United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In reply refer to:
CRC-HC-Los Vaqueros

MAR 21 2011

Memorandum

To: Regional Director, U.S. Bureau of Reclamation, Sacramento, California (Attn: Sharon McHale)

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

Subject: Fish and Wildlife Coordination Act Report for the Los Vaqueros Reservoir Expansion Project

This memorandum transmits the Fish and Wildlife Service's Fish and Wildlife Coordination Act Report for the Los Vaqueros Reservoir Expansion Project. This report is prepared under the authority of, and in accordance with, the provisions of section 2(b) of the Fish and Wildlife Coordination Act (48 stat. 401, as amended: 16 U.S. C. 661 et seq.). This report assesses potential project effects on fish and wildlife resources and provides our recommendations to avoid, minimize or compensate potential adverse effects and is primarily based on information provided in the U.S. Bureau of Reclamation's (Reclamation) and Contra Costa Water District's February 2009 and March 2010 *Los Vaqueros Reservoir Expansion Project Draft and Final Environmental Impact Statement/Environmental Impact Reports*; the Los Vaqueros Reservoir Expansion Project Mitigation Monitoring and Reporting Program, dated March 2010; the Los Vaqueros Reservoir Expansion Project Golden Eagle Protection Plan; the Service's February 24, 2011 Biological Opinion, pursuant to section 7 of the Endangered Species Act of 1973 as amended. This report is being provided to the California Department of Fish and Game and National Oceanic and Atmospheric Administration National Marine Fisheries Service.

If you have any questions regarding this report, please contact Mark Littlefield, Chief, Watershed Planning Branch at (916) 414-6600.

Attachment

cc:
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United States Department of the Interior
Fish and Wildlife Service

Fish and Wildlife Coordination Act Report

Los Vaqueros Reservoir Expansion Project

Bureau of Reclamation and Contra Costa Water District

Sacramento Fish and Wildlife Office
Sacramento, California

March 2011

Executive Summary

This document constitutes the U.S. Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act (FWCA) report, as provided for in section 2(b) of the FWCA (Public Law 85-624; 16 U.S.C. 661-667e), regarding the Los Vaqueros Reservoir Expansion Project located in Contra Costa and Alameda counties, California. The findings of this report are based on information provided in the U.S. Bureau of Reclamation's (Reclamation) and Contra Costa Water District's (CCWD) August 2008 *Los Vaqueros Reservoir Expansion Project Administrative Draft Environmental Impact Statement/Environmental Impact Report*, prepared by Environmental Science Associates (ESA) (Reclamation and CCWD 2008); Reclamation's and CCWD's February 2009 *Los Vaqueros Reservoir Expansion Project Draft and Final Environmental Impact Statement/Environmental Impact Report* (EIS/EIR), prepared by Environmental Science Associates (Reclamation and CCWD 2009, 2010); the Los Vaqueros Reservoir Expansion Project Mitigation Monitoring and Reporting Program, dated March 2010;); the Los Vaqueros Reservoir Expansion Project Golden Eagle Protection Plan; the Service's February 24, 2011 Biological Opinion, pursuant to section 7 of the Endangered Species Act of 1973 as amended; available data; field investigations; meetings; official correspondence; personal communication; and electronic mail. This report includes recommendations to provide fish and wildlife equal consideration with other Los Vaqueros Reservoir Expansion Project (project) purposes.

The proposed project is located in southeastern Contra Costa County and northeastern Alameda County. Construction activities would take place in the southern end of the Sacramento-San Joaquin Delta (Delta), near the City of Byron. Construction areas would include land within the Kellogg Creek watershed, land on the western bank of Old River, as well as pipeline and utility corridors between Kellogg Creek watershed, Old River, and Bethany Reservoir.

The Los Vaqueros Reservoir Expansion Project EIS/EIR evaluated four alternatives in detail. Alternative 1 and Alternative 2 would allow Reclamation and CCWD to expand the storage capacity of the existing Los Vaqueros Reservoir, expand diversion capacity by building a new intake and pump station, build new conveyance pipelines to increase existing water conveyance capacity, and build a new pipeline that would connect additional water agencies in the south San Francisco Bay Area (Bay Area) with expanded Los Vaqueros Reservoir facilities.

Alternative 3 would allow for an expanded reservoir, but without a south Bay Area connection. The goal of this alternative would be to provide Reclamation with greater operational flexibility for the Central Valley Project (CVP) system, increasing water supply available at appropriate times for environmental uses such as cold-water releases to support salmon spawning, pulse flow releases to support salmon migration, or water supply for the wildlife refuges.

Alternative 4 would allow for a smaller expansion of the existing reservoir than Alternatives 1-3 and would not include south Bay Area connection. Alternative 4 would provide CCWD with greater water supply reliability. Alternative 4 has been represented in the EIS/EIR as the environmentally superior alternative/environmentally preferable alternative. Pursuant to the National Environmental Policy Act (NEPA) Reclamation will identify Alternative 4 as the environmentally preferable alternative in the Record of Decision, but has identified that implementation of Alternative 4 would not preclude subsequent development of a larger reservoir such as identified in Alternative 1.

As summarized in Table 1 below, Alternatives 1 and 2 include the largest reservoir expansion (up to 275 TAF) and the South Bay Connection to serve the three South Bay water agencies (ACWD, SCVWD and Zone 7). Alternatives 1 and 2 differ in the operational emphasis between environmental water management and water supply reliability. Alternatives 3 and 4 have no South Bay Connection, and differ in the size of the expanded reservoir (a 275 TAF versus a 160 TAF reservoir, respectively) and the extent of expanded facilities; Alternative 3 and 4 also differ in operational emphasis.

Table 1. Reservoir Expansion Alternatives with Key Distinguishing Characteristics
Source: Reclamation and CCWD 2009

Project Characteristic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Expanded Reservoir Storage Capacity	275 TAF	275 TAF	275 TAF	160 TAF
Operational Emphasis	Environmental Water Management & Water Supply Reliability	Environmental Water Management	Environmental Water Management	Water Supply Reliability
New South Bay Connection	Yes, 470 cfs	Yes, 470 cfs	No	No
Intake Facilities	Construct new 170 cfs intake on Old River	Construct new 170 cfs intake on Old River	Expand existing intake facility on Old River by 70 cfs	No changes to existing intake facility
Pipeline Capacity from Intake to Expanded Reservoir	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 570 cfs	No changes to existing pipeline capacity
Expanded Transfer Facility	Yes	Yes	Yes	No, only minor upgrades are needed
Additional Power Supply Needed	Yes	Yes	Yes	No

The Los Vaqueros Reservoir expansion project objectives include the following:

Primary Objectives:

- Develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs.

- Increase water supply reliability for water providers within the Bay Area, to help meet municipal and industrial water demands during drought periods and emergencies, or to address shortages due to regulatory and environmental restrictions.

Secondary Objective:

- Improve the quality of water deliveries to municipal and industrial customers in the Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

As a contractor of Reclamation's CVP, CCWD diverts flows from CVP storage facility releases. Under CCWD's contract with Reclamation, CCWD can divert and re-divert up to 195 TAF per year of water from its Rock Slough and Old River intakes (and Alternative Intake Project [AIP] under a letter approval from Reclamation signed on January 13, 2010). The CCWD also diverts water from Old River under its own Los Vaqueros water right permit. Additionally, CCWD has a permit to divert and store the water from Kellogg Creek, which is a natural tributary to the reservoir.

Water use within CCWD's service area is currently between 125 and 140 TAF per year. These demands are met with a combination of reservoir releases and direct diversions of CVP contract water, as well as diversions under other water rights (e.g., City of Antioch pre-1914 water rights), groundwater, conservation, and recycled water. From 44 TAF to 70 TAF of reservoir capacity represents emergency storage (depending on hydrological conditions) that would provide from 3 to 6 months of supply for CCWD at current demand levels during times when water from the Delta is unavailable due to natural disaster, toxic spill, levee failure, or other significant event.

Formal consultation for the Los Vaqueros Reservoir Expansion project was completed by the Service on February 24, 2011 (Service file # 81420-2009-F-0201-1). 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 a revised the Resource Management Plan

Formal consultation under section 7 of the Endangered Species Act with the Service on the effects of the original Los Vaqueros Reservoir Project on the San Joaquin kit fox (federally endangered), bald eagle (formerly federally threatened, now delisted; State endangered) (Service 1993b) California red-legged frog (federally threatened), and conference reports on the effects on the Alameda whipsnake (federally threatened) (Service 1996), longhorn fairy shrimp (federally endangered), and the vernal pool fairy shrimp (federally threatened) resulted in Biological Opinions (BO) and Conference Opinions (later adopted as BOs) from the Service (Service 1993c). These BOs list several nondiscretionary terms and conditions that Reclamation (and ultimately CCWD) must comply.

CCWD operates the reservoir together with its intakes under BOs and permits, including the following subset:

- National Oceanographic and Atmospheric Administration (NOAA) Fisheries 1993 BO addressing the effects of the original Los Vaqueros Reservoir Project on Sacramento River winter-run Chinook salmon specified no significant operational requirements other than the no-fill and no-diversion requirements described above.

- The Service's 1993 BO addressing the effects of the original Los Vaqueros Reservoir Project on delta smelt requires CCWD to preferentially divert CVP water from the screened Old River intake from January through August each year, in addition to the no-fill and no-diversion requirements previously described. It also restricts filling of the reservoir from December through June based on the position of the 2 parts per thousand isohaline ("X2") in the Bay-Delta. It also requires CCWD to operate all of its intakes and the reservoir as an integrated system to minimize impacts to endangered species, and requires monitoring at all intakes to minimize take of delta smelt during the spawning and rearing period Service 1993d).

- State Water Resources Control Board 1994 Decision also includes limits on combined diversions from Old River and Rock Slough of 350 cfs and 242,000 acre-feet per year (after the first year of operation of Los Vaqueros Reservoir). Additionally, the Decision requires releases to Kellogg Creek to maintain the downstream beneficial uses.

- The Service's 2007 BO for the AIP, covering delta smelt, integrates operations of the new intake on Victoria Canal into the operations of the previously described facilities to minimize take of delta smelt. The combined permitted diversion rate of Old River and AIP is 320 cfs (Service 2007b).

- NOAA Fisheries 2007 BO for the AIP, covering winter-run Chinook salmon, spring-run Chinook salmon, Central Valley steelhead, and North American green sturgeon, also integrates operations of the AIP into the operations of the facilities previously described, to minimize take of these species.

In addition to the existing BOs, a FWCA report was prepared by the Service for the Los Vaqueros Reservoir Project in 1993. As part of the report, the Service prepared and submitted a valley oak and blue oak woodland mitigation plan. The plan recommended creating or enhancing a total of 394 acres of valley oak woodland and savanna, and between 16 and 67 acres of blue oak woodlands depending upon the actual acreage affected by the project (Service 1993a).

For the original Los Vaqueros Reservoir Project, impacts on wetlands and other waters of the U.S. regulated under Section 404 of the Clean Water Act were authorized under an individual permit from the U.S. Army Corps of Engineers (USACE). Wetland creation and enhancement requirements totaled 49.21 acres.

Summary

While the project alternatives are intended to reduce impacts to fish in the Delta, and improve Bay Area water supply reliability and Bay Area drinking water quality, as described above, these alternatives also would result in temporary and permanent impacts to the environment. The environmental impacts associated with the project alternatives can be generally categorized as follows: project construction; facility siting / footprint; and project operations.

Construction

Most environmental impacts identified for the project alternatives would be associated with project construction; these impacts would occur for up to 3 years and would cease once project construction is completed. Construction impacts include effects associated with transport of construction materials and equipment and carrying out construction activities such as excavation, grading, foundation development, paving, and building of structures.

Facility Siting / Footprint

Facility siting or footprint effects are the permanent effects that result from locating a facility on a specific site and removing or altering what was on the site previously. Most of the footprint effects would be associated with expansion of the reservoir, which would result in adverse effects on biological resources. In some cases, impacts identified for the project alternatives were considered to be substantial and in most cases, feasible mitigation measures were identified to reduce these effects.

- Reservoir and Dam. Under Alternatives 1, 2 and 3 the reservoir would be expanded from 100 TAF to 275 TAF, which would increase the area of reservoir inundation by about 1,000 acres; from 1,500 acres to 2,500 acres. Under Alternative 4, reservoir expansion from 100 TAF to 160 TAF would inundate an additional 400 acres; increasing the area of inundation from 1,500 acres to 1,900 acres. The expanded reservoir would inundate existing habitat for biological resources, including various sensitive plant and animal species; inundation primarily would affect grassland habitat but also oak woodland, riparian, scrub, and wetland habitats, including existing mitigation/compensation lands.

- Pipelines. Construction of new pipelines under Alternatives 1-3 would result in impacts to biological resources. Pipelines would be buried and the surface area restored. However, even with surface restoration, installation of the Transfer-Bethany Pipeline under Alternatives 1 and 2 may permanently and directly impact northern claypan vernal pools; and may affect local vernal pool hydrology in pools outside the alignment by altering surface flows, groundwater flows, or infiltration rates, and reducing the quality or extent of the overall vernal pool complex outside the project.

- Water Diversion Operations. By design, the project alternatives are intended to reduce impacts to Delta fishery resources. The one exception is associated with project operations under Alternative 3. Under this alternative, additional water would be diverted through the expanded Los Vaqueros Reservoir system and, unlike conditions under Alternatives 1 and 2; this water diversion would not be offset by a commensurate reduction in Delta water diversion from the CVP and SWP Delta export pumps. Consequently, additional fish could be adversely affected by the increased Delta diversion. By contrast, Alternatives 1 and 2 may potentially reduce impacts to Delta fishery resources during times of the year most critical to sensitive fish species. Use of fish screens for diversion of water for South Bay water agencies is expected to reduce impacts to Delta fishery resources; impacts may be reduced further by managing pumping reduction timing and delivering water to South Bay water agencies from reservoir storage.

  Pumping in the Delta would increase under all four alternatives. Pumping in Old River may incrementally contribute to net reverse flows in Old and Middle rivers during certain times of the year, and incrementally increase fish entrainment and salvage mortality risk at the SWP and CVP export facilities during these times (Service 2008d).

  A component of Alternatives 2 and 3 includes dedicated storage for environmental water supply, which could be used to benefit fish and wildlife in a variety of ways. These water supplies could be stored and used at a time when they are needed most. However, storing these environmental water supplies would result in environmental costs.

The Service has recommended that Reclamation and CCWD implement a number of mitigation and avoidance measures in order to minimize the effects of the project on fish and wildlife resources.

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Introduction

The U. S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation) and Contra Costa Water District (CCWD) propose to expand the storage capacity of the existing Los Vaqueros Reservoir, expand diversion capacity by building a new intake and pump station, building new conveyance pipelines to increase existing water conveyance capacity, and building a new pipeline that would connect additional water agencies in the south San Francisco Bay Area (Bay Area) with expanded Los Vaqueros Reservoir facilities.

The Los Vaqueros Reservoir Expansion Project (reservoir expansion project) objectives include the following:

Primary Objectives:

- Develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs.

- Increase water supply reliability for water providers within the Bay Area, to help meet municipal and industrial water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions.

Secondary Objective:

- Improve the quality of water deliveries to municipal and industrial customers in the Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

Bay Area water agencies rely heavily on water supplies conveyed through the Sacramento-San Joaquin Delta (Delta) to meet their normal year demands as well as prepare them for drought periods. The CCWD customers receive over 90 percent of their supply from the Delta while the three Bay Area agencies that receive State Water Project water – Alameda County Water District (ACWD), Santa Clara Valley Water District (SCVWD), and Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7), each receive 40 to 65 percent of their supply from the Delta (Reclamation and CCWD 2008).

All of these agencies have long-term water supply plans to provide for their customers into the future during both extended droughts and emergencies. Each agency has a diversified water supply portfolio including resource management strategies such as increased conservation, water recycling, desalination of brackish groundwater and water banking (Reclamation and CCWD 2008). The ACWD, SCVWD, and Zone 7 also each have local groundwater basins that provide additional storage for conjunctive use of surface water. Local groundwater supply and storage gives these three agencies flexibility and time to respond to droughts and emergencies. Delta water remains an important component of each of their water supply plans (Reclamation and CCWD 2008).

