its habitat. However, there are a number of local efforts to control invasive riparian plant species. For example, the American River Parkway has invasive species removal efforts by Sacramento Weed Warriors (a community stewardship project associated with the California Native Plant Society) and others, and the Cosumnes River Preserve has a group of volunteers who regularly remove exotics and restore native habitats (Talley et al. 2006).

Several other factors may threaten the beetle including fire, flooding, and over-grazing by livestock. The condition of elderberry shrubs can be adversely affected by fire, which is often common at the urban-wildland interface. Brush fires initially have a negative effect on shrub condition and, therefore, beetle larvae through direct burning and stem die-off. A year after fire, however, surviving elderberry resprout and display rapid stem growth (Crane 1989). Fires often scarify the hard elderberry seed coat leading to germination of seedlings the following season (Crane 1989). Frequent or repeated fire, however, may kill remaining shoots, root crowns and seeds, causing elderberry to be eliminated from an area for many years since recruitment by seeds is patchy and generally slow (Crane 1989). Elderberry shrubs appeared suitable for the beetle two to six years after burning, but were often uninhabited, with the presence of old, burned exit holes suggesting pre-burn occupancy and post-burn vacancy (Talley et al. 2006.). The post-fire lag in occupancy is likely the result of the limited movements of the beetle. Beetle occupancy occurred six to seven years post burn and, as in the alluvial plain of the American River Parkway, is about the same within the post-burn compared with unburned areas (Talley et al. 2007). No quantitative studies of the net effects of fire on the beetle have been undertaken (e.g., examining beetle and elderberry through time after burns or in areas with varying burn frequencies and magnitude).

The beetle can tolerate flooding of its riparian habitat. The animal has higher occupancy rates in riparian than non-riparian habitats, and associations between the beetle and proximity to rivers were either not observed or there was a weak positive correlation with nearness to the river (Halstead and Oldham 1990; Talley 2005; Talley et al. 2007). These findings illustrate that the beetle is not likely harmed by flooding and that higher habitat quality may be associated with rivers. In addition, if elderberry, a facultative riparian shrub, can withstand flooding, then the beetle likely will survive these events. Most floods occur during winter or early spring when the beetle is in its early life history stages, so that the effects of floods are even less likely to affect the beetle. If the shrub is exposed to prolong flooding (i.e., anoxia) and becomes severely stressed, then the beetle may be affected. The duration and magnitude of flooding at which elderberry stresses is uncertain and the levels of stress that affect the beetle is also unknown. Elderberry shrubs have adaptations that plants use to persist with flooding such as lenticels and aerenchyma, demonstrating that it is probably at least somewhat flood tolerant. Finally, if an area is flooded too frequently so that elderberry cannot survive then no beetles would be able to inhabit the area (Talley 2005).

Another potential factor in the beetle's decline is the effects of inappropriate levels of livestock grazing, which can result in destruction of entire elderberry plants and inhibition of elderberry regeneration. Cattle, sheep and goats readily forage on new elderberry growth, and goats will consume even decadent growth. Well-manicured stands of elderberries, such as occurs due to livestock grazing, have generally been shown to have a relative absence of beetles (Service 1984). The effects on the beetle of both grazing and exotic plant invasions are likely significantly exacerbated by the problem of habitat fragmentation of elderberries. Such fragmentation increases the edge:interior ratio of habitat patches, thereby facilitating the adverse effects of these outside influences.

Status of the Species: In recent decades, these riparian areas have continued to decline as a result of ongoing agricultural conversion as well and urban development and stream channelization. As of the year 1989, there were over 100 dams within the Central Valley drainage basin, as well as thousands of miles of water delivery canals and stream bank flood control projects for irrigation, municipal and industrial water supplies, hydroelectric power, flood control, navigation, and recreation (Frayer et al. 1989). Riparian forests in the Central Valley have dwindled to discontinuous strips of widths currently measurable in yards rather than miles.

Some accounts state that the Sacramento Valley supported approximately 775,000 to 800,000 acres of riparian forest as of approximately in the year 1848, just prior to statehood (Smith 1977; Katibah 1984). No comparable estimates are available for the San Joaquin Valley. Based on early soil maps, however, more than 921,000 acres of riparian habitat are believed to have been present throughout the Central Valley under pre-settlement conditions (Huxel et al 2001; Katibah 1984). Another source estimates that of approximately 5,000,000 acres of wetlands in the Central Valley in the 1850s, approximately 1,600,000 acres were riparian wetlands (Warner and Hendrix 1985; Frayer et al. 1989).

Based on a CDFG riparian vegetation distribution map, by the year 1979, there were approximately 102,000 acres of riparian vegetation remaining in the Central Valley. This represents a decline in acreage of approximately 89 percent as of the year 1979 (Katibah 1984).

More extreme figures were given by Frayer et al. (1989), who reported that woody riparian forests in the Central Valley had declined to 34,600 acres by the mid-1980s (from 65,400 acres in 1939).

A more recent analysis, completed by The Central Valley Historic Mapping Project, observed similar decreases in the amount of riparian habitat (Geographic Information Center 2003). Loss of riparian habitat between the year 1900 and the year 1990 in the Central Valley was about 96 percent in the southern portion of the Valley (Kern County to Fresno County) (16,000 acres remaining), 84 percent in the middle Valley (Merced County to San Joaquin County) (21,000 acres remaining) and 80 percent in the northern Valley (Sacramento and Solano counties to Shasta County) (96,000 acres remaining). Although these studies have differing findings in terms of the number of acres lost (most likely explained by differing methodologies), they attest to a dramatic historic loss of riparian habitat in the Central Valley.