Water Supply Reliability

Reclamation's and CCWD's February 2009, and March 2010 *Los Vaqueros Reservoir Expansion Project Draft and Final Environmental Impact Statement/Environmental Impact Reports* (EIS/EIR), prepared by Environmental Science Associates, indicates that environmental regulations, in combination with the effects of drought or emergency events, could reduce water supply reliability. The EIS/EIR states the proposed reservoir expansion project would provide more flexibility in managing the timing, location, and quantity of diversions, as well as provide additional storage for increased water management flexibility. As a result, the proposed project would improve water supply reliability for urban users in the Bay Area (Reclamation and CCWD 2009).

Multiple points of diversion, coupled with additional storage capacity, may improve water management flexibility to respond to changing fishery conditions in the Delta. With these expanded facilities, the timing and/or location of water diversions could be adjusted to work around sensitive periods and locations for fish. Increased Delta storage may allow water to be diverted from the Delta at times when fish populations are least sensitive to harm due to pumping, and to be delivered when needed. New conveyance facilities from the Los Vaqueros system to Bethany Reservoir would allow water to be delivered for Bay Area water agencies or environmental uses south of the Delta without relying on the State Water Project (SWP) or Central Valley Project (CVP) export pumps. Additional storage in the system would also allow water to be reserved from one year to another to respond to drought periods, regulatory restrictions, and emergencies. An expanded reservoir would provide up to an additional 175 thousand acre-feet (TAF) of storage capacity that would be available to Bay Area communities during such times (Reclamation and CCWD 2009).

Environmental Considerations

All water diverted through reservoir expansion project facilities would be through intakes equipped with positive barrier fish screens designed and operated to regulatory agency specifications. Therefore, direct impacts to fish resulting from operating the expanded project facilities would be minimized (Reclamation and CCWD 2008).

Water Quality

The EIS/EIR states that the reservoir expansion project could provide incremental improvements in the quality of Delta water provided to Bay Area water agencies that receive deliveries from the South Bay Aqueduct (SBA). When Delta water quality is high, water would be diverted and stored in the expanded reservoir. During dry periods when Delta water quality is poor, the expanded reservoir would provide higher quality water for SBA deliveries in lieu of direct diversion from the Delta. Thus, salinity levels would be reduced in SBA deliveries as a result of storing water in Los Vaqueros Reservoir. The reservoir expansion project could also improve other aspects of water quality for the agencies on the SBA, as the water delivered from Los Vaqueros Reservoir would no longer pass through Clifton Court Forebay where warm, shallow, slow-moving water often results in algae growth and a resulting increase in organic carbon content and taste and odor issues (Reclamation and CCWD 2009.

Fish and Wildlife Coordination Act Report

This document constitutes the U.S. Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act (FWCA) report, as provided for in section 2(b) of the FWCA (Public Law 85-624; 16 U.S.C. 661-667e), regarding the Los Vaqueros Reservoir Expansion Project located in eastern Contra Costa and Alameda counties, California. The FWCA provides that Federal agencies consult with the Service before undertaking or approving projects carried out under Federal permits and licenses that control or modify bodies of water for any purpose, and that fish and wildlife resources receive equal consideration and be coordinated with other features of the projects. The purpose of FWCA consultation is to conserve fish and wildlife resources by preventing their loss or damage, and by developing and improving these resources. This report reviews the proposed alternative (Alternative 1), and the no action alternative. A brief summary and comparison of Alternatives 1-4 are included in the Discussion and Conclusion sections.

It should be noted that Alternative 4 is selected in the EIS/EIR as the environmentally superior alternative/environmentally preferable alternative. Pursuant to the National Environmental Policy Act (NEPA) Reclamation will identify Alternative 4 as the environmentally preferable alternative in the Record of Decision, but has identified that implementation of Alternative 4 would not preclude subsequent development of a larger reservoir such as identified in Alternative 1. Because of this decision, the Service has elected to retain the analysis of Alternative 1 within the context of the FWCA report.

Details of the reservoir expansion project effects on federally-listed species and associated conservation measures are be addressed in section 7 consultations and Biological Opinions (BO) provided by the Service and the National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NOAA Fisheries), which will describe Reclamation's responsibilities pursuant to the Federal Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (FESA).

The findings of this report are based on information provided in Reclamation's and CCWD's August 2008 *Los Vaqueros Reservoir Expansion Project Administrative Draft Environmental Impact Statement/Environmental Impact Report*, prepared by Environmental Science Associates (Reclamation and CCWD 2008); Reclamation's and CCWD's February 2009 *Los Vaqueros Reservoir Expansion Project Draft and Final Environmental Impact Statement/Environmental Impact Report* (EIS/EIR), prepared by ESA (Reclamation and CCWD 2009, 2010); the Los Vaqueros Reservoir Expansion Project Mitigation Monitoring and Reporting Program, dated March 2010;); the Los Vaqueros Reservoir Expansion Project Golden Eagle Protection Plan; the Service's February 24, 2011 Biological Opinion, pursuant to section 7 of the Endangered Species Act of 1973 as amended (ESA); available data; field investigations; meetings; official correspondence; personal communication; and electronic mail. This report includes recommendations to provide fish and wildlife equal consideration with other Los Vaqueros Reservoir Expansion Project (project) purposes.

Project Setting

The Delta is an area of transition between the freshwater runoff from the Sacramento and San Joaquin rivers and the tidally driven saltwater flows from the Pacific Ocean and San Francisco Bay (Bay). The Bay/Delta estuary is the largest estuary on the West Coast. It is a complex system of rivers, sloughs, islands, open water areas, and constructed features such as barriers, tide gates, and water diversion pumps. A number of smaller tributaries also flow into the Delta, and there are additional inflows from agricultural and municipal wastewater discharges within the Delta and upstream (Reclamation and CCWD 2008).

The Delta is critical to California's economy, supplying drinking water for two-thirds of Californians and irrigation water for over 7 million acres of agricultural land. The Delta is also a key component of California's two largest water distribution systems: the CVP operated by Reclamation and the SWP operated by California Department of Water Resources (DWR). Both the State and Federal systems pump water out of the southern Delta to agricultural and urban contractors in the Bay Area and in central and southern regions of the State (Reclamation and CCWD 2008).

The Delta provides essential habitat for numerous species of fish, birds, mammals, and plants; and supports agriculture, urban communities, and a large percentage of California's commercial and recreational anadromous fisheries (including salmon, steelhead, sturgeon, and striped bass). The Delta includes about 738,000 acres of low-lying land interlaced with about 700 miles of navigable waterways, and includes more than 70 islands and tracts devoted mostly to agriculture (Service 2007). Most of the land within the Delta is below sea level and is protected from flooding by a system of more than 1,000 miles of levees. Diversion of water onto Delta islands and tracts for agricultural irrigation occurs locally throughout the Delta. There are over 1,800 local diverters who collectively are capable of diverting between 2,500 and 5,000 cubic feet per second (cfs) (roughly 5,000 to 10,000 acre-feet per day) from the Delta (Service 2007). Within-Delta agricultural diversions occur primarily from April to August, with peak diversions usually occurring during July. Typical Delta diversion facilities consist of unscreened pumps and/or siphons.

The Bay and Delta serve as habitat for a rich ecosystem of aquatic and terrestrial species, including over 30 species protected under Federal and State regulations. The aquatic habitat supports anadromous fish such as Chinook salmon and steelhead trout that pass through the Delta on their way to the ocean and back to upstream rivers to spawn, as well as many resident species such as delta smelt that live their entire lives in the Delta and San Francisco Bay estuary. All these species are susceptible to flow and water quality conditions in the Delta (Reclamation and CCWD 2008).

Annual monitoring of fish abundance from 2002-2004 identified record low indices of delta smelt and young striped bass, and near-record lows of longfin smelt and threadfin shad (Resources Agency [California Department of Water Resources, California Department of Fish and Game] 2007). Many factors have been cited for the decline of the Delta ecosystem generally and fish species in particular including: invasive species, low primary productivity (phytoplankton), reduced and altered timing of inflows to the Delta, increased and altered timing of exports from the Delta, declining water quality due to increased discharges from wastewater treatment plants, agricultural drains, industrial operations, and non-point pollution sources, changes in physical and chemical parameters such as flow and salinity, and loss of wetlands and floodplains to urbanization and agricultural land conversion (Healey 2007; Baxter *et al*. 2008; and Reclamation and CCWD 2008).

In order to protect delta smelt, the Service issued a BO for the Operations Criteria and Plan (OCAP) on December 15, 2008 (Service file number 81420-2008-F-1481-5). On June 4, 2009, NOAA Fisheries released an OCAP BO for species under their jurisdiction. Future operations of the CVP and SWP are presumed to be consistent with both BOs.

The proposed reservoir expansion project would be located in southeastern Contra Costa County and northeastern Alameda County. Construction activities would take place in the southern end of the Delta, near the City of Byron. Construction areas would include land within the Kellogg Creek watershed, land on the western bank of Old River, as well as pipeline and utility corridors between Kellogg Creek watershed, Old River, and Bethany Reservoir (see Figures 1 and 2).

The proposed project is located in the California Floristic Province. This area is characterized by a Mediterranean climate with steep to rolling hills of the eastern Diablo Range and a portion of the southern Delta. Vegetation is a mosaic of annual grasslands, croplands, oak woodlands, upland scrubs, wetland communities, and riparian scrubs and forests. Within the Kellogg Creek watershed, valley/foothill woodland and forest, annual grasslands, upland scrub, aquatic and riparian vegetation

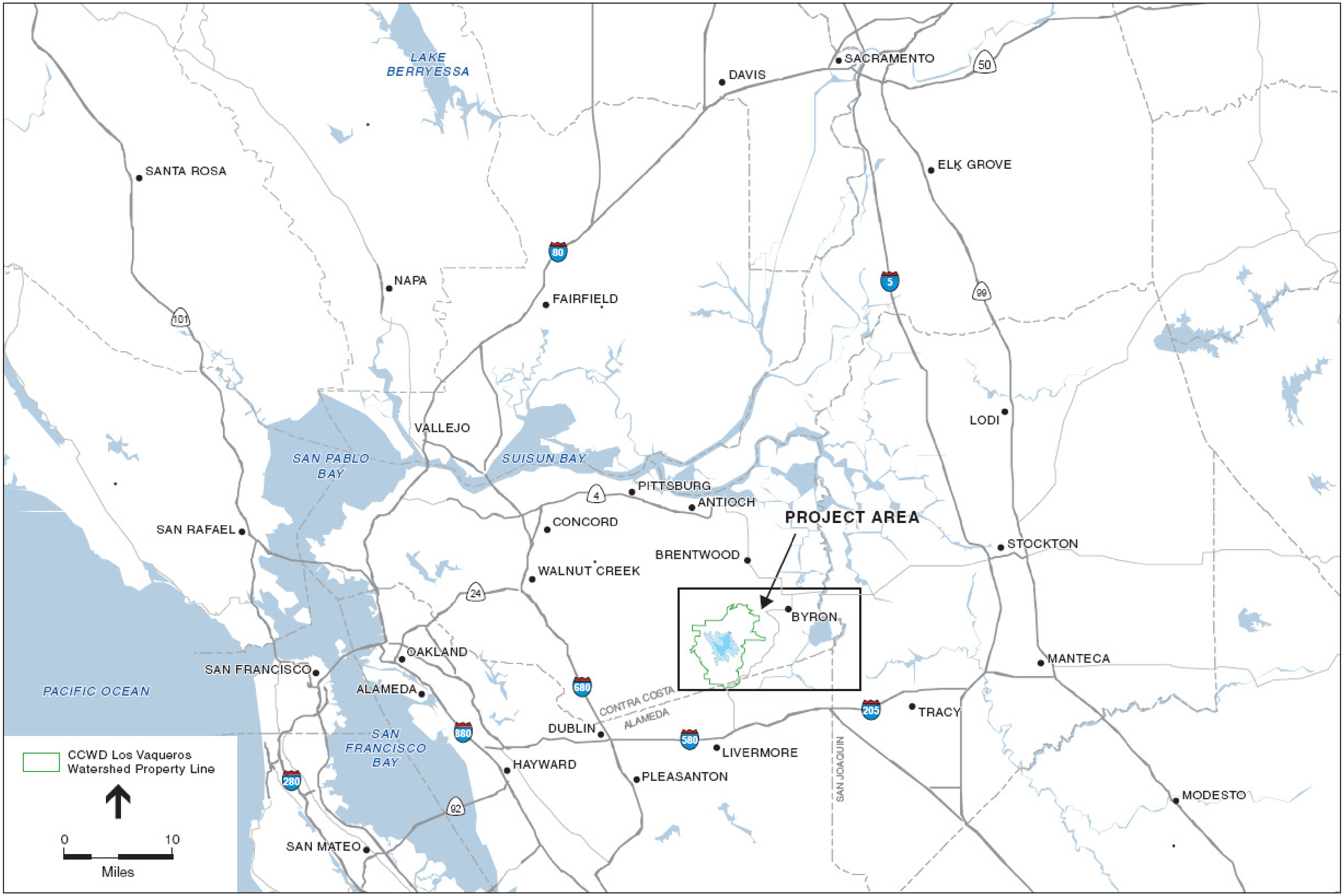

Figure 1. Regional Project Area Location
Source: Reclamation and CCWD 2009

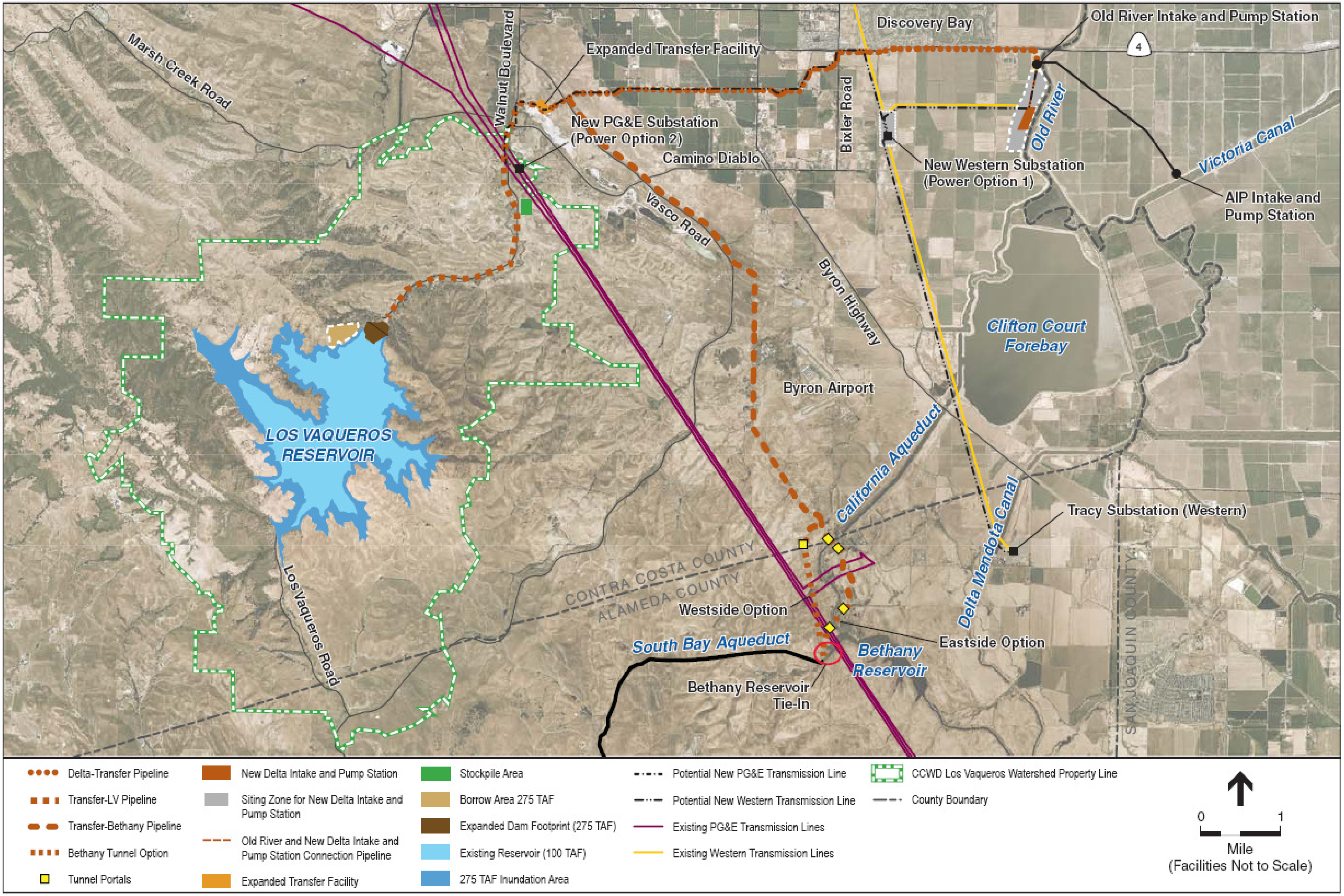

Figure 2. Proposed Facilities – Alternative 1 (Proposed Alternative) and Alternative 2
Source: Reclamation and CCWD 2009

dominate the landscape. Valley floor portions along pipeline corridors are characterized by annual grasslands, upland croplands, intermittent streams, and seasonal wetlands.

Current principal land uses vary within the watershed and along pipeline corridors, and include agriculture, pasture lands, cattle grazing and open space. Project activities are principally in undeveloped areas that support minimal or low-density residential, commercial, and industrial development.

The Los Vaqueros Reservoir Expansion proposed alternative “project area” includes: all of the terrestrial and aquatic areas within the construction footprint of the proposed intake and pump station on Old River; conveyance pipeline corridors; transfer facility; reservoir inundation footprint and dam; recreation facilities; borrow area; electrical power facilities, stockpile and disposal areas; staging areas; access roads and vehicle traffic areas; and mitigation/compensation sites. Refer to Figures 1 and 2 for the project area and the location of the larger proposed facilities. The following terms are used to distinguish areas of potential direct impact from areas of potential indirect impact: “project area” refers to areas of potential direct effects from proposed facilities or activities; “project study area” refers to the area surrounding the proposed facility sites evaluated for potential indirect effects.

Project Background

This section provides an overview of the existing Los Vaqueros Reservoir facilities and operations, a history of the expansion project, a description of current Delta water supply facilities and operations, and a summary of ongoing planning processes related to the Delta. This information provides context for understanding the proposed Los Vaqueros Reservoir Expansion Project. The information contained in this section was obtained from Reclamation’s and CCWD’s February 2009 and March 2010 Draft and Final EIS/EIRs respectively.

Existing Los Vaqueros Reservoir and Facilities

The existing Los Vaqueros Reservoir (reservoir) is a 100 TAF storage reservoir in southeastern Contra Costa County owned and operated by CCWD. The reservoir is operated to improve water quality and provide emergency storage for CCWD’s 550,000 customers in central and eastern Contra Costa County. The CCWD completed the reservoir and associated facilities (including a new intake on Old River near Highway 4) in 1998 (see Figure 3). The reservoir facilities are operated as an integrated system with the Contra Costa Canal and Rock Slough intake built as part of the Federal CVP in the 1940s. The CCWD also owns the Los Vaqueros Watershed (watershed) which covers about 20,000 acres. The watershed lands are managed for water quality, conservation of special-status species and their habitats, and recreation. More recently, CCWD has constructed or is constructing two facilities that will be operated integrally with the reservoir—an intertie with East Bay Municipal Utility District (EBMUD) completed in 2007, and a new intake on Victoria Canal known as the Alternative Intake Project (AIP), currently under construction.

Los Vaqueros Dam and Reservoir

The Los Vaqueros Dam is a 190-foot-high earthfill embankment dam with a crest elevation of 487 feet above mean sea level. The reservoir occupies about 1,462 acres when full (about 100 TAF). A spillway is located on the left abutment and the inlet/outlet structure is located on the right abutment. When originally designed, no measures were incorporated to facilitate a future raise of the dam,

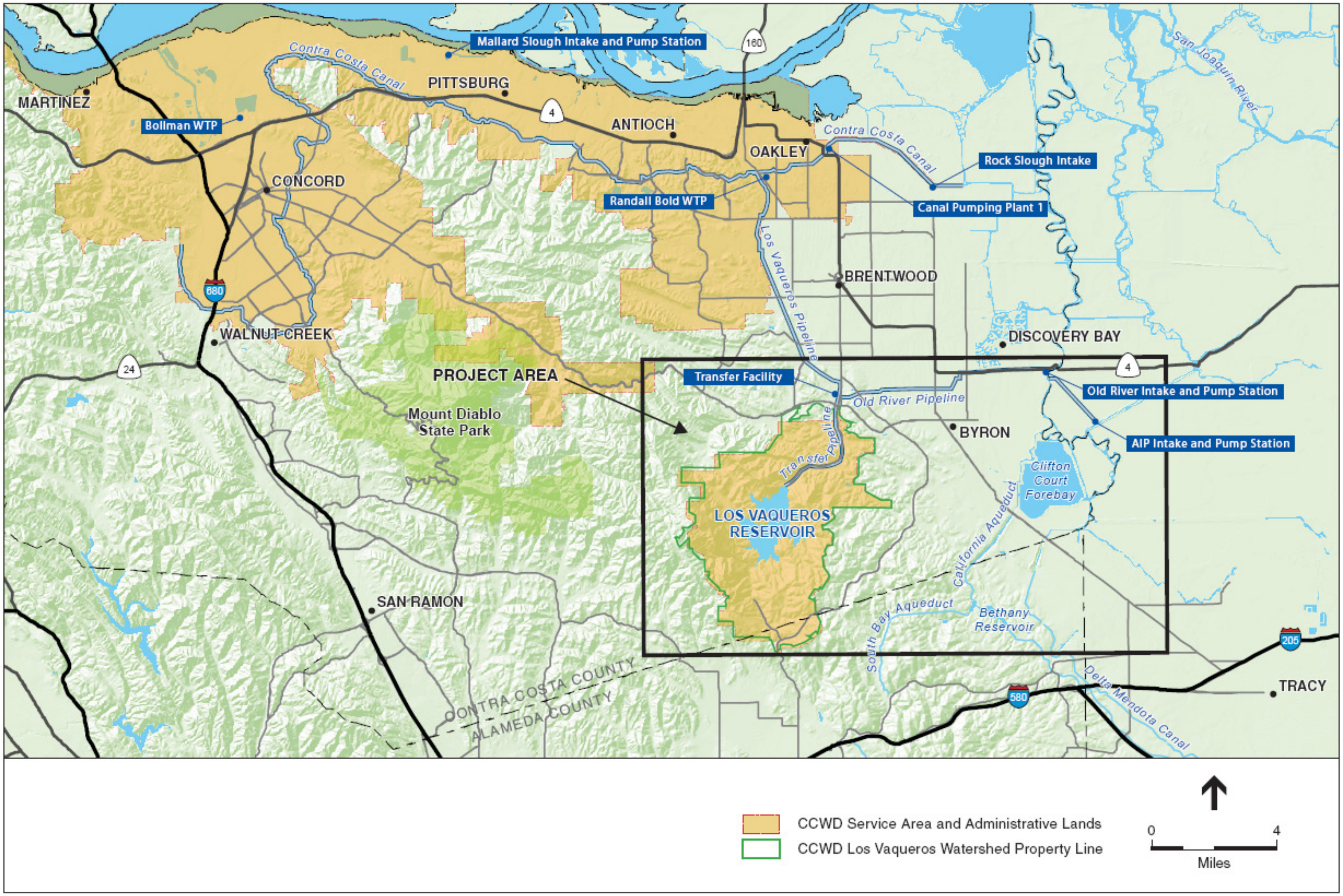

Figure 3. Project Area Location Relative to CCWD Existing Water System Facilities
Source: Reclamation and CCWD 2009

however, recent studies have concluded that a limited raise is feasible. Raising the dam by the maximum amount considered feasible would allow the reservoir water surface to be raised by 88 feet, which would create an additional 175 TAF of reservoir storage.

Old River Intake and Pump Station

The Old River Intake and Pump Station divert water from Old River through a fish screen and delivers it to the Old River Pipeline. The pump station delivers up to 250 cubic feet per second (cfs). The Old River intake was configured to accommodate an additional 70 cfs of intake capacity with additional fish screens. The facility is on a 16.8-acre site near Highway 4 and Discovery Bay. The Old River fish screen is a positive barrier fish screen with vertical openings of 3/32nds of an inch. It is oriented parallel to the ambient flow in Old River, allowing fish to swim past the intake, and is equipped with a traveling rake automated cleaning system.

Old River Pipeline and Transfer Facility

The Old River Pipeline connects the Old River Intake and Pump Station to the Transfer Facility. The pipeline is about 34,500 feet long and 78 inches in diameter and conveys up to 250 cfs. From the Transfer Facility, water can be pumped up to the reservoir, and/or allowed to flow down to the Contra Costa Canal. The Transfer Facility is on a 24.3-acre site and includes the following facilities:

- Transfer Pump Station — A plant that delivers up to 200 cfs to the reservoir
- Transfer Reservoir — A reservoir that provides water storage for flow control operations
- Flow Control Station — Regulates flow from the Transfer Pipeline into the Los Vaqueros Pipeline

Transfer Pipeline

The Transfer Pipeline consists of about 19,600 feet of 72-inch-diameter pipe and connects the Transfer Facility to the reservoir. The Transfer Pipeline can convey up to 200 cfs from the Transfer Facility to the reservoir and up to 400 cfs from the reservoir to the Transfer Facility.

Los Vaqueros Pipeline

The Los Vaqueros Pipeline connects the transfer facility to the Contra Costa Canal. The pipeline consists of two continuous segments: the first is about 18,000 feet long with a 96-inch-diameter pipe and the second is 29,000 feet long with a 90-inch-diameter pipe. The pipeline has a capacity of 400 cfs.

Contra Costa Canal and Rock Slough Intake[1]

The Contra Costa Canal was completed by Reclamation in 1948. The canal is owned by Reclamation and operated by CCWD. The canal is the primary conveyance facility for CCWD's untreated water supply, carrying water from both the Rock Slough intake and the Old River

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[1] In addition to Old River and Rock Slough, CCWD owns the Mallard Slough intake at the southern end of a 3,000-foot-long channel running due south from Suisun Bay, near Mallard Slough (across from Chipps Island). The Mallard Slough intake was reconstructed in 2002 and is equipped with a positive barrier fish screen. The CCWD has a license and permit from the SWRCB for diversions of up to 26,780 acre-feet per year at this location, but rarely uses the intake due to poor water quality. When CCWD diverts water at Mallard Slough, it typically reduces pumping of CVP water at its other intakes, primarily at the Rock Slough intake.

intake (via the Los Vaqueros Pipeline) for deliveries to treatment plants, industry, and irrigation customers throughout CCWD's service area. The canal is 48 miles long with capacities ranging from 350 cfs at the Rock Slough intake to 22 cfs at its western terminus at Martinez Reservoir. The earth-lined portion of the canal is subject to water quality degradation due to seepage into the canal from saline groundwater in the area. The CCWD is undertaking a project to encase this portion of the canal. The Los Vaqueros Pipeline connects to the canal at the Neroly blending basin near the Randall Bold Water Treatment Plant in Oakley, California.

Rock Slough intake has a capacity of 350 cfs and is currently unscreened. Because water quality at Old River is generally better than at Rock Slough, and because the Old River intake is screened, Rock Slough is used less frequently than in the past. When the AIP is operational, use of Rock Slough will drop even further. However, Old River and the AIP do not have sufficient capacity to meet all CCWD's demands now or in the future, so Rock Slough continues to be an important component of CCWD's system.

Reclamation, in collaboration with CCWD, is responsible for constructing a fish screen at Rock Slough under the Central Valley Project Improvement Act and the 1993 Service BO for the Los Vaqueros Project. Reclamation received an extension on fish screen construction until December 2008, and has prepared a request for further extension until 2018 because the requirements for screen design will change when CCWD completes an ongoing project to encase the earth-lined portion of the canal.

Intertie with EBMUD
The intertie with EBMUD connects the Los Vaqueros Pipeline with the Mokelumne Aqueduct in Brentwood, enabling CCWD to wheel a portion of its CVP contract water supply through Freeport Regional Water Authority and EBMUD facilities to the reservoir. Under an agreement between CCWD, EBMUD and Freeport Regional Water Authority, CCWD can wheel up to 3,200 acre-feet per year through the intertie. The intertie also functions as an emergency connection between EBMUD and CCWD, enabling the districts to share water resources in an emergency or during planned outages.

Alternative Intake Project
The AIP adds a new 250 cfs intake on Victoria Canal that is connected to the Old River Pipeline via a 2.5-mile buried pipeline across Victoria Island and through a tunnel beneath Old River. The new intake will be equipped with a positive barrier fish screen. The AIP will increase CCWD's access to high quality water year-round, especially in the fall and during drought periods. The AIP does not increase the total amount of water diverted from the Delta, but provides additional diversion location flexibility.

Los Vaqueros Watershed Recreation Facilities
Recreational facilities that provide both water-oriented and upland recreational opportunities have been constructed and operated since reservoir installation. These include 55 miles of trails, a marina, fishing piers, a visitor center, and picnic areas. Recreation facilities and programs are managed in a manner consistent with the Resource Management Plan adopted by the CCWD Board of Directors in 1999, with BOs issued by the Service and a Memorandum of

Understanding (MOU) with the CDFG covering San Joaquin kit fox, bald eagle, California red-legged frog, and Alameda whipsnake, among other threatened and endangered species in the watershed.

Los Vaqueros Reservoir Operations

CCWD operates the reservoir together with its intakes to provide high-quality, low-salinity water to its customers. In winter and spring, when the Delta is relatively fresh (generally January through July), customer demand is supplied by direct diversion from the Delta. In the late summer and fall months, CCWD releases water from the Los Vaqueros reservoir to blend with higher-salinity direct diversions from the Delta to meet CCWD water quality goals. The reservoir is re-filled during winter and spring, when chloride concentrations at Old River are low. Currently, the reservoir is operated in a manner consistent with the BOs issued by the Service for the reservoir, which require numerous fish protection measures including an annual 75-day "no-fill" period and a concurrent 30-day "no-diversion" period. The default dates for the no-fill and no-diversion periods are March 15 through May 31 and April 1 through April 30, respectively; the Service, NOAA Fisheries and CDFG can change these dates to best protect covered species. Customer demand during the no-diversion period is met through releases from the reservoir.

As a contractor of Reclamation's CVP, CCWD diverts flows from CVP storage facilities releases. Under CCWD's contract with Reclamation, CCWD can divert and re-divert up to 195 TAF per year of water from its Rock Slough and Old River intakes (and AIP under a letter approval from Reclamation signed on January 13, 2010). The CCWD also diverts water from Old River under its own Los Vaqueros water right permit. Additionally, CCWD has a permit to divert and store the water from Kellogg Creek in the reservoir.

Water use within CCWD's service area is currently between 125 and 140 TAF per year. These demands are met with a combination of reservoir releases and direct diversions of CVP contract water, as well as diversions under other water rights (e.g., City of Antioch pre-1914 water rights), groundwater, conservation, and recycled water. From 44 TAF to 70 TAF of reservoir capacity represents emergency storage (depending on hydrological conditions) that would provide from 3 to 6 months of supply for CCWD at current demand levels during times when water from the Delta is unavailable due to natural disaster, toxic spill, levee failure, or other significant event. From 1987 to 1989, CCWD's water deliveries were as much as 140 TAF per year while recent deliveries have been less than 120 TAF per year, despite an increase in service area population of almost 40 percent over the same period.