Environmental Baseline

California Red-legged Frog

The proposed action is located in the East San Francisco Bay Core Area of the East San Francisco Bay Recovery Unit number 16 for the California red-legged frog (Service 2002). California red-legged frogs have been documented throughout the 18,500 acre Los Vaqueros Watershed (Watershed) and stock ponds in the Watershed support some of the highest densities of California red-legged frog in the region (Jones and Stokes Associates 2006). The CNDDB reports 96 California red-legged frog occurrences in and near the Watershed (CDFG 2010).

The Watershed also lies within the East Contra Costa HCP/NCCP (ECCHCP/NCCP) inventory area. The ECCHCP/NCCP provides a regional conservation strategy that includes the development and acquisition of a preserve system. A completed preserve system will encompass 23,800 to 30,300 acres of land in eastern Contra Costa County and will include connections linking existing and future protected private and public lands. Currently, over 5,000 acres have been acquired for inclusion in the preserve system including a large area contiguous to the Watershed on the east that supports numerous occurrences of California tiger salamander and California red-legged frog and provides habitat for San Joaquin kit fox.

The filling of the original reservoir in 1998 resulted in the inundation of approximately 1,460 acres within the Watershed including 14.85 acres of wetland areas, and approximately 3,700 feet of Kellogg Creek and its tributary drainages. Currently within the Watershed there are 68 stock ponds and 22 semi-permanent or alkali marshes that provide aquatic habitat for California red-legged frogs and that potentially provide breeding habitat for the species. Upland habitat in the Watershed includes grassland, scrub, woodlands, and riparian. The mosaic of habitats in the Watershed provides breeding, dispersal, foraging, and sheltering habitat that in combination support all life stages of California red-legged frog. The Watershed also provides opportunities for larger dispersal movements given its connectivity with adjacent protected and non-protected open lands with known occurrences.

CCWD actively manages upland and aquatic habitat for the California red legged frog within the Watershed consistent with a Service-approved Resource Management Plan (CCWD 1999). This includes maintaining suitable breeding habitat conditions at key locations, maintaining livestock exclusion corridors along designated riparian corridors, implementing a predator control program, and implementing a monitoring program. Introduced predators of concern in the Watershed include bullfrogs and several species of fish, including bass and mosquitofish. Bullfrogs were first observed in the Watershed in 2002 along the northernmost reach of Kellogg Creek. Bullfrog barriers have been placed within the Kellogg Creek streambed in this area to prevent bullfrogs from moving into the Watershed from adjacent properties. It appears that to date, bullfrogs have been effectively controlled within the Watershed; during 2010 monitoring efforts, one adult bullfrogs was removed from the control area of Kellogg Creek, but no bullfrogs were observed in any ponds in the Watershed. Mosquitofish were observed in three ponds and a single largemouth bass was observed in one pond located adjacent to the western boundary of the Watershed.

California red legged frogs have at some point been observed in all but 2 of the marshes and 6 of the stock ponds in the Watershed. Based on data collected during CCWD monitoring efforts, the percentage of ponds and marshes with successful California red-legged frog breeding increased steadily between 2000 and 2006 but showed a dramatic decline in 2007. In 2009, successful breeding was recorded at approximately 18 percent of semipermanent and alkali marshes, 43 percent of key stock ponds managed for California red-legged frog, and 25 percent of non-key stock ponds, the lowest levels observed in 10 years. In 2010, successful breeding was recorded at approximately 32 percent of semipermanent and alkali marshes, 57 percent of key stock ponds, and 36 percent of non-key stock ponds. This represents an increase in the percentage of total number of ponds supporting successful reproduction from 26 percent in 2009 to 38 percent in 2010 (CCWD 2011).

Within the action area, two ponds and four marshes lie within the inundation area; an additional four marshes and nine ponds lie within 0.3 mile of the expanded reservoir boundary or construction-related activities. California red-legged frogs have been observed in each of the marshes and in all but one of the ponds. Within the action area, potential California red-legged frog breeding habitat is also present in slow-moving portions of Kellogg Creek upstream from Walnut Boulevard, within 500 feet of the Primary and Secondary Core Borrow Areas. Grassland, scrub, and woodland habitats within the action area provide good quality upland foraging, refugia, and dispersal habitat.

California Tiger Salamander

The CNDDB describes over 150 occurrences of California tiger salamander in Contra Costa County with the majority of these records from the vicinity of the Watershed (CDFG 2010). Within the Watershed there are 68 stock ponds and 22 semi-permanent or alkali marshes that provide potential breeding habitat for the species. California tiger salamanders have been observed in 63 of these locations. They are also known to occur in several created and natural seasonal wetlands and vernal pools in the northern and eastern portions of the Watershed. Based on CCWD monitoring data, there was a general decline in the total number of ponds where salamanders were observed from 2002 to 2007, with an increase in subsequent years. In 2010, California tiger salamanders were observed in 23 stock ponds and in six semipermanent or alkali marshes (CCWD 2011).

California tiger salamanders are thought to widely use grassland and woodland habitat throughout the Watershed for upland refugia, foraging, and dispersal and numerous California ground squirrel burrows and burrow complexes suitable for use by California tiger salamanders are available throughout the Watershed. The mosaic of habitat features on the Watershed provide breeding, dispersal, foraging, or sheltering habitat that in combination supports all life stages. As with the California red-legged frog, the Watershed is also likely used for larger dispersal movements given the connectivity of this site with adjacent protected and non-protected open lands with known occurrences.

Within the action area, two ponds and four marshes lie within the inundation area; an additional four marshes and nine ponds lie within 0.3 mile of the expanded reservoir boundary or construction-related activities. California tiger salamanders have been observed in nine of the ponds and two of the marshes. Grassland, scrub, and woodland habitats within the action area provide good quality upland foraging, refugia, and dispersal habitat.

Alameda Whipsnake

The Alameda whipsnake is restricted to the western and central portions of Alameda and Contra Costa Counties. Due mostly to urban development, its range is now fragmented into five distinct populations (Service 2002a). The Los Vaqueros Watershed supports a portion of the Mt. Diablo-Black Hills population of Alameda whipsnake. The Mt. Diablo-Black Hills population is considered to have a high potential for recovery if threats from urban development, catastrophic fire, and grazing practices can be well managed (Service 2002a).

Alameda whipsnakes have been recorded in upland scrub habitat in the southwestern portion of the Watershed where the quality of scrub habitat is very high (Jones and Stokes Associates 1990; Swaim, pers. comm. 2007). In 2003 and 2004, field surveys found Alameda whipsnakes within the Watershed, and all age classes (adult, sub-adult, and young of the year) were found in these surveys (McGriff, pers. comm., 2004). Alameda whipsnakes have also been documented from at least three grassland areas in the Watershed that do not include chaparral habitat (ESA 2004). Scrub habitat within the Watershed is present primarily on east facing slopes west of the reservoir. Scrub habitat within the action area is located on the steep rocky slopes adjacent to the dam where chamise has colonized the area used for borrow for construction of the original dam. Grasslands and woodlands in the action area, particularly those near scrub habitat on the western side of the reservoir, could also provide habitat for Alameda whipsnake.

San Joaquin Kit Fox

In 1973 Swick estimated that Contra Costa County supported a population of 123 San Joaquin kit fox but cautioned that this estimate could be high. Surveys conducted in 2001 and 2002 in Contra Costa County and Alameda Counties in areas identified as having high potential to support San Joaquin kit fox found no evidence of den occupancy by San Joaquin kit fox (Clark et al. 2003). However, this does not necessarily indicate an absence of San Joaquin kit fox from these areas, but does suggest that kit fox density is low or their occurrence is periodic. Maintaining a connection to core San Joaquin kit fox populations in the San Joaquin Valley is likely critical to supporting a viable kit fox population in Contra Costa County.

Black Diamond Mines Regional Preserve (BDMRP), Round Valley Regional Preserve, and the Watershed are all large protected areas that have been identified as important for maintaining a Contra Costa County population of San Joaquin kit fox. Round Valley regional preserve lies directly to the north of the Watershed. The BDMRP lies further to the northwest. It is thought that kit fox utilize the habitat within and travel between the Watershed and BDMRP and that providing connectivity between these areas is important for sustaining a viable San Joaquin kit fox population in Contra Costa County (Jones and Stokes Associates 2006). The ECCHCP/NCCP identifies four potential north/south routes or habitat linkages for San Joaquin kit fox between the Watershed and BDMRP. The existing reservoir lies within and partially obstructs the Round Valley corridor, the southernmost corridor that connects the Watershed to BDMRP.

Prior to reservoir filling in 1998, the entire valley within the Watershed was presumably used by kit fox and a southern branch of the Round Valley corridor was likely though the low-lying valley floor area that is now inundated. A narrow (between 500 feet and 1,800 feet wide) partially obstructed corridor remains to the west of the reservoir and forms the current southern branch of the Round Valley corridor to BDMRP. Based on the high quality of the gently rolling grassland within this western corridor it was expected to provide habitat and a functional corridor despite being interrupted at two locations by oak savannah habitat measuring about 300 feet and 400 feet in width. However, monitoring conducted since 1998 has not detected kit fox use of the western corridor since the reservoir was filled. Large tracts of grassland to the north, east, and south of the reservoir are contiguous with the Herdlyn Watershed possibly providing a corridor between Round Valley and areas east of the reservoir and forming a potential northern branch of the Round Valley corridor to BDMRP. However, grassland and oak woodland habitat in this eastern corridor area is predominantly on moderate to steep slopes (between 15 and 50 percent). These slopes are steeper than those preferred by kit fox, but are within the described usage parameters for kit fox.

In order to compensate for the effects of the original reservoir on kit fox, CCWD dedicated approximately 6,000 acres of land within the Watershed through conservation easements to kit fox habitat management. These easement lands are located adjacent to the reservoir to the south, west, and north and include the lands in the southern branch of the Round Valley corridor. They also include parcels in the far north and east portions of the Watershed within the northern branch of the Round Valley corridor. Habitat management on these compensation lands includes managing grazing intensity to maintain prey populations for the San Joaquin kit fox and prohibiting rodenticide use except where needed to prevent health or safety problems. The ECCHCP/NCCP has also acquired large areas to the east of the Watershed as part of their preserve system increasing the total area of protected lands to the east of the reservoir available to kit fox and potentially providing linkages to areas south and east of the watershed.

Grasslands and woodlands throughout the Watershed are suitable San Joaquin kit fox habitat, and the dense rodent prey base on the Watershed provides an abundant food source. During pre-construction surveys for the original reservoir, San Joaquin kit fox were primarily detected in adjacent Watersheds. Most of the sightings were from the Herdlyn watershed to the south and east of the reservoir. A natal den with at least three pups was found in the Herdlyn watershed in 1988, and kit foxes, but no natal dens, were seen in the same area in 1989 (Jones and Stokes Associates 1991). Two San Joaquin kit fox sightings were recorded to the east of the Watershed along the proposed Vasco Road alignment in 1989 (Jones and Stokes Associates 1990), and in 1988 one San Joaquin kit fox was seen in Round Valley to the north of the reservoir. Surveys conducted in 1992 resulted in the sighting of a single kit fox within the Kellogg Creek Watershed, the sighting of two adult kit foxes in the Round Valley Regional Park, and the sighting of a single kit fox at the western boundary of the BDMRP (Clark et al. 2007). Following construction of the original reservoir, annual kit fox surveys were performed in the Watershed through 2009. During this period the only San Joaquin kit fox observation was a single sighting in 2008 in close proximity to the Los Vaqueros Watershed Administrative Offices northeast of the reservoir (Howard, 2008). Other recent sightings in the vicinity of the Watershed include two sightings at Vasco Caves (one in May 2001 and one in June 2002) and two sightings at Brushy Creek in 2002.