Existing Conservation Commitments

<u>Terrestrial and Wetland Habitats and Associated Species</u>

Service BO for San Joaquin Kit Fox and Bald Eagle

Formal consultation under section 7 of the ESA on the effects of the original Los Vaqueros Reservoir Project on the San Joaquin kit fox (federally endangered) and bald eagle (formerly federally threatened, now delisted; State endangered) resulted in a BO from the Service in 1993 (Service file number 1-1-92-F-48) (Service 1993b). The BO lists several terms and conditions that Reclamation (and ultimately CCWD) agreed to comply. Measures that affect long-term management in the watershed include:

- The CCWD shall acquire and protect in perpetuity a total of 7,544 acres of habitat for San Joaquin kit fox, which includes 6,513 acres within the watershed and 1,031 acres in two separate mitigation areas outside the watershed, depending upon final assessment of all impacts from the project (Note: Ultimately, the recreational component of the project did not have the anticipated impacts to San Joaquin kit fox habitat. As a result, the required amount of conservation easements became 5,779 acres). The habitat will be managed by CCWD under a Service- and CDFG-approved habitat management plan. This acreage amounts to a 3:1 compensation ratio (compensation lands: impacted lands) for the original project impacts to San Joaquin kit fox.

- The CCWD shall develop a recreation plan that addresses potential effects on San Joaquin kit fox and bald eagle in the watershed. The Service and CDFG shall have approval authority over the plan to ensure that any potential effects on these species are reduced to an "insignificant level."

- The CCWD shall monitor bald eagles in the watershed to help determine the effects of recreation on bald eagle use of the area and the mortality rates resulting from wind turbines in the project area. These effects shall be studied by CCWD using a Service- and CDFG-approved monitoring and study plan.

Figure 4 shows the location and status of San Joaquin kit fox easements within the watershed.

Service BO for California Red-Legged Frog and Alameda Whipsnake
Formal consultation concerning the effects of the original Los Vaqueros Reservoir Project on the California red-legged frog (federally threatened), and a conference report on the effects on the Alameda whipsnake (federally threatened) resulted in a BO from the Service in 1996 (Service file number 1-1-96-F-151) (Service 1996). As with the previous BO, this BO specified several nondiscretionary terms and conditions that Reclamation (and ultimately CCWD) must comply.

Measures that affect long-term management for these species in the watershed include the following:

- The CCWD shall monitor the extent and quality of California red-legged frog habitat to ensure that it does not decline over time. If any mitigation sites (ponds and wetlands) that were specifically created for California red-legged frog fail to support successfully reproducing California red-legged frogs for at least 1 year within the next 5 years from the date of this BO, the site shall be replaced at a 3:1 ratio.

- Wetlands that are identified for California red-legged frog mitigation must maintain adequate water levels throughout the year to provide suitable California red-legged frog breeding habitat. Compensation and minimization measures include creation or enhancement of 12.21 acres of wetlands, 10.59 acres of riparian, and 11.23 acres of stock ponds.

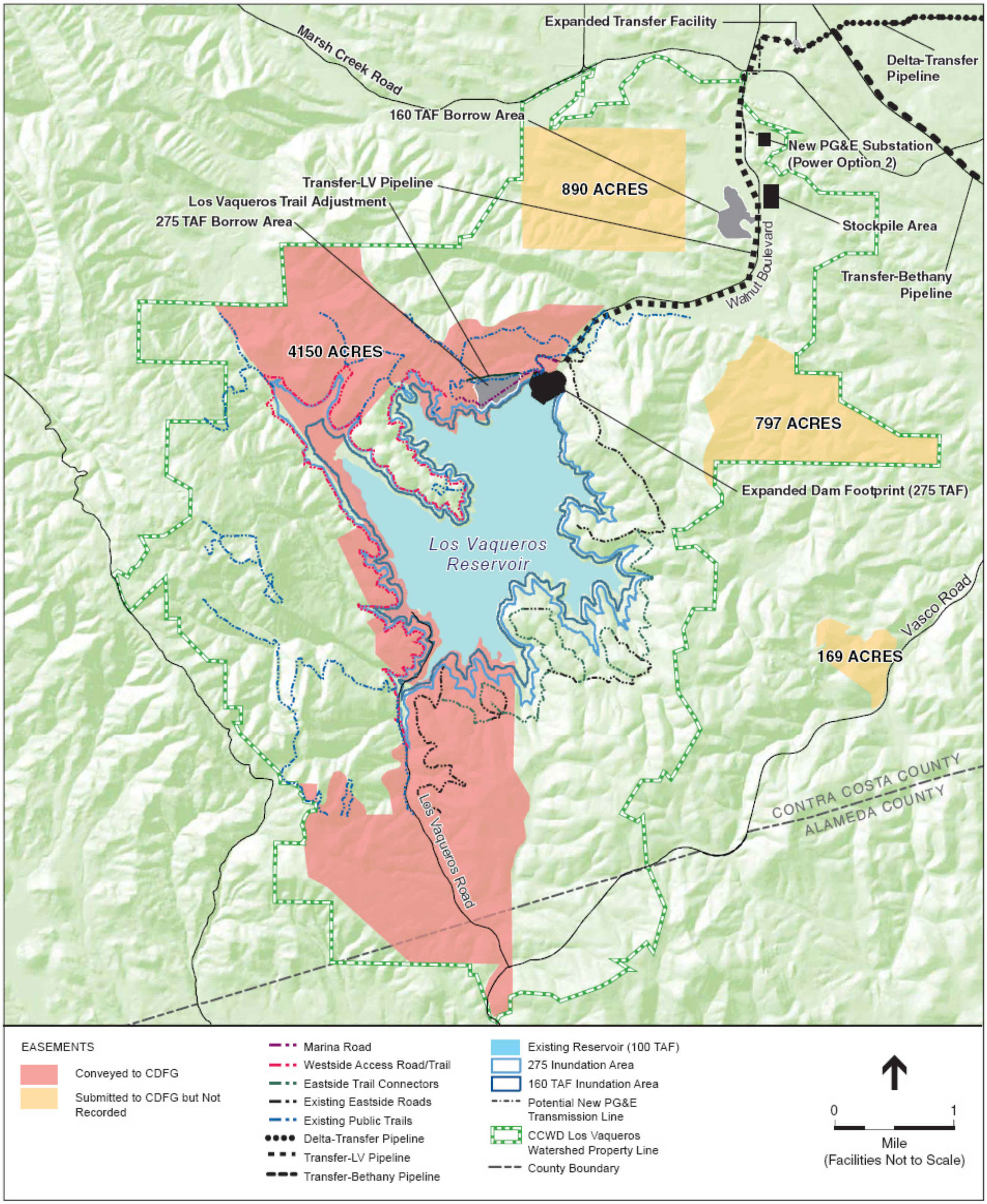


Figure 4. Location of San Joaquin Kit Fox Easements within Los Vaqueros Watershed
Source: Reclamation and CCWD 2009

Wetland and riparian habitats downstream of Los Vaqueros Dam site shall be monitored to ensure those areas are maintained as wetland habitats.

- All alkali marsh compensation wetlands shall be planted with bulrush at densities specified in the BO. The vegetation at these sites shall be monitored as they mature to ensure that they remain suitable for California red-legged frogs.

- Monitor all stock ponds, created ponds, and semi-permanent and alkali marsh mitigation wetlands in April, July, August, September, October, and once in winter of every year for water level, stage of California red-legged frog development, and presence of bullfrogs. Report the results of this monitoring effort by January 15 of every year of the project. Livestock fencing in areas specified in the BO must be maintained in perpetuity to protect California red-legged frog habitat.

- CCWD shall prepare and submit for approval to the Service a Predator Management Plan for the project area. The plan will include measures to reduce or eliminate habitat for bullfrogs, monitoring for the presence of bullfrogs and their egg masses, dewatering stock ponds with bullfrogs, and success criteria.

- Changes in land uses identified in the watershed management program and the resource management plan shall not occur without additional consultation with the Service.

- Visitor use shall be limited and pets shall be prohibited from Drainage Units D, E, F, and G. No recreational activities shall be allowed in the California red-legged frog mitigation sites (see Figure 5 for mitigation site locations). See Figure 6 for access restrictions in the watershed.

- Mosquito abatement and the application of any herbicides or pesticides in the project area must be approved by the Service.

- No construction activities, public vehicle traffic (including trams), bikes, or recreational facilities shall be allowed within 500 feet of chaparral or scrub, excluding Old Vasco Road, which enters the reservoir site from the south.

- No off-road travel within 500 feet of chaparral or scrub shall be allowed without prior approval by the Service. See Figure 6 for access restrictions in the watershed.

- Vehicle speed limits of 15 mph must be observed within 500 feet of Alameda whipsnake habitat.

- No additional firebreaks will be constructed in chaparral without Service approval.

Service BO for Vernal Pool Crustaceans
For the Los Vaqueros Reservoir Project, the Service issued a conference report (Service file number 1-1-93-C-68) (Service 1993c), clarification letter, and later adopted the Conference Opinion as a BO with modifications to terms and conditions (Service file number 1-1-95-F-117)

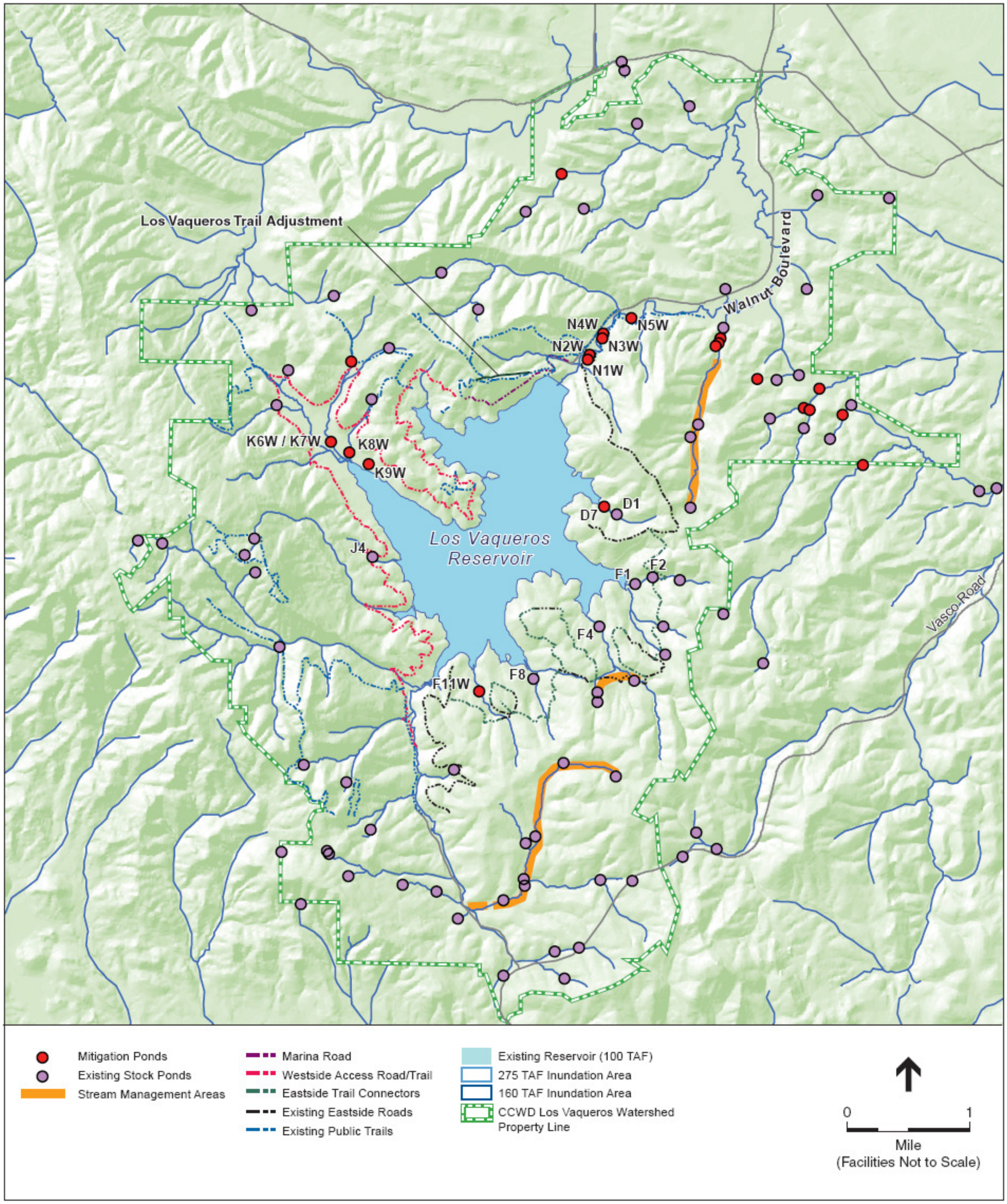


Figure 5. Location of Wetlands Created for California Red-legged Frog and Stock Ponds within the Los Vaqueros Watershed
Source: Reclamation and CCWD 2009

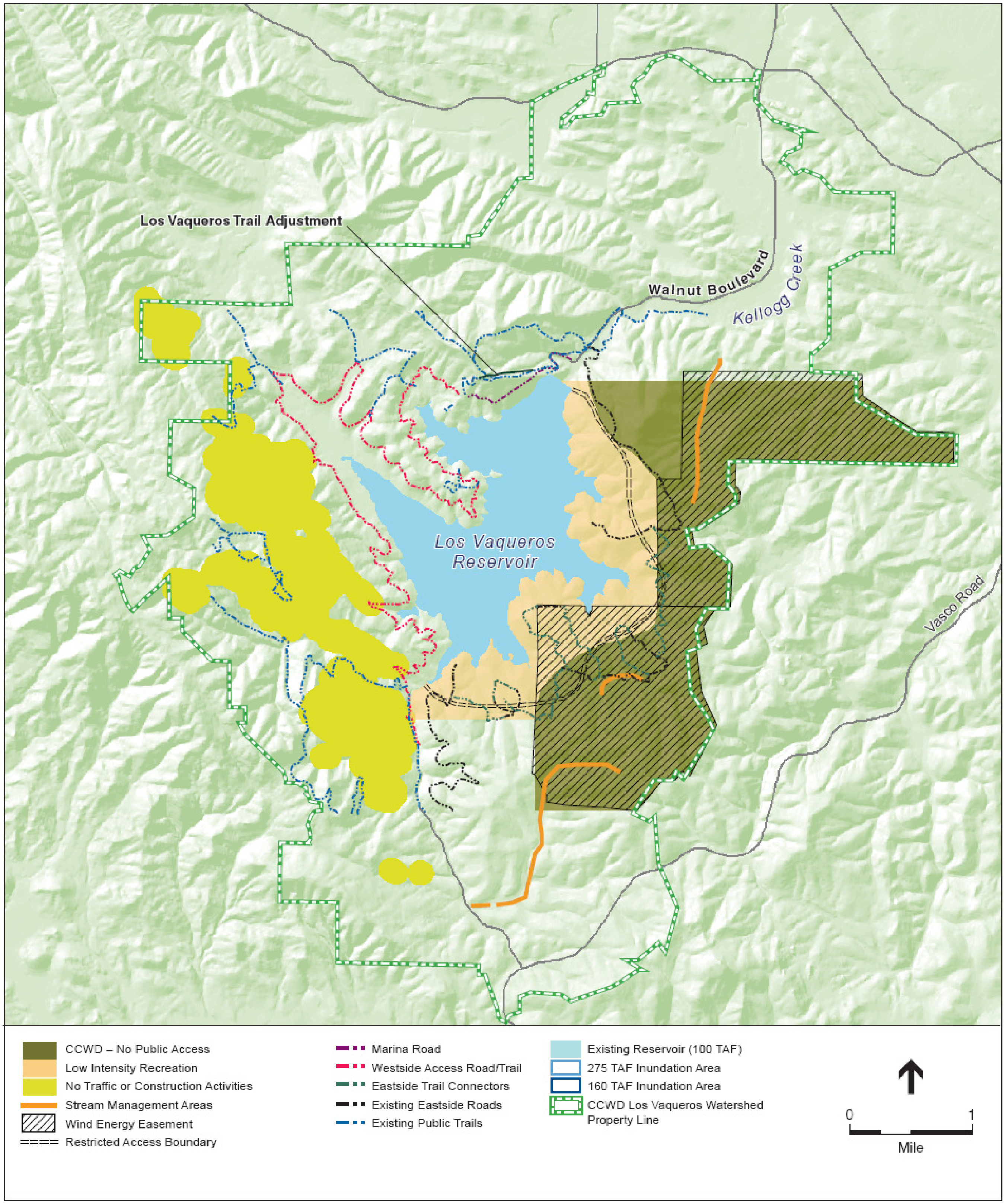


Figure 6. Access Restrictions within the Los Vaqueros Watershed
Source: Reclamation and CCWD 2009

for the longhorn fairy shrimp (federally endangered) and the vernal pool fairy shrimp (federally threatened) (Service 1995b). These two species of federally listed invertebrates were originally addressed in a conference report by the Service in 1993 when they were still proposed for listing. Following the issuance of the conference report, both species were formally listed. The Service adopted the conference report into the BO in 1995 after modifying several terms and conditions. Measures that affect long-term management in the watershed include:

Human use in the easternmost portion of the Kellogg Creek watershed and in Conservation Area 1 shall be restricted to activities associated with wind energy generation, dryland farming, grazing, and administration by CCWD. Public use shall be restricted to research and occasional educational activities conducted under the supervision of CCWD staff or other designated land management agencies. This use designation corresponds to the No-Use designation in the conceptual recreation plan. Lands immediately east of the reservoir will be managed by CCWD to allow low-intensity dispersed recreation use. The eastern boundary of the area shall be fenced to prevent human access to the more restricted easternmost lands and this fence and the Kellogg Creek vernal pools area shall be patrolled to ensure that no trespassing happens and that the fence remains intact. Accepted uses in the lands immediately east of the reservoir include hiking and boat landing, and associated activities such as picnicking. Except as may be provided under Term and Condition 1b, major facilities shall not be located in this area. This use designation corresponds to the Controlled-Use category in the conceptual recreation plan.