Valley Elderberry Longhorn Beetle

The range of the valley elderberry longhorn beetle is described as including the eastern portion of Contra Costa County where watersheds drain into the Central Valley; the Watershed is located at the very westernmost fringe of the potential range. The nearest known occurrence of valley elderberry longhorn beetle is approximately 17 miles east of the existing dam. Because the geographic division between the valley elderberry longhorn beetle and the coastal longhorn beetle subspecies is not well known in this area and there are no documented occurrences of valley elderberry longhorn beetle within Contra Costa County (CDFG 2010) it is uncertain whether the species occurs within the Watershed. However, it is assumed that elderberry shrubs within the Watershed could support valley elderberry longhorn beetle.

Elderberry shrubs are scattered throughout many of the creeks within the Watershed (ESA, 2005). Shrubs are especially common above the reservoir in Kellogg Creek, Mallory Creek, and Adobe Creek. Exit holes attributed to valley elderberry longhorn beetle were found in several portions of the project inundation area and downstream from the dam. Based on surveys conducted in 2005, the there are 18 elderberry shrubs with 98 stems measuring larger than one inch in diameter in the action area that are presumed to support this species.

Effects of the Proposed Action

California Red-legged Frog and California Tiger Salamander

The proposed action will result in temporary and permanent effects to aquatic and upland habitat for California red-legged frog and California tiger salamander. This could result in individuals bring directly and/or indirectly injured or killed by activities that disturb breeding, feeding, sheltering, and dispersal habitat.

Reservoir inundation will result in the permanent loss of two ponds and four marshes. All of these support California red-legged frogs and five support breeding populations of the species. One pond and one marsh support breeding populations of California tiger salamander. An additional 13 ponds and marshes lie within 0.3 mile of the expanded reservoir boundary or construction-related activities and may be indirectly affected by project-related activities; 12 of these are known to support California red-legged frogs and nine are known to support California tiger salamanders. Two of the ponds to be inundated lie within the conservation easement area to the west of the existing reservoir.

Reservoir inundation and associated facilities and construction will result in the permanent loss of a total of 451.27 acres of upland habitat including: 410.21 acres of annual grasslands, 29.34 acres of oak woodlands, and 11.72 acres of other habitats including upland scrub, seasonal wetland, ephemeral and drainage, and riparian habitat. Approximately 56 of these acres are within the Primary and Secondary Core Borrow Areas. The two borrow areas will be utilized sequentially with borrow activities lasting up to 24 months at each site. The borrow areas will ultimately be restored to annual grassland or seasonal wetland following project completion, however the time it will take borrowed areas to return to functional habitat is unknown. An additional 8.47 acres of upland habitat will be temporarily disturbed by construction activities.

Ponds will be filled with soil or breached during the non-breeding season. Therefore it is anticipated that no California red-legged frog or California tiger salamander eggs, tadpoles, or larvae will be injured or killed during pond filling. Any adults or juveniles present in ponds would be relocated prior to filling or would retreat upslope with inundation. However, displaced individuals will be subject to increased potential for predation, desiccation, and their ability to find required resources such as food and shelter will be reduced as they move. The loss of ponds could also result in an increase in injury and mortality of individuals that use the site for breeding since these individuals would need to travel greater distances to find alternate breeding sites. California red-legged frog and California tiger salamander reproductive success within the Watershed may be reduced if alternative breeding sites are not able to support the addition of displaced breeding individuals. The loss of ponds will also result in increased distances between suitable breeding ponds in some areas and could thereby reduce opportunities for dispersal between ponds.

Because water levels are expected to rise slowly (2-3 inches/day), juvenile and adult California red-legged frogs in upland habitat are expected to retreat upslope during reservoir inundation. Although California tiger salamanders take shelter in underground refugia during the non-breeding season, they have been seen to migrate from burrows during summer and fall rainfall events and it is anticipated that, where possible, they will emerge from their burrows and retreat upslope during inundation as well. However, some individuals could drown if they are unable to emerge from their burrow. Displaced California red-legged frogs and California tiger salamanders will be subject to increased potential for predation, desiccation, and their ability to find required resources such as food and shelter will be reduced as they move.

The use of large and small construction equipment in work areas could disturb, collapse, or crush animal burrows resulting in injury or mortality to any California red-legged frogs or California tiger salamanders present. Construction traffic in work areas and between work sites and borrow areas is likely to result in injury and mortality of individuals. Noise and lighting associated with construction could result in increased disturbance potentially causing individuals in and near construction activities to vacate the area. Construction activities could also present a barrier to dispersing individuals and restrict overland movement. Conducting awareness training for employees, conducting preconstruction surveys for listed species, installing wildlife exclusion fencing around work areas, having a Service-approved biologist or monitor present at work sites to prevent injury to individuals and move them to a safe location, limitations on nighttime work during the wet season, and hand excavation of burrows in designated areas, will minimize these effects.

Degraded water quality from runoff over disturbed areas is likely to result in decreased water quality within the action area. Hazardous substances from leaking equipment could also result in decreased water quality. Reduced water quality could result in reduced reproductive success, prey availability, and foraging success of California red-legged frogs and California tiger salamanders. Contaminated equipment and workers could introduce or spread nonnative invasive plant species, which would diminish habitat quality. Implementing best management practices for erosion control, restricting maintenance and fueling of vehicles and equipment to designated areas, and revegetating disturbed areas will minimize these effects.

Increased recreational use of expanded recreational facilities and trails will likely result in increased human disturbance and increased food availability for predators such as raccoons; this could result in decreased California red-legged frog and California tiger salamander populations. The reservoir already supports populations of non-native predatory fish, however, the expanded reservoir will provide additional fish habitat and fish populations are expected to increase. In addition, the higher water levels associated with the expanded reservoir will result in closer proximity of the fish population to ponds near the reservoir shoreline and could increase the probability that predatory fish may be introduced to these ponds during flood events. Bullfrogs appear to enter the Watershed primarily from adjacent properties to the north, therefore reservoir expansion is not expected to increase the threat of bullfrog invasion above current levels.