- Several areas in the watershed shall be set aside from most human activities. These areas include the easternmost portion of the watershed and Conservation Area 1 (See Figure 6 above for access restrictions in the watershed). Lands immediately east of the reservoir shall only have low-intensity, dispersed recreation use. Excluded areas shall be fenced and patrolled to exclude public access.

- The Kellogg Creek vernal pool complex and a 200-foot buffer are within lands for which a conservation easement has been granted to CDFG.

Bald and Golden Eagle Protection Act – Golden Eagle
Compliance with the Federal Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and mitigation measures adopted through the CEQA/NEPA process require CCWD to monitor nesting golden eagles. In addition, activities such as construction and recreation should avoid disturbing nesting golden eagles. To accomplish this avoidance, CCWD seasonally closes and reroutes recreation trails that pass within 0.5 mile of nesting golden eagle sites and temporarily suspends watershed operations in the vicinity of active nests.

The CDFG California Endangered Species Act (CESA) Memorandum of Understanding for San Joaquin Kit Fox
CDFG and CCWD signed a CESA memorandum of understanding for the Los Vaqueros Reservoir Project on February 16, 1994, which outlines several conservation measures that were included in the Service's BO for this species. Measures include acquiring the conservation areas mentioned previously for this species and legally conveying the easements to CDFG, monitoring kit fox habitat, and several construction-related measures. Other measures include prohibiting the widespread use of rodenticides in the watershed.

Service Fish and Wildlife Coordination Act Report – Oak Woodland
A FWCA Report and Final Recommendations were prepared by the Service for the Los Vaqueros Reservoir Project in 1993. As part of the report, the Service prepared and submitted a valley oak and blue oak woodland mitigation plan. The plan recommended creating or enhancing a total of 394 acres of valley oak woodland and savanna, and between 16 and 67 acres of blue oak woodland. Since the recreation facilities plan was incomplete at the time, a range was established for blue oak woodland mitigation in order to address the range of potential impacts. Recommendations for developing the maximum recreation facilities concept would have included 67 acres of blue oak mitigation.

U.S. Army Corps of Engineers (USACE) Section 404 Permits – Wetlands
For the original Los Vaqueros Reservoir Project, impacts on wetlands and other waters of the U.S. regulated under Section 404 of the Clean Water Act were authorized under an individual permit (Permit No. 199000070) from USACE. Wetlands created as part of Section 404 compliance were required to meet specific permit performance standards for both vegetation and hydrology. Mitigation is considered successful if, after 6 years of monitoring, approximately 80 percent of each wetland type has met USACE's criteria for vegetation and hydrology performance. Wetland creation and enhancement requirements are presented for each wetland type in Table 1 below.

Table 1. Summary of Original Los Vaqueros Project Impacts to Waters of the U.S. and Required Mitigation
(Source: Reclamation and CCWD 2009)

Wetland Type	Impacts (Acres)	Mitigation Commitment (Acres)	Mitigation Commitment (Type)
Alkali marsh	2.06	4.12	creation
Semi-permanent marsh	3.64	7.33	creation
Vernal pool	0.01	0.02	creation
Willow-cottonwood riparian	0.38	0.76	creation
Seasonal wetlands	N/A	6.48	creation
Alkali grassland and meadow	3.23	30.50	enhancement
Total	9.32	49.21	

<u>**Tidal Aquatic Habitats and Associated Species**</u>
The CCWD operates the reservoir together with its intakes under the following BOs and permits:

- The NOAA Fisheries' BO addressing the effects of the original Los Vaqueros Reservoir Project on Sacramento River winter-run Chinook salmon, issued March 18, 1993. No significant operational requirements other than the no-fill and no-diversion requirements described in the "Project Background" section under the "Los Vaqueros Reservoir Operations" heading.

- The Service's BO (Service file number 1-1-93-F-35) (Service 1993d) addressing the effects of the original Los Vaqueros Reservoir Project on delta smelt issued September 9, 1993 and clarified by letter dated September 24, 1993. In addition to the no-fill and no-diversion requirements previously described, this BO requires CCWD to preferentially divert CVP water from the screened Old River intake from January through August each year. It also restricts filling of the reservoir from December through June based on the position of the 2 parts per thousand isohaline ("X2") in the Bay-Delta. It also requires CCWD to operate all of its intakes and the reservoir as an integrated system to minimize impacts to endangered species. It requires monitoring at all intakes to minimize take of delta smelt during the spawning and rearing period.

- DFG's Memorandum of Understanding (MOU) regarding the Los Vaqueros Project, covering delta smelt and winter-run Chinook salmon, was issued February 16, 1994. The MOU requires the same conditions as the Federal BOs for these species.

- State Water Resources Control Board Decision No. 1629 issued June 2, 1994. The decision contains the same operational rules as the BOs and MOU, but also includes limits on combined diversions from Old River and Rock Slough of 350 cfs and 242,000 acre-feet per year (after the first year of operation of Los Vaqueros Reservoir). Additionally, the Decision requires releases to Kellogg Creek to maintain the downstream beneficial uses.

- The Service's BO for the AIP, covering delta smelt, was issued April 27, 2007, and subsequently amended on May 16, 2007 (1-1-07-F-0044) (Service 2007b). This BO integrates operations of the new intake on Victoria Canal into the operations of the previously described facilities to minimize take of delta smelt. The combined permitted diversion rate of Old River and AIP is 320 cfs.

- NOAA Fisheries BO for the AIP, covering winter-run Chinook salmon, spring-run Chinook salmon, Central Valley steelhead, and North American green sturgeon, was issued July 3, 2007. This BO also integrates operations of the AIP into the operations of the facilities previously described, to minimize take of these species.

Project Description

Reclamation's and CCWD's February 2009, Draft EIS/EIR, describes the proposed Los Vaqueros Reservoir Expansion Project. The March 2010, Final EIS/EIR provided refinements to the basic four alternatives identified in the draft document. Summaries, including refinements as identified in the final EIS/EIR are provided below for each alternative and the No Project/No Action Alternative, if the refinement would have an effect on fish and wildlife resources.

No Project/No Action Alternative

Under this alternative, CCWD and Reclamation would not implement the Los Vaqueros Reservoir Expansion Project. However, CCWD, Reclamation, and others potentially served by the project would proceed with other approved activities and projects to maintain, modify and/or expand their existing water systems in accordance with their respective plans. To maintain supply reliability to its customers, CCWD would continue to implement actions identified in its 1998 Future Water Supply Study, including acquisition of water transfers as needed to provide reliable dry-year water supply. The CCWD also would operate the AIP as approved by the BOs for OCAP.

Under this alternative, no new emergency storage would be provided to CCWD or its customers; and no new conveyance connection to Bethany Reservoir would be made. The approved enlargement of the SBA now in progress would be completed, but no other changes to the SBA conveyance system or operation are anticipated at this time. The No Project/No Action Alternative also does not include changes to the SWP or the CVP facilities or operations, other than the operational changes required to protect delta smelt under the Service's December 2008 OCAP BO.

The No Project/No Action Alternative includes the projects identified in the CALFED Storage Program Common Assumptions/Common Modeling Package. Key projects assumed to be in place and operating in the future include the Delta Mendota Canal–California Aqueduct Intertie, permanent operable barriers in the south Delta, and the Freeport Regional Water Project.

DWR and Reclamation are conducting studies on potential modifications to the existing water conveyance system through the Delta (DWR Notice of Preparation for Bay Delta Conservation Plan EIR/EIS, February 13, 2009), but no specific project(s) are sufficiently certain to include in the No Action/No Project future scenario.

Alternatives 1-3

Alternative 1 and Alternative 2 would allow Reclamation and CCWD to expand the storage capacity of the existing Los Vaqueros Reservoir, expand diversion capacity by building a new intake and pump station, build new conveyance pipelines to increase existing water conveyance capacity, and build a new pipeline that would connect additional water agencies in the south Bay Area with expanded Los Vaqueros Reservoir facilities.

Alternative 3 would allow for an expanded reservoir, but without a south Bay Area connection. The goal of this alternative would be to provide Reclamation with greater operational flexibility for the CVP system, increasing water supply available at appropriate times for environmental uses such as cold water releases to support salmon spawning, pulse flow releases to support salmon migration, or water supply for the wildlife refuges.

Each of these three alternatives has similar fish and wild resource impacts with the exception of Alternative 3, which would not provide a connection to the SBA as preciously noted. Key components of these three alternatives include:

- Expanded 275 TAF reservoir
- Emphasis on either environmental water management and/or water supply reliability
- South Bay Connection of up to 470 cfs (Transfer-Bethany Pipeline)(Alternatives 1 and 2)
- New Delta Intake and Pump Station with a capacity of up to 170 cfs or expansion of existing pump on Old River (Alternative 3)
- Expanded pipeline from the Delta to the reservoir, to allow a capacity of 670 cfs

Under these alternatives, the reservoir would be expanded from the existing storage capacity of 100 TAF to 275 TAF. New intake, pumping, and conveyance facilities would be constructed in order to move water from the Delta to the Los Vaqueros Reservoir. For Alternatives 1 and 2 the

South Bay Connection (Transfer-Bethany Pipeline) would be constructed linking the Los Vaqueros Reservoir system to South Bay water agencies via Bethany Reservoir and the SBA.

Reclamation and CCWD anticipate that Alternative 1 would reduce impacts to Delta fish through improved diversion screening and coordinated operations with the CVP and SWP systems. If Reclamation and DWR agree, CVP and SWP Delta export pumping would be reduced to correspond with the use of the Los Vaqueros Reservoir pumping system for the South Bay water agencies. Shifting this water diversion to the more effectively screened Los Vaqueros Reservoir system intakes is expected to have fewer direct impacts to fish than the same amount of water diverted from either the SWP or CVP export facilities.

Alternative 1 and 2 would also include storage to improve water supply reliability and emergency water supplies for Bay Area water agencies. The proposed alternative includes the largest proposed expansion of the reservoir, a new intake in the Delta, increased conveyance capacity from the Delta to the reservoir, and a South Bay connection (Transfer-Bethany Pipeline). Water would be moved through the expanded reservoir system into the SWP system at Bethany Reservoir, which serves all three South Bay water agencies (ACWD, SCVWD, and Zone 7), and into San Luis Reservoir, which provides SCVWD its CVP contract water.

In addition to expansion of the Los Vaqueros Reservoir, Alternatives 1 -3 would involve expansion of some of the other existing CCWD water system facilities along with construction of new facilities. Figure 2 above shows the project area and the existing water system facilities within the project area. The new and expanded facilities proposed under Alternative 1 would be integrated into the existing water system facilities shown in Figure 2. See the "Project Background" section for a description of CCWD's existing reservoir and related water system facilities.

Existing facilities that would be integrated into the proposed Los Vaqueros Reservoir Expansion Project are: Old River Intake and Pump Station, AIP, Old River Pipeline, Transfer Facility, Transfer Pipeline, and Los Vaqueros Dam and Reservoir. Under all Alternatives, certain features of CCWD's existing operations would be integrated into the proposed Los Vaqueros Reservoir Expansion Project. These include:

- Reservoir filling would occur during periods of low salinity to ensure that the project would continue to meet CCWD's water quality goals.

- Water for direct deliveries to CCWD would be diverted under CCWD's CVP water supply contract or as transfers such as CCWD's long-term agreement with the East Contra Costa Irrigation District.

- Water stored in Los Vaqueros Reservoir for CCWD purposes would be diverted under CCWD's Los Vaqueros water right permit or under CCWD's CVP water supply contract.

- No water would be diverted through the Los Vaqueros intake system from the Delta during a 30-day No-Diversion Period in the spring. This would provide fishery protection by avoiding diversions during a fish-sensitive period. It is assumed that other Delta operational restrictions would not affect reservoir filling and direct deliveries outside of the No-Diversion Period.

Alternative 1-3 would require additional electrical power supply to proposed project facilities from the existing Western Area Power Administration (Western) and/or Pacific Gas and Electric (PG&E) power utilities that serve existing CCWD facilities. A summary of the main facilities for each alternative is provided in Table 2 below.

Table 2. Summary of Major Facility Components for Each Alternative
Source: Reclamation and CCWD 2009

Component	No Project/No Action	Alternatives 1-3
Reservoir Facilities		
Los Vaqueros Reservoir – Storage Capacity	100 TAF	275 TAF
Dam Raise	N/A	Yes
Maximum Water Surface Elevation	472 ft	560 ft
Intake Facilities		
Old River Intake and Pump Station (*existing facility*)	250 cfs	250 cfs
Delta Intake and Pump Station (*new facility*)	N/A	Up to 170 cfs
AIP (*existing facility*)	250 cfs	250 cfs
Conveyance Pipelines and Facilities		
Old River Pipeline (*existing facility*)	320 cfs	320 cfs
Delta-Transfer Pipeline (*new facility*)	N/A	350 cfs
Total Conveyance Capacity from Delta to Transfer Facility	**320 cfs**	**670 cfs**
Transfer Facility (pumping/storage tank capacities) (*existing facility; upgraded and expanded under Alternative 1*)	200 cfs/4 MG	670 cfs/12 MG
Transfer Pipeline (*existing facility*)	200 cfs from Transfer Facility to LV Res. and 400 cfs from LV Res. to CC Canal via LV Pipeline	400 cfs from LV Res. to CC Canal via LV Pipeline
Transfer-Los Vaqueros Pipeline (Transfer-LV Pipeline) (*new facility*)	N/A	670 cfs from Transfer Facility to LV Res. and 470 cfs from LV Res. to Bethany Res. via Transfer-Bethany Pipeline
Transfer-Bethany Pipeline (*new facility*)	N/A	470 cfs
Electrical Power Facilities (Two Options)		
Option 1: Extend new supply facilities from and upgrades to existing Western facilities *OR* Option 2: Extend new supply facilities from and upgrades to existing Western and PG&E facilities	N/A	Needed

cfs = cubic feet per second; TAF = thousand acre-feet; MG = million gallons; ft = feet; CC = Contra Costa; LV Res. = Los Vaqueros Reservoir; Bethany Res. = Bethany Reservoir; LV Pipeline = Los Vaquero Pipeline; N/A = not applicable; PG&E Pacific Gas & Electric; Western = Western Area Power Administration

Proposed Facilities
As proposed, Alternatives 1-3 would expand the Los Vaqueros Reservoir storage capacity to 275 TAF and involve raising the existing dam; essentially building over the existing dam to support the larger reservoir. Figure 7 shows the reservoir inundation area for the 275-TAF reservoir compared to the existing Los Vaqueros reservoir. The reservoir water surface area would increase from about 1,500 acres to about 2,500 acres.

Total diversion capacity under these alternatives would be up to 670 cfs. Of this total diversion capacity, 500 cfs would come from the existing Old River Intake and Pump Station (250 cfs) and AIP (250 cfs), and the remaining capacity would come from a new 170-cfs Delta Intake and Pump Station with the exception of Alternative 3 which would involve just an expansion of the existing Old River Facility.

The new Delta Intake and Pump Station would be constructed along Old River within the siting zone shown on Figure 2; south of the existing intake structure. Additional investigations are required to select the final site location within the siting zone.

Existing conveyance facilities that move water from the Delta to the Los Vaqueros Reservoir would increase conveyance capacity by constructing the following:

- Installation of an additional pipeline parallel to the existing pipeline that extends from the Delta to the Transfer Facility and then from the Transfer Facility to the reservoir; and

- Expanded facilities at the existing Transfer Facility site.

The proposed new Delta-Transfer Pipeline would have a capacity of up to 350 cfs and would be installed generally parallel to the existing Old River Pipeline between the new Delta Intake and Pump Station and the Transfer Facility. With the addition of the second pipeline, total conveyance capacity between the Delta intake facilities and the Transfer Facility would be up to 670 cfs. Similarly, an adjoining pipeline, referred to as the Transfer-LV Pipeline, would be installed parallel to the existing Transfer Pipeline between the Transfer Facility and the Los Vaqueros Reservoir. The Transfer-LV Pipeline would fill the expanded reservoir at a rate of up to 670 cfs and release water from the Los Vaqueros Reservoir to Bethany Reservoir via the Transfer-Bethany Pipeline (described below) at a rate of up to 470 cfs. The existing Transfer Pipeline would convey release flows to the Contra Costa Canal via the Los Vaqueros Pipeline at up to 400 cfs.

The existing Transfer Facility would be expanded to accommodate movement of the higher flow volumes into and out of the expanded reservoir, and into the Transfer-Bethany Pipeline. As shown on Table 2, with the proposed expansion of the Transfer Facility, the total pumping capacity would be 670 cfs and Transfer Facility storage capacity would be 12 million gallons (MG). The additional facilities would be next to the existing facilities at this site. In addition, an energy recovery system would be installed at the Transfer Facility to capture hydraulic energy generated by gravity-delivered water from the reservoir to the Transfer-Bethany Pipeline.

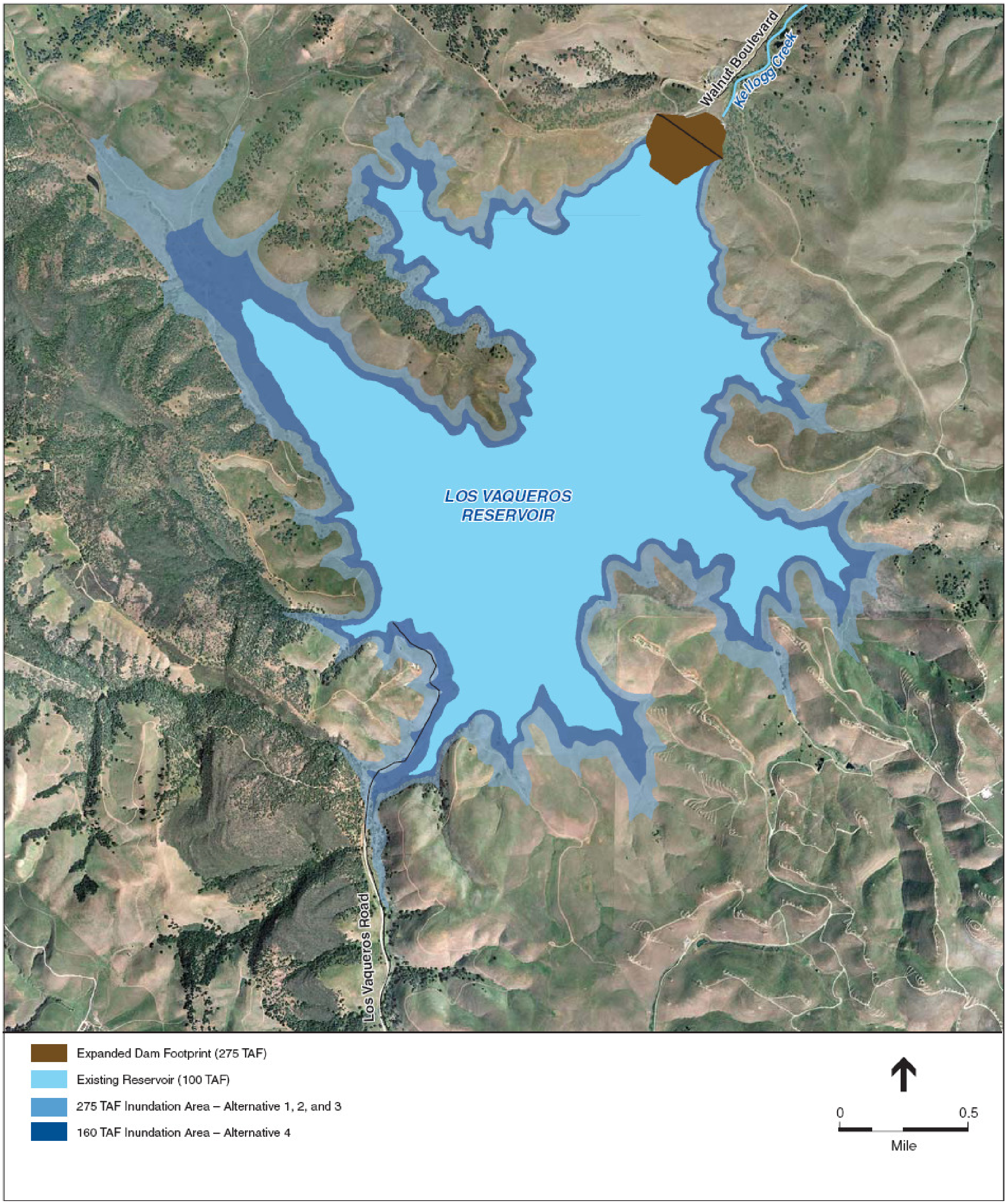


Figure 7. Reservoir Expansion – Inundation Area
Source: Reclamation and CCWD 2009

A key component of this alternative is the South Bay Connection, which consists of the Transfer-Bethany Pipeline and appurtenant facilities extending between the Transfer Facility and Bethany Reservoir. The point of delivery would be near the South Bay Pumping Plant. From the point of delivery, the water would either be pumped into the SBA for use by the South Bay water agencies or moved to San Luis Reservoir for use by SCVWD as Federal CVP water supply. No new or modified facilities are needed to move water beyond the point of delivery. The new Transfer- Bethany Pipeline would have a capacity of up to 470 cfs; the final capacity requirements will be determined during project design.

Additional and/or new power supplies would be required at the new Delta Intake and Pump Station and Expanded Transfer Facility. Power could be supplied via either of two options: **Power Option 1: Western Only** would extend new supply facilities from and construct upgrades to existing Western facilities; or **Power Option 2: Western & PG&E** would extend new supply facilities from and construct upgrades to existing Western and PG&E facilities. The power options are described in more detail below.

Existing recreational facilities within the Los Vaqueros Watershed that are disturbed or displaced by the reservoir expansion would be relocated or replaced. Alternatives 1-3 include construction of additional recreational facilities as described in more detail below.

Operations
The Draft EIS/EIR states the water system operations for Alternative 1 were designed with a dual emphasis on both primary objectives, using an expanded Los Vaqueros Reservoir to improve Environmental Water Management and increase Water Supply Reliability for the Bay Area. Alternative 1 would also meet the secondary objective of water quality improvement. This alternative would reserve 20 TAF of the expanded reservoir for CCWD.

Operations would be coordinated with SWP and CVP operations as generally described below. It is anticipated that water for South Bay water agency use would be diverted under existing CVP and SWP water right permits, modified as needed. Figure 8 is a schematic that shows how water will be delivered under Alternative 1.

Environmental Water Management
The Draft EIS/EIR states that when operated in coordination with Reclamation's CVP system and DWR's SWP system, the expanded reservoir would be operated to divert and deliver a portion of the South Bay water agencies' contracted State and Federal system water through the expanded Los Vaqueros system and new Transfer-Bethany Pipeline instead of through the existing SWP and CVP Delta export pumping facilities.

The expanded reservoir system would only divert water through positive barrier fish screens designed and operated to regulatory agency specifications[2]. These fish screens are expected to reduce fish entrainment and impingement as water is diverted for delivery to South Bay water agencies. The CVP and SWP Delta exports are expected to decrease by the same quantity of water diverted through Los Vaqueros Reservoir facilities for the South Bay water agencies. Shifting this water diversion to the screened Los Vaqueros Reservoir intakes is expected to have

[2] The unscreened Rock Slough intake would continue to operate, but is not part of the expanded reservoir system.

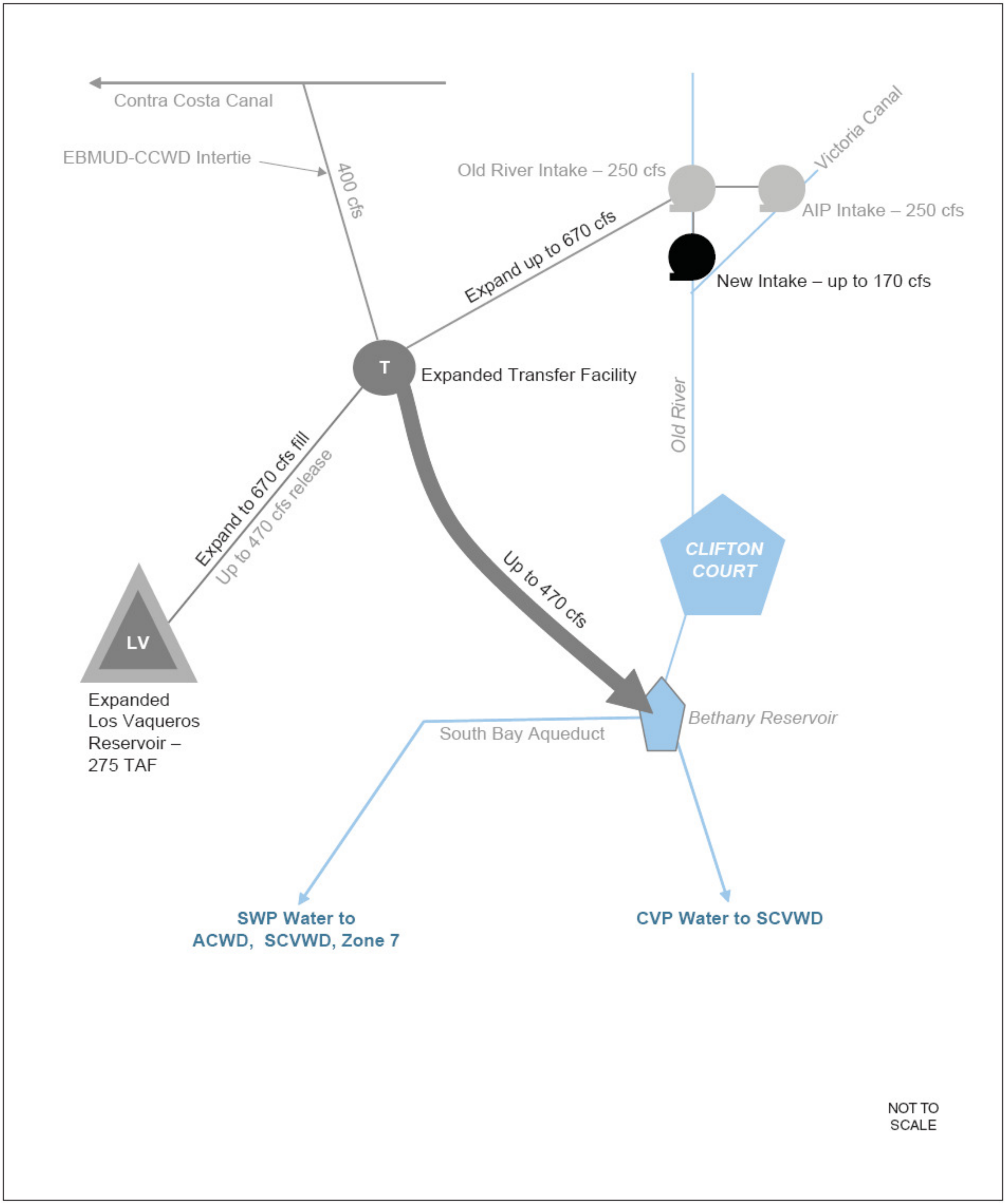


Figure 8. Alternative 1 Schematic – 275 TAF Reservoir with South Bay Connection
Source: Reclamation and CCWD 2009

fewer impacts to fish than the same amount of water diverted through either the SWP or CVP export facilities. This reduction in impacts to fish is expected to occur at the same time as the diversion shift to Los Vaqueros Reservoir system intakes. Estimates indicate that such operations could yield about 100 to 150 TAF of water per year to use in this manner.

The additional storage is also expected to provide operational flexibility to reduce or eliminate diversions into the expanded Los Vaqueros system during the most sensitive fish period without disrupting supplies. Current regulations for Los Vaqueros include a no-diversion period during the most critical spring fish period. During this period, water needs are met with stored water in Los Vaqueros Reservoir. Shifting South Bay water agency diversions to the expanded Los Vaqueros system would allow the no-diversion period to be applied to South Bay water agencies, in addition to CCWD. During this no-diversion period, CCWD could continue to deliver water to participating agencies from water stored in the expanded reservoir.

Water would be diverted by the expanded Los Vaqueros system through three separate Delta intakes (Old River, AIP, and the new Delta Intake and Pump Station). Multiple points of diversion, coupled with additional storage capacity would allow for coordination with CVP and SWP operations and pumping facilities to improve flexibility and respond to changing fishery conditions in the Delta, which may reduce impacts to fish.

Water Supply Reliability
Reclamation and CCWD expect that water delivery operations under Alternative 1 would provide water supply reliability for Bay Area water agencies.

The expanded reservoir system would be used to partially restore delivery reductions to the South Bay water agencies that have occurred and are expected to continue to occur due to regulatory restrictions at the SWP and CVP Delta export pumps.

The additional storage is expected to increase the amount of water available in dry years to South Bay water agencies and CCWD, reducing the need to purchase supplemental dry-year supplies, activate dry-year exchange programs, or institute drought management measures. The expanded reservoir would allow more storage of water in wet periods for use in dry periods. The amount of dry-year storage available to the South Bay water agencies is integrated with the supply available for Delta supply restoration and is not quantified separately. Operating for dry-year storage is expected to increase the amount of good quality water available to CCWD from Los Vaqueros Reservoir by up to 20 TAF at the start of a drought.

Increased stored water supplies is expected to be available for delivery to Bay Area water agencies through the Transfer-Bethany Pipeline or through existing interties in the event of a Delta levee failure, contaminant spill, or other emergency. Emergency storage available to the Bay Area region under Alternative 1 is about 225 TAF.

Proposed Facilities Description

Los Vaqueros Reservoir Expansion/Dam Modification

Reservoir expansion would involve dam raise modifications as well as construction of appurtenant facilities including a spillway, inlet/outlet works, and a reservoir oxygenation system.

Raising the existing dam for expansion to 275 TAF would require construction on the upstream and downstream sides of the existing dam and would therefore require that the reservoir be empty during construction. Draining the reservoir would be accomplished primarily by the planned release of the water into the CCWD distribution system, which could take 6 months to 1 year to accomplish. The reservoir would remain drained and out of service throughout the estimated 3-year construction period and be refilled following construction completion.

The Los Vaqueros Reservoir would be out of service for about 4 years from the time the reservoir was completely drained to allow for construction of the dam expansion through refilling the expanded reservoir. A temporary diversion pipe would be installed to divert any inflows from Kellogg Creek around the dam and into Kellogg Creek to maintain the flows required in CCWD’s water rights and BOs and to sustain the habitats dependent on these flows.