Although preconstruction surveys, the presence of on-site biological monitors, and hand excavation of burrows will reduce the likelihood of injury caused by ground disturbing activities within work areas, capturing and handling California red-legged frogs and California tiger salamanders to remove them from a work area may result in the harassment, injury, or mortality of individuals. Stress, injury, and mortality may occur as a result of improper handling, containment, and transport of individuals. Death and injury of individuals could occur at the time of relocation or later in time subsequent to their release. Although survivorship for translocated California tiger salamanders or California red-legged frogs has not been estimated, survivorship of translocated wildlife, in general, is lower because of intraspecific competition, lack of familiarity with the location of potential breeding, feeding, and sheltering habitats, and increased risk of predation. Improper handling, containment, or transport of individuals will be reduced or prevented by use of Service-approved biologists and through development and implementation of a Service-approved relocation plan that will provide detailed protocols for proper relocation procedures.

To compensate for temporary and permanent effects to California red-legged frog and California tiger salamander as a result of the proposed action, CCWD will provide compensation in the form of habitat preservation and enhancement. Lands included in a Service-approved compensation package will provide both upland and aquatic habitat for these species and will be permanently restricted from development through binding conditions incorporated into a conservation easement. This land will be protected and managed for the conservation of these species in perpetuity. These lands will help maintain the geographic distribution of these species and will contribute to the recovery of the species by increasing the amount of habitat that is secure from development threats and the other factors that threaten the species that can be addressed by habitat protection and management.

Alameda Whipsnake

The proposed action will result in temporary and permanent effects to upland scrub, grassland, and woodland that could provide habitat for Alameda whipsnake resulting in direct and indirect effects to the species. An estimated 3.04 acres of scrub habitat will be permanently impacted by dam construction and reservoir inundation and 0.08 acre will be temporarily effected. Alameda whipsnakes can also use grassland and woodland habitat, in particular when it is in the vicinity of scrub habitat. Within 1,000 feet of scrub habitat, 3.27 acres of annual grasslands, 2.54 acres of oak woodlands, and 0.67 acres of riparian habitat will be permanently affected by the proposed action. Within 2,500 feet of scrub habitat, 120.34 acres of annual grasslands, 10.41 acres of oak woodlands, and 3.27 acres of riparian habitat will be permanently affected. In particular, the flooding of annual grasslands near Los Vaqueros Road on the southwestern edge of the reservoir, would reduce the amount of nonscrub habitat available to Alameda whipsnakes within 2,500 feet of upland scrub habitat. Inundation would also extend the waterline about 1,000 feet farther south along Los Vaqueros Road and during high water periods and could decrease connectivity between scrub habitats to the west of the road and annual grassland to the east.

Construction traffic in work areas and between work sites could result in injury and mortality of Alameda whipsnakes from vehicle strikes and use of large and small construction equipment in work areas could disturb, collapse, or crush animal burrows resulting in injury or mortality to any individuals sheltering there. Construction activities could also present a barrier to dispersing individuals and restrict overland movement. Noise and increased human disturbance associated with construction activities could potentially cause individuals in and near work sites to vacate the area. Inundation is not expected to result in direct mortality and injury because Alameda whipsnakes are expected to migrate upslope with the slowly rising waters as they do under the current seasonal reservoir filling schedule. However displaced individuals could be subject to increased potential for predation and their ability to find required resources such as food and shelter could be reduced. Conducting awareness training for employees, conducting preconstruction surveys for listed species, installing wildlife exclusion fencing, having a Service-approved biologist or monitor present at work sites will minimize these effects.

To compensate for temporary and permanent effects to Alameda whipsnake as a result of the proposed action, CCWD will provide compensation in the form of habitat preservation and enhancement. Lands included in a Service-approved compensation package will include scrub habitat as well as grassland and woodland habitat located in close proximity to chaparral or scrub habitat. This will provide linkages between scrub patches and help to maintain the Mt. Diablo-Black Hills population of Alameda whipsnake and will contribute to the recovery of the species by increasing the amount of habitat that is secure from development threats and the other factors that threaten the species that can be addressed by habitat protection and management.

San Joaquin Kit Fox

The proposed action will result in temporary and permanent effects to grassland and woodland habitat that could provide San Joaquin kit fox denning, foraging, or dispersal habitat resulting in direct and indirect effects to the species. Project construction and reservoir inundation will principally affect grassland habitat with permanent impacts to a total of 410.21 acres of annual grasslands habitat and 29.34 acres of oak woodland habitat. An additional 8.47 acres of habitat will be temporarily disturbed by construction activities. Approximately 56 of the acres considered permanently impacted are within the Primary and Secondary Core Borrow Areas. Although the borrow areas will ultimately be restored to annual grassland or seasonal wetland following project completion, borrow activities will last up to 24 months at each site and it is unknown how long it will take borrowed areas to return to functional habitat. The expanded reservoir will also raise the waterline into three sections of oak woodland habitat to the west of the existing reservoir isolating two large grassland areas (totaling 284.76 acres) from surrounding grasslands likely rendering these areas inaccessible to San Joaquin kit fox and resulting in a permanent loss of habitat.

The corridor to the east of the existing reservoir, which measures between about 1 and 2.5 miles wide, will be narrowed by less than 50 feet at its narrowest point. Because the corridor will not be appreciably narrowed, it is expected to maintain its current level of function of as a link between Round Valley and important San Joaquin kit fox areas south and east of the watershed and as a potential northern branch of the Round Valley corridor to BDMRP. Although the Primary and Secondary Core Borrow Areas are located within this eastern corridor, it is expected that because the corridor is large and borrow areas will be used sequentially, enough habitat will remain undisturbed that the corridor will remain available during construction and borrow activities. The effective travel distance between the lower Watershed and Round Valley will be unchanged following project completion.