A portion of the dam raise materials would be obtained from a borrow area just upstream of the left abutment (see Figure 9). The borrow area would be about 36 acres for the 275-TAF dam raise. The material for the central core of the dam would be excavated from the alluvial clay deposits naturally occurring on the floor of the reservoir. This area is inundated by the existing reservoir.

Although the dam raise would be constructed in large part from local materials quarried from nearby borrow areas, certain materials would need to be imported and stockpiled near the dam in sufficient quantity to maintain an adequate flow of materials. Some material would be stockpiled adjacent to the existing dam on the downstream side. In addition, another estimated 15-acre stockpile/staging area was identified along Walnut Boulevard near the entrance to the watershed.

For the 275-TAF reservoir, excess earthen materials would be disposed of within the reservoir inundation area. If additional disposal areas are needed, the final disposal areas selected would depend on the type and volume of material to be disposed.

Delta Intake Facilities

Alternatives 1 and 2 would incorporate operation of CCWD’s existing Delta intakes (AIP and Old River Intake and Pump Station) into its operations. Under Alternative 1 and 2, a new Delta Intake and Pump Station would be required to pump water from Old River and convey it to the Transfer Facility and/or the South Bay Connection (Bethany Reservoir). The intake facilities are shown on Figure 10. The new Delta Intake and Pump Station facility would be along Old River, just south of CCWD’s existing Old River.

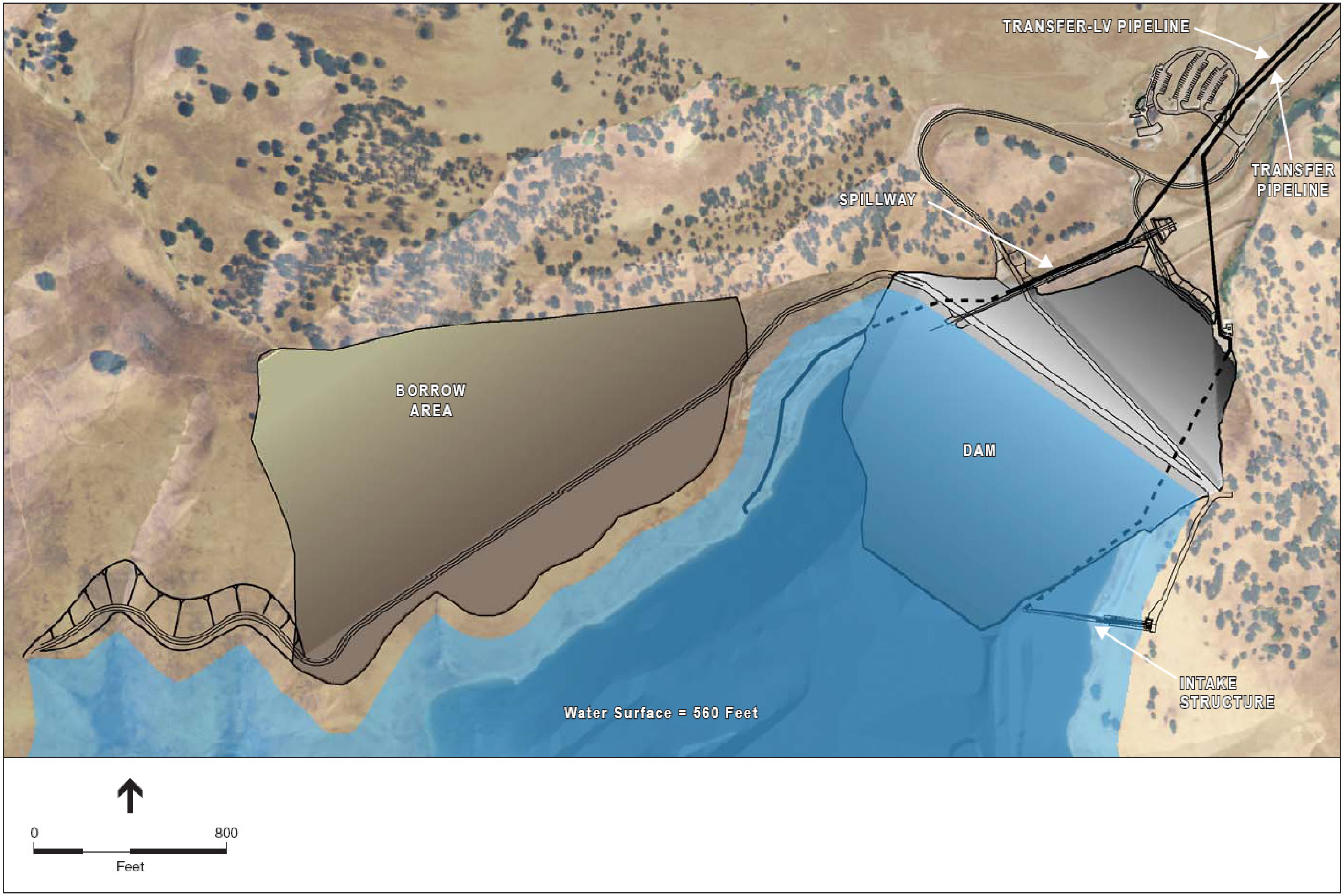


Figure 9. 275 TAF Reservoir – Dam Raise and Borrow Area
Source: Reclamation and CCWD 2009

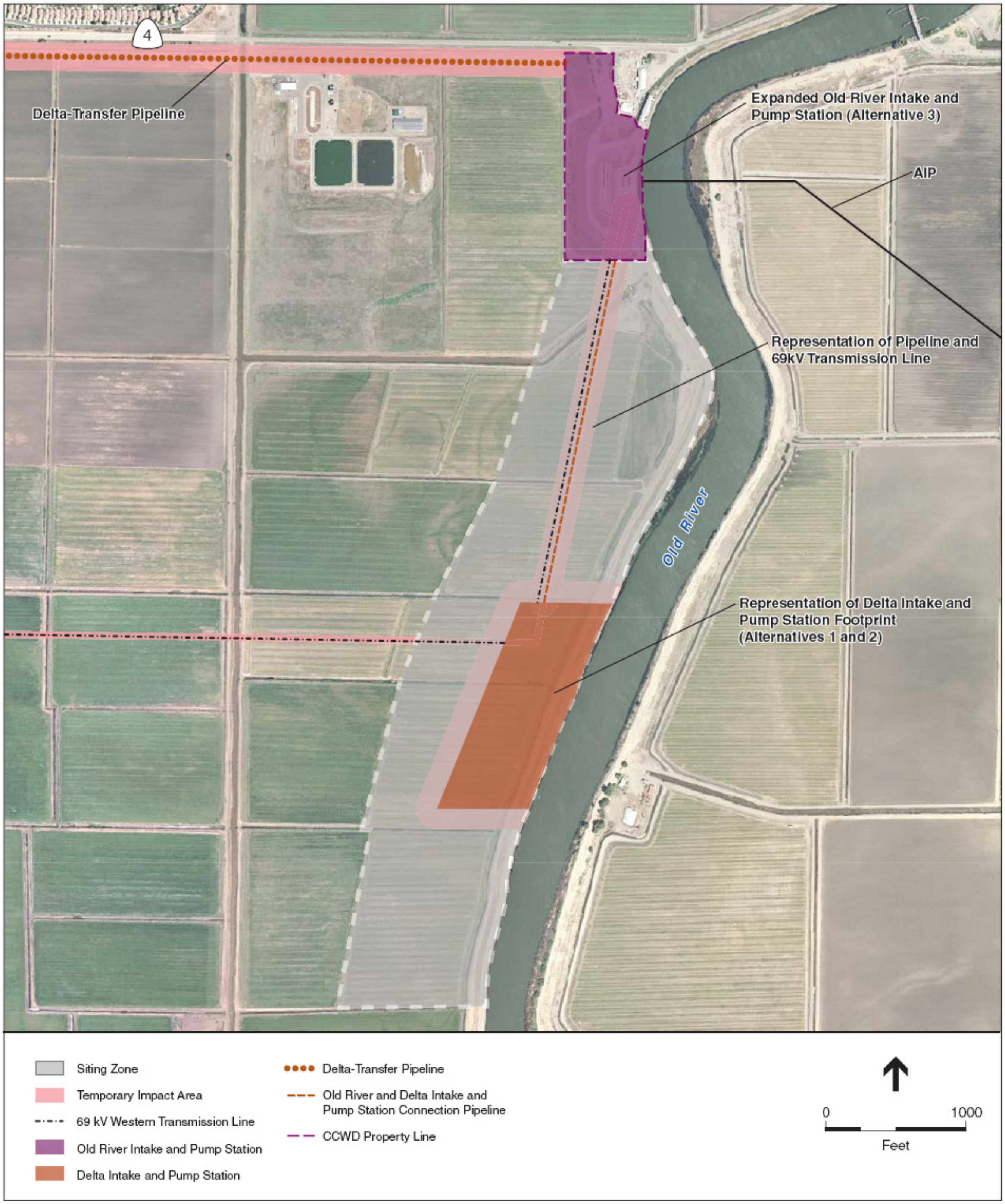


Figure 10. Intake Facilities
Source: Reclamation and CCWD 2009

The new Delta Intake and Pump Station would be sited on about 22 acres. Additional investigations are required to select the final site location. Therefore, a broader siting zone was evaluated within which the 22-acre facility would be located (see Figure 10). A pipeline connecting the new Delta Intake and Pump Station to the Old River Intake and Pump Station and an electrical transmission line would be installed within this siting zone.

The new Delta Intake and Pump Station would include a well structure with positive barrier fish screens. An earthen setback levee would be constructed around the site to provide levee protection during construction of the intake and to maintain continuity of the road system along the levee after construction. A conceptual layout of this facility is shown on Figure 11. This facility would include a pump station with a capacity to deliver up to 170 cfs. Access to the site would be on existing roads and the facility site would be fenced. The site, now in agricultural use, would be completely cleared prior to construction.

The new levee configuration would consist of additional earthen fill placed about 1,000 to 1,200 feet longitudinally and 250 to 300 feet laterally on the land side of the existing levee. Sheet piles would also be longitudinally placed about 350 feet upstream and downstream of the new intake and would be integrated into the new setback levee to serve as a seepage barrier. Riprap slope protection would be installed on the water side of the existing levee for a distance of about 400 to 500 feet both upstream and downstream of the new intake. The elevation along the top of the new embankment fill and the existing embankment at the intake would be raised above the existing levee top elevation to account for anticipated sea level rise due to climate change. Erosion control measures such as hydroseeding would be used on the landward side of the new setback levee.

In-water construction activities for fish screen installation would be conducted either from a barge or from the top of the levee road. A sheet pile cofferdam would be installed in Old River to isolate the work area from the water allow the construction area to be dewatered.

If excavation is required to prepare the cofferdam site, this excavated material would be contained within a designated containment area or areas on the land side of the levee. An earthen dike or siltation fences would enclose the containment area(s). Retention of the excavated materials would promote settling of the suspended sediments. After installation of the cofferdam, the water in the cofferdam enclosure would be pumped out and either disposed of on land or treated (as necessary) and discharged back to Old River. For installation of the fish screen, excavation would be required in Old River in an area of about 2,400 square feet to depths within 1 to 2 feet of the existing channel bottom.

Conveyance Facilities

Delta Transfer Pipeline

At present, water is diverted from the Delta at the Old River Intake and Pump Station and conveyed via the Old River Pipeline to the Transfer Facility. The Old River Pipeline generally traverses agricultural fields and orchards.

Under Alternatives 1-3, a new pipeline, the Delta-Transfer Pipeline, would be constructed between the new Delta Intake and Pump Station and the Expanded Transfer Facility. This

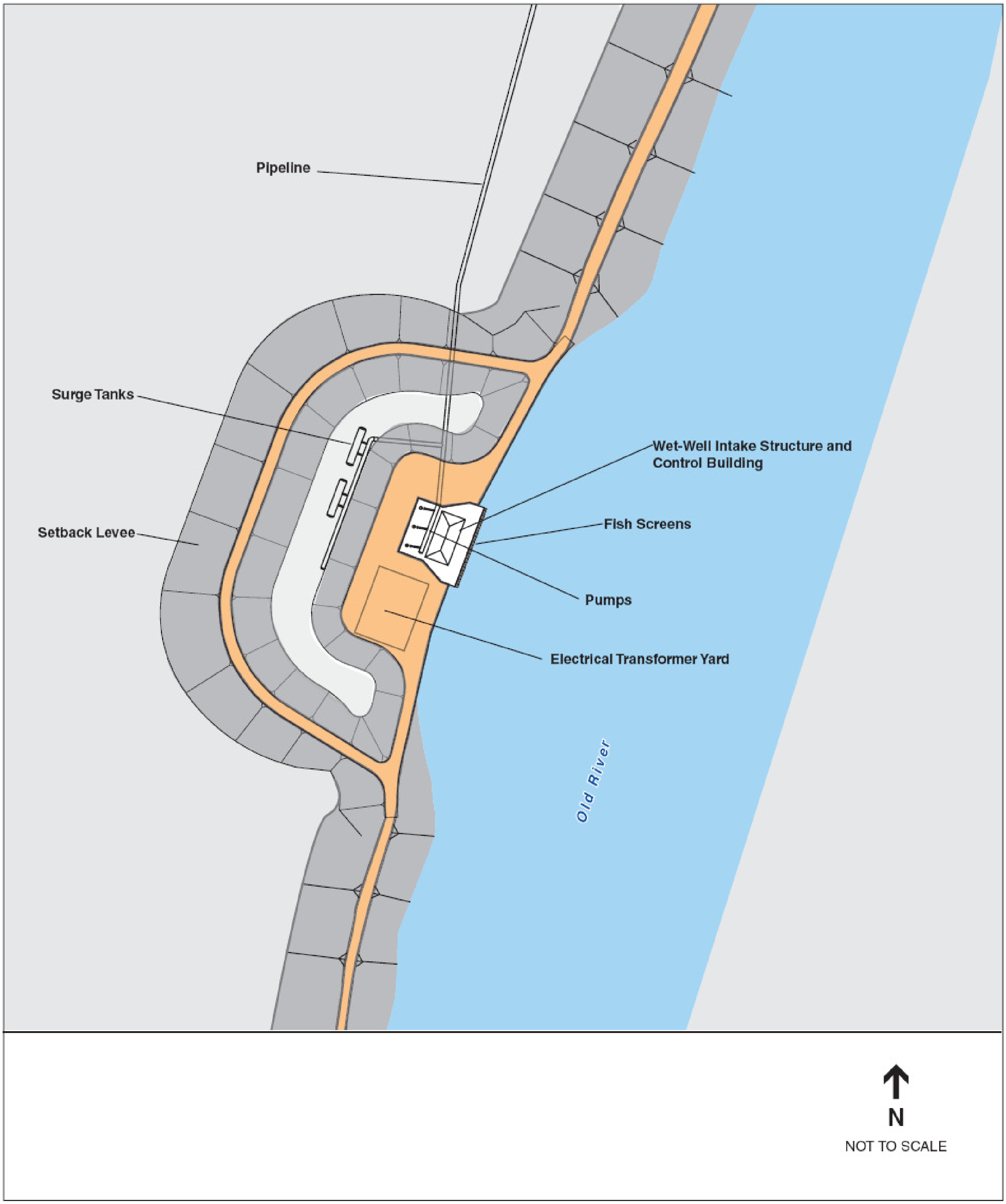


Figure 11. New Delta Intake and Pump Station – Conceptual Layout
Source: Reclamation and CCWD 2009

pipeline would generally parallel the existing Old River Pipeline alignment within the existing Old River Pipeline permanent right-of-way for most of the route (see Figure 12). The pipe would be about 38,000 feet long, 96 inches in diameter and would be capable of conveying up to 350 cfs. The pipeline measurement for Alternatives 1-2 includes the connecting pipeline from the new Delta Intake and Pump Station to the Old River Intake and Pump Station.

Transfer Facility

The existing Transfer Facility is on a fenced 24.3-acre site and regulates flows into and out of the Los Vaqueros Reservoir and into the Contra Costa Canal via the Los Vaqueros Pipeline. Alternative 1 would require expansion of the Transfer Facility to provide the capacity to move additional water to the expanded, higher reservoir. The existing 200 cfs capacity at the Transfer Facility would be expanded by 470 cfs for a total pumping capacity of 670 cfs. The new facilities would be on the northern portion of CCWD-owned property, adjacent to the existing Transfer Facility, as shown on Figure 13.

Transfer-LV Pipeline

At present, water is conveyed from the Transfer Facility either under gravity to the Contra Costa Canal via the Los Vaqueros Pipeline or pumped up to the Los Vaqueros Reservoir via the Transfer Pipeline. The Transfer Pipeline is about 19,600 feet long (about 3.7 miles) and 72 inches in diameter (see Figure 13).

Under Alternatives 1and 2, an additional pipeline, the Transfer-LV Pipeline, would be installed to convey up to 670 cfs from the Transfer Facility to the expanded Los Vaqueros Reservoir and would also be used for release flows. The existing Transfer Pipeline would only be used for releases and would retain its existing capacity of up to 400 cfs. The Transfer-LV Pipeline would be connected to the Transfer-Bethany Pipeline at the Expanded Transfer Facility and used to convey water under gravity from the expanded Los Vaqueros Reservoir to Bethany Reservoir.

The new Transfer-LV Pipeline would generally parallel the existing Transfer Pipeline alignment within the existing Transfer Pipeline 85-foot permanent easement right-of-way for a majority of the route. The additional pipeline could be up to 132 inches in diameter.

Transfer-Bethany Pipeline (South Bay Connection)

The Transfer-Bethany Pipeline would be as long as 8.9 miles (about 47,000 feet), up to 132 inches in diameter, and connected to the Delta-Transfer and Old River Pipelines at a point just east of the Transfer Facility. It would have the capacity to convey up to 470 cfs. Water would be conveyed through the Transfer-Bethany Pipeline to Bethany Reservoir for delivery to South Bay water agencies.

The Transfer-Bethany Pipeline would start on the eastern side of Vasco Road near the Transfer Facility with a connection to the Delta-Transfer Pipeline and extend approximately 8.5 to 8.9 miles southeast to Bethany Reservoir. At this time, there are two options for the final southern segment of the pipeline to the Bethany Reservoir Tie-in: a Westside Option and an Eastside Option. As described below, both of these options include tunnel segments (see Figure 14).

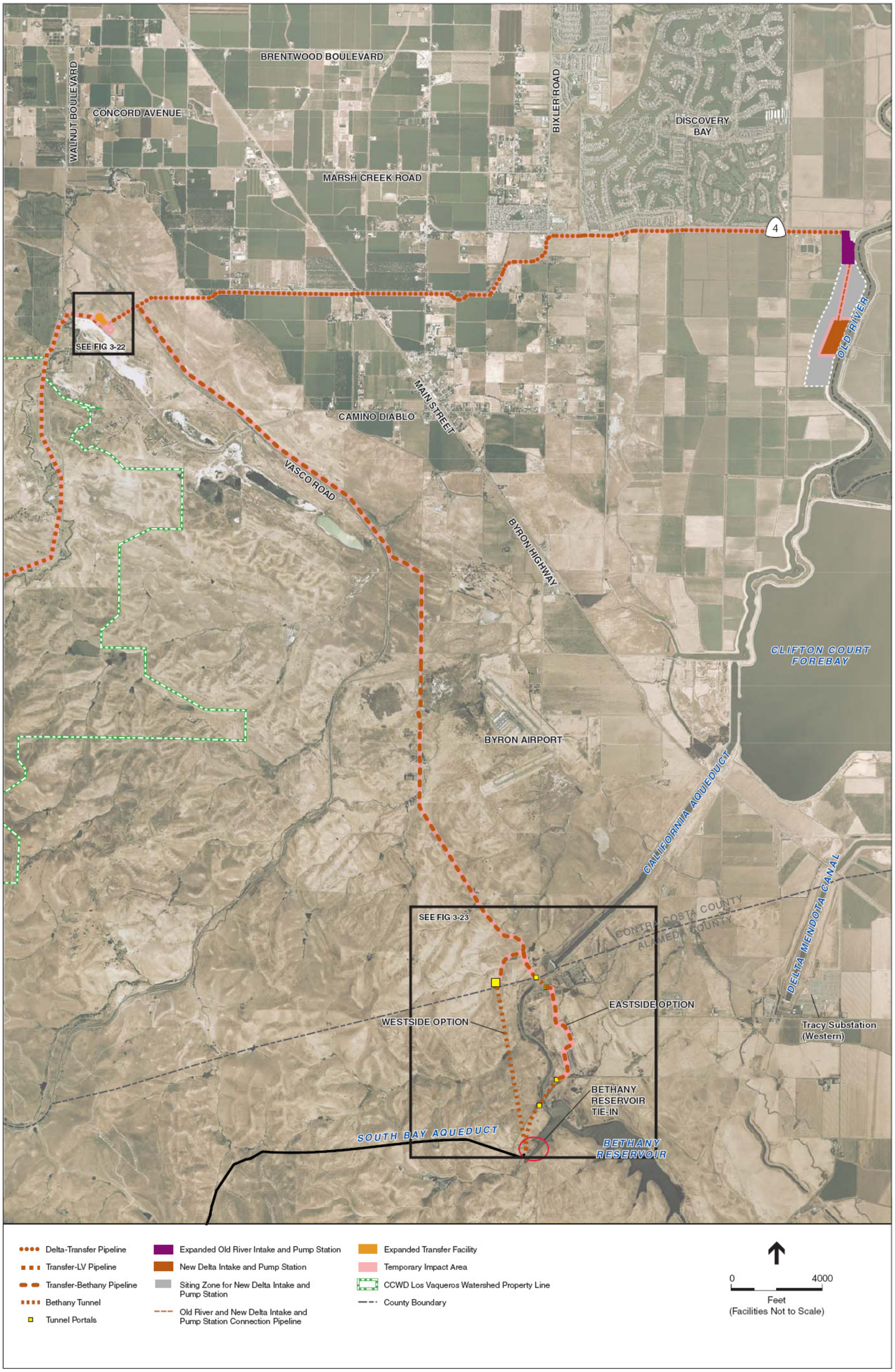


Figure 12. Overview of Conveyance Facilities ("FIG 3-22" and "FIG 3-23" correspond to Figures 13 and 14 respectively) Source: Reclamation and CCWD 2009

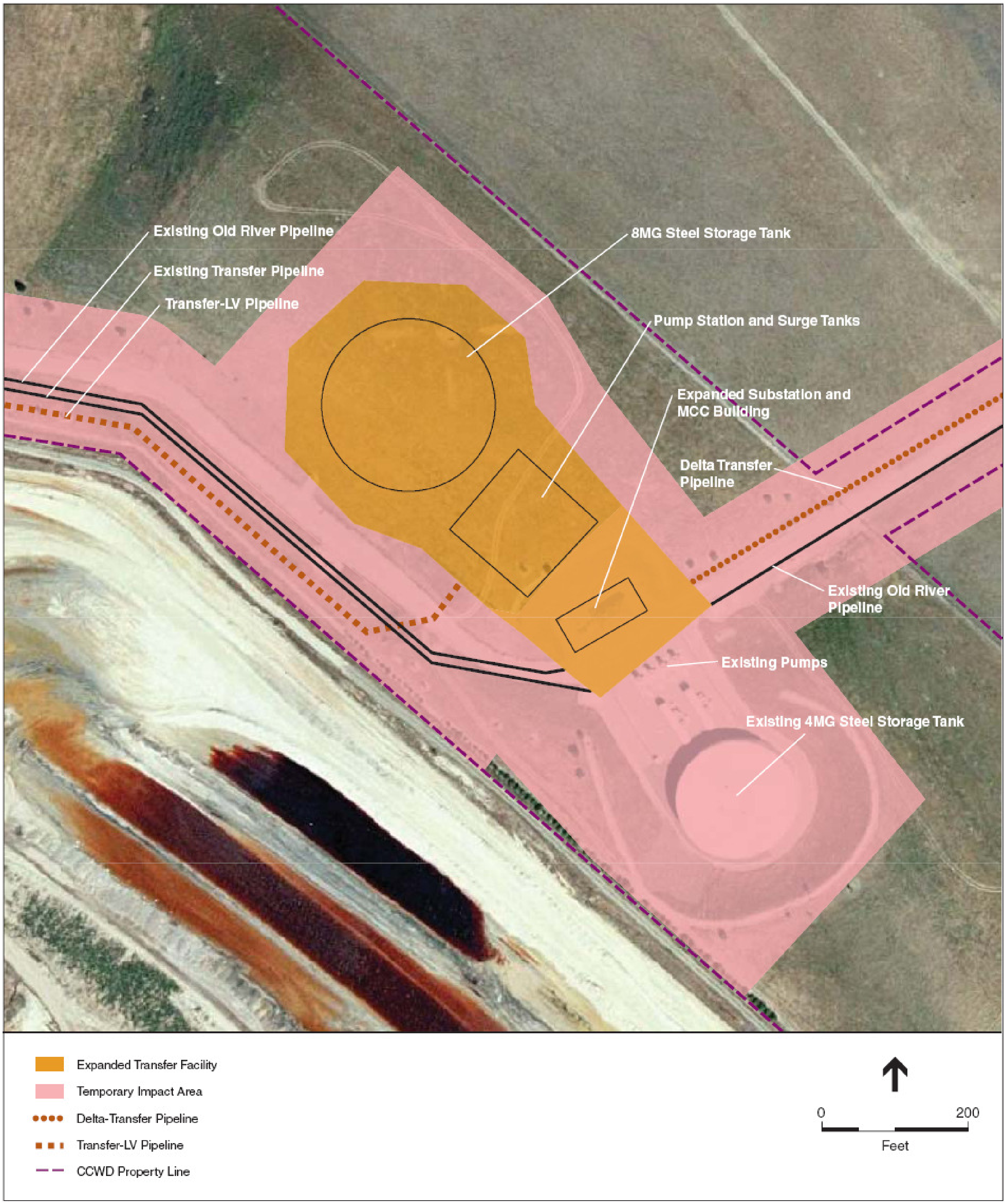


Figure 13. Expanded Transfer Facility
Source: Reclamation and CCWD 2009

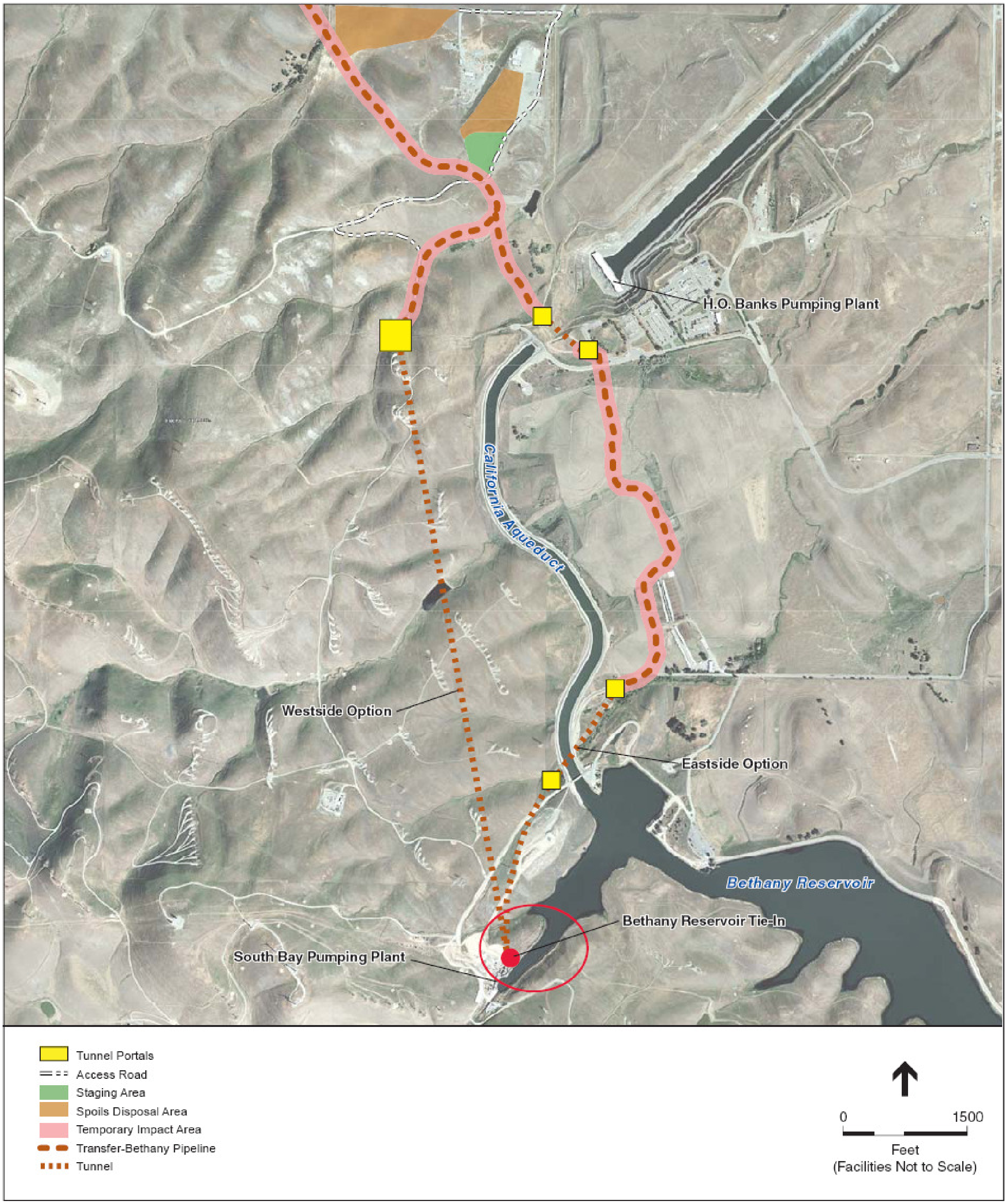


Figure 14. Transfer-Bethany Pipeline Alignment Detail
Source: Reclamation and CCWD 2009

1. Westside Option (about 1.8 miles): the pipeline would continue an additional 0.4 mile south and then would be tunneled the last 1.4 miles to the Bethany Reservoir Tie-in.

Tunneling this last segment would deal with the hilly terrain and maintain gravity flow to the Bethany Reservoir Tie-in.

2. Eastside Option (about 2.2 miles): the pipeline would continue about 0.4 mile towards the Banks Pumping Plant, then tunnel about 0.1 mile under the California Aqueduct, traverse south toward Bethany Reservoir for about 1.0 mile, to a final tunnel segment, about 0.7 mile, under the California Aqueduct to the Bethany Reservoir Tie-in.

Blow-Off and Air Valves – All Pipelines
Blow-off and air valves would be installed along the new pipelines proposed under Alternative 1. Blow-off valves and air valves are permanent release valves for water and air, respectively, used during pipeline filling and draining and during routine operations. Blow-off valves and air valves are installed at low points and high points, respectively. The actual locations of these valves would depend on the pipeline alignment; however, for purposes of this analysis, it is reasonable to assume that one air valve would be installed about every 1,000 feet and one blow-off valve every 2,000 feet. The valve structures have a concrete base with a medium diameter pipe extending about 2 feet above the base for a total height of about 2 to 4 feet above the ground.

Construction – All Pipelines
Project pipelines would be constructed throughout the full 36-month estimated project construction period. However, any given segment of pipeline would be in active construction for a much more limited period. For purposes of the impact analysis in this document, it is assumed that pipeline construction proceeds at a pace of about 120 feet per day for open-trench construction and at a reduced pace for tunneling or boring and jacking.

The temporary construction easement for the Delta-Transfer Pipeline and the Transfer-LV Pipeline was assumed to be 200 feet wide, and the Transfer-Bethany Pipeline to be 300 feet wide for purposes of environmental impact analysis. The actual construction area used would be narrower in some places due to environmental constraints (e.g., to avoid wetlands), physical conditions, or landowner issues