The corridor to the west of the reservoir will be further reduced following inundation. The grassland within the corridor will be interrupted by approximately 700 feet of oak woodland at each of three locations; an increase over the current two interruptions totaling 700 feet. It is unlikely that San Joaquin kit fox will use the remaining area to the west of the expanded reservoir following reservoir expansion. Loss of this corridor will compromise the southern branch of the Round Valley corridor to BDMRP and because the habitat within the northern branch of the Round Valley corridor is steep and provides much lower quality habitat, San Joaquin kit fox use of the Round Valley area may be reduced. This will contribute to cumulative loss of habitat connectivity in Contra Costa County for San Joaquin kit fox and could restrict the species' access to the northern portion of its range.

Of the total area to be impacted by the proposed action, 159.99 acres of annual grasslands and 17.64 acres of valley foothill woodland and riparian habitat lie within existing conservation easements for San Joaquin kit fox established to compensate for effects of the original reservoir. In addition, the 284.76 acres of grasslands that will be isolated following inundation fall within San Joaquin kit fox easement areas. These impacts are primarily adjacent to the western boundary of the existing reservoir and within the western movement corridor. Because the value of these easement lands is based not only on their present function and value, but on the assumption that they would be protected in perpetuity and would be managed to increase their value over time, their loss results in ramifications above and beyond the loss of habitat and a movement corridor and will require resolution of legal issues associated with vacating recorded conservation easements.

In order to compensate for temporary and permanent effects to San Joaquin kit fox from loss of habitat CCWD will acquire and preserve in perpetuity lands within a Service-approved compensation package. The compensation package will include a minimum of 4,890 acres. This includes additional lands preserved to those impacted in order to account for the loss habitat, movement corridors, and habitat connectivity for San Joaquin kit fox within the northern portion of their range, and for the loss of San Joaquin kit fox conservation easement lands. The compensation package will aim to preserve existing movement corridors within the northern San Joaquin kit fox range and currently includes one large undercrossing of the I-580 corridor in Alameda County.

During construction activities, individual San Joaquin kit foxes may be directly injured or killed by vehicle strikes resulting from increased construction traffic or through inadvertent crushing or entombment in collapsed dens or burrows. San Joaquin kit foxes may be attracted to construction sites due to the increased availability of cover (e.g., within pipes, trenches, or materials staging areas) or the increased availability of forage items such as food scraps and trash, increasing their risk of injury. Individual kit foxes may also be subject to harassment resulting from increased levels of human disturbance and vehicle use, excavation of dens and burrows, or entrapment in open holes and trenches. Some reservoir facilities and construction areas will require night-time lighting for safety and security, both during and after construction and could potentially cause individuals in and near construction activities to vacate the area. Construction related effects to San Joaquin kit fox will be minimized by conducting pre-construction surveys, establishing exclusion zones around any active kit fox dens located during surveys, and enforcing strict night-time speed limits.

San Joaquin kit foxes may escape direct injury during construction activities but become displaced into adjacent areas. Human disturbance related to recreational usage of the new Eastside Trail could make areas south of the reservoir less attractive to kit foxes. Displaced animals may be vulnerable to increased predation, exposure, starvation, or stress through disorientation, loss of shelter, and intraspecific and interspecific aggression. Coyotes, cited as a significant source of San Joaquin kit fox mortality, are thought to have increased in number on the Watershed since reservoir filling in 1998. Construction-related activities could result in an increase adverse coyote/kit fox interactions, however, the expanded reservoir and recreation facilities are not expected to result in an additional increase in the coyote population or result in increased adverse coyote/kit fox interactions.

<u>Valley Elderberry Longhorn Beetle</u>

Eighteen elderberry shrubs, with 98 stems measuring larger than one inch in diameter fall within the inundation zone of the expanded reservoir. Of these, shrubs exhibiting typical valley elderberry longhorn beetle exit holes will be removed and transplanted to a Service-approved location. The remaining shrubs will be inundated by the expanded reservoir. An additional eight shrubs with a total of 33 stems measuring larger than one inch in diameter are located within 100 feet of the reservoir inundation boundary or construction areas and could be indirectly affected by the proposed action.

Inundation will result in the loss of habitat for valley elderberry longhorn beetle and in mortality to any individuals present in shrubs to be inundated. Although transplantation of shrubs with exit holes may prevent direct mortality of beetles, the shrubs could experience stress, become unhealthy, or die as a result of changes in soil, hydrology, microclimate, or associated vegetation resulting in reduced habitat quality for the beetle. Branches containing larvae may be cut, broken, or crushed as a result of the transplantation process.

Indirect effects to the beetle could occur from the operation and construction activities, including sedimentation, erosion, and dust. Also, accidental grading in areas designated as avoidance areas, or other careless handling of heavy equipment during construction could destroy or injure elderberry shrubs used by the beetle. Changes in hydrology associated with the higher water line of the expanded reservoir could also result in adverse effects to the health of shrubs located within 100 feet of the new reservoir shoreline. Effects will be minimized by transplanting elderberry shrubs with exit holes to outside the inundation area, planting additional elderberry shrub seedlings in the Watershed outside the project area, and implementing BMP's to confine work to approved areas and to control dust.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Service is aware of numerous non-federal actions currently planned in the vicinity of the proposed action, defined here as eastern Contra Costa and Alameda counties and western San Joaquin County. Environmental analysis is either underway or completed for most of these projects. These projects include such actions as urban expansion, road improvement projects, water transfers and developments, and continued agricultural development. The cumulative effects of these known actions pose a significant threat to the eventual recovery of all listed species in this area. However, many of these activities will be reviewed under section 7 of the Act as a result of the Federal nexus provided by section 404 of the Federal Water Pollution Control Act, as amended (Clean Water Act).

Urban expansion in eastern Contra Costa and Alameda counties and western San Joaquin County will further fragment and isolate populations of California red-legged frogs, California tiger salamanders, Alameda whipsnake, and San Joaquin kit fox from other nearby populations. Urban expansion is also generally accompanied by increased predation associated with domesticated pets or feral animals that negatively affect populations of these species. Continued development and maintenance of roadways and water projects to serve expanding urban areas are also likely to further fragment and isolate populations of these species. In addition, numerous activities that could negatively impact listed species in and near the project area could result from private actions that may occur without consultation with or authorization by the Service. Discing, a common practice on agricultural lands, can result in substantial losses of upland habitat for California red-legged frogs, California tiger salamanders, and San Joaquin kit fox. Ground squirrel control on private rangeland can reduce the number of borrows available to California red-legged frog, California tiger salamander, San Joaquin kit fox, and Alameda whipsnake for sheltering and reduce prey populations for kit fox. Overgrazing on private lands can result in degradation and loss of riparian vegetation, increased water temperatures, streambank and upland erosion, and decreased water quality in streams.

The global average temperature has risen by approximately 0.6 degrees Celsius during the 20th Century (IPPC 2001, 2007; Adger et al 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (IPPC 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 (Anonymous 2007; Inkley et al. 2004; Adger et al. 2007; Kanter 2007) likely imperils several listed species including the California red-legged frog and the California freshwater shrimp and the resources necessary for their survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitats and/or food sources, and/or increased numbers of their predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction, with range shifts precluded by lack of habitat.

Conclusion

After reviewing the current status of the California red-legged frog, California tiger salamander, Alameda whipsnake, San Joaquin kit fox, and the valley elderberry longhorn beetle; the environmental baseline for the action area; the effects of the proposed Los Vaqueros Reservoir Expansion Project, and the cumulative effects; it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of these listed species. We base this conclusion on the implementation of extensive conservation measures to minimize the effects to listed species and the acquisition and protection of a minimum of 4,890 acres of habitat suitable for listed species in Contra Costa, Alameda, and San Joaquin Counties in order to preclude future detrimental land uses in these areas and preserve existing movement corridors for San Joaquin kit fox.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including 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 this Incidental Take Statement.

The measures described below are nondiscretionary, and must be implemented by Reclamation so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption under section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activity that is covered by this incidental take statement. If Reclamation (1) fails to require the applicant, or any of its contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

California Red-legged Frog

The Service anticipates that incidental take of the California red-legged frog will be difficult to detect because when this amphibian is not located at breeding ponds, it inhabits the burrows of ground squirrels or other rodents, or may be difficult to locate due to its cryptic appearance and behavior; the sub-adult and adult animals may be located a distance from the breeding ponds; dispersal occurs during rainy nights in the fall, winter, or spring; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Losses of this species also may be difficult to quantify due to seasonal fluctuations in numbers, random environmental events, changes in water regimes at breeding ponds, or other environmental disturbances. Therefore, the Service anticipates that all California red-legged frogs inhabiting the 625.61 acres to be inundated by reservoir expansion and within the 120.15 acres to be temporarily and permanently disturbed by construction-related activities will be subject to incidental take in the form of harm, harassment, and capture. The Service anticipates that no more than twelve (12) California red-legged frogs will be subject to incidental take in the form of death or injury as a result of construction-related activities and reservoir inundation and no more than six (6) will be subject to incidental take in the form of death or injury as a result of capture and relocation activities. Upon implementation of the Reasonable and Prudent Measures, incidental take of California red-legged frog associated with the proposed Los Vaqueros Reservoir Expansion Project will become exempt from the prohibitions described under section 9 of the Act.

California Tiger Salamander

The Service anticipates that incidental take of tiger salamanders will be difficult to detect because when tiger salamanders are not in their breeding ponds, or foraging, migrating, or conducting other surface activity, they inhabit the burrows of ground squirrels or other rodents; the burrows may be located a distance from the breeding ponds; the migrations occur on a limited period during rainy nights in the fall, winter, or spring; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Losses of tiger salamanders may also be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. Therefore, the Service anticipates that all California tiger salamanders inhabiting the 625.61 acres to be inundated by reservoir expansion and within the 120.15 acres to be temporarily and permanently disturbed by construction-related activities will be subject to incidental take in the form of harm, harassment, and capture. The Service also anticipates that no more than six (6) California tiger salamanders will be subject to incidental take in the form of death or injury as a result of construction-related activities and reservoir inundation and no more than three (3) will be subject to incidental take in the form of death or injury as a result of capture and relocation activities. Upon implementation of the Reasonable and Prudent Measures, incidental take of California tiger salamanders associated with the proposed Los Vaqueros Reservoir Expansion Project will become exempt from the prohibitions described under section 9 of the Act.

Alameda Whipsnake

The Service expects that incidental take of the Alameda whipsnake will be difficult to detect because this animal may range over a large territory and the finding of an injured or dead individual is unlikely because of their relatively small body size. Therefore, the Service anticipates that all Alameda whipsnakes inhabiting 625.61 acres to be inundated by reservoir expansion and within the 120.15 acres to be temporarily and permanently disturbed by construction-related activities will be subject to incidental take in the form of harm, harassment, and capture. The Service also anticipates that no more than one (1) Alameda whipsnake will be subject to incidental take in the form of death or injury as a result of construction-related activities and no more than one (1) will be subject to incidental take in the form of death or injury as a result of capture and relocation activities. Upon implementation of the Reasonable and Prudent Measures, incidental take of California tiger salamanders associated with the proposed Los Vaqueros Reservoir Expansion Project will become exempt from the prohibitions described under section 9 of the Act. Upon implementation of the Reasonable and Prudent Measures, incidental take associated with the proposed Los Vaqueros Reservoir Expansion Project in the form of harm, harassment, capture, injury, and death of the Alameda whipsnake caused by construction activities will become exempt from the prohibitions described under section 9 of the Act. Upon implementation of the Reasonable and Prudent Measures, incidental take of Alameda whipsnake associated with the proposed Los Vaqueros Reservoir Expansion Project will become exempt from the prohibitions described under section 9 of the Act.

San Joaquin Kit Fox

The Service expects that incidental take of the San Joaquin kit fox will be difficult to detect or quantify because they inhabit dens or burrows when not foraging, mating, or conducting other surface activity; animals can range over a large territory and are primarily active at night; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Losses of this species also may be difficult to quantify due to seasonal fluctuations in their numbers. Therefore, the Service anticipates that all San Joaquin kit fox inhabiting 625.61 acres to be inundated by reservoir expansion and within the 120.15 acres to be temporarily and permanently disturbed by construction-related activities will be subject to incidental take in the form of harm and harassment. The Service anticipates that no San Joaquin kit fox will be subject to incidental take in the form of death or injury resulting from project-related actions. Upon implementation of the Reasonable and Prudent Measures, incidental take of San Joaquin kit fox associated with the proposed Los Vaqueros Reservoir Expansion Project will become exempt from the prohibitions described under section 9 of the Act.

Valley Elderberry Longhorn Beetle

The Service anticipates incidental take of the valley elderberry longhorn beetle will be difficult to detect or quantify. The cryptic nature of this species and its relatively small body size make the finding of a dead specimen unlikely. This species occurs in habitats that make them difficult to detect. Due to the difficulty in quantifying the number of individuals that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of elderberry stems greater than 1.0 inch in diameter at ground level that will become unsuitable as a result of the action. Therefore, the Service anticipates that all beetles inhabiting 98 elderberry stems greater than 1.0 inch in diameter at ground level on shrubs that will be inundated will be taken as a result of the proposed project. The incidental take associated with the proposed action on the valley elderberry longhorn beetle is hereby exempted from prohibitions of take under section 9 of the Act.

Effect of the Take

In the accompanying biological opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to the California red-legged frog, California tiger salamander, Alameda whipsnake, San Joaquin kit fox, or valley elderberry longhorn beetle.

Reasonable and Prudent Measure

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize the effect of take on the California red-legged frog, California tiger salamander, Alameda whipsnake, San Joaquin kit fox, and valley elderberry longhorn beetle:

> The proposed action will be implemented by the project proponent as described in the *Description of the Proposed Action* of this biological opinion.

Terms and Conditions

To be exempt from the prohibitions of Section 9 of the Act, the applicant shall ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure-- described above. These terms and conditions are nondiscretionary.

The following terms and conditions will implement the Reasonable and Prudent Measure described above:

1. Reclamation shall require CCWD to fully implement measures to minimize the potential for incidental take of federally-listed species thorugh implementation of conservation measures as described in the Description of the Proposed Action section of this biological opinion, including in the *Habitat Preservation and Enhancement* and *Conservation Measures sections.*

2. Reclamation shall ensure that the project proponent complies with the *Reporting Requirements* of this biological opinion and the written reports described.

3. If requested, the applicant shall ensure the Service, CDFG, or their authorized agents can examine the action area for compliance with the Project Description, Conservation Measures, and Terms and Conditions of the Biological Opinion before, during, or after project completion.

Reporting Requirements

The Service must be notified within one (1) business day of the finding of any injured listed species or any unanticipated damage to their habitats associated with the proposed project. Injured animals must be cared for by a licensed veterinarian or other qualified person such as the Service-approved biologist. Notification should 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 area. The Service contact persons are the Coast Bay Branch Chief, Endangered Species Program at the Sacramento Fish and Wildlife Office (916) 414-6600, and the Resident Agent-in-Charge of the Service's Law Enforcement Division, 2800 Cottage Way, Room W-2928, Sacramento, California 95825, at (916) 414-6660.

The applicant shall submit a post-construction compliance report prepared by the on-site biologist to the Sacramento Fish and Wildlife Office within sixty (60) calendar days of the date of the completion of construction activity. This report shall detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the California red-legged frog and California freshwater shrimp, if any; (v) occurrences of incidental take of any listed species, if any; (vi) documentation of employee environmental education; and (vii) other pertinent information.

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 that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases. The Service requests notification of the implementation of any conservation recommendations in order to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats. We propose the following conservation recommendations:

1. Reclamation should assist the Service in implementing recovery actions identified in the Recovery Plan for the California Red-legged Frog (Service 2002), Recovery Plan for Upland

Species of the San Joaquin Valley, California (Service 1998), and Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, California (Service 2003).

2. Reclamation should encourage or require the use of appropriate locally collected California native species in revegetation and habitat enhancement efforts.

3. To avoid transferring disease or pathogens while handling amphibians, Reclamation should encourage all applicants to follow the Declining Amphibian Populations Task Force Fieldwork Code of Practice (Service 2005).

4. Sightings of any listed or sensitive animal species should be reported to CDFG's California Natural Diversity Database. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed should also be provided to the Service

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and/or proposed species or their habitats, the Service requests notification of the implementation of these recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the Los Vaqueros Reservoir Expansion Project. As provided in 50 CFR §402.16 and in the terms and conditions of this biological opinion, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (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 that was 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 operations causing such take must cease pending reinitiation.

If you have questions concerning this biological opinion on the Los Vaqueros Reservoir Expansion Project, please contact Stephanie Jentsch or Ryan Olah at the letterhead address, at telephone number (916) 414-6600, or email Stephanie_Jentsch@fws.gov or Ryan_Olah@fws.gov.

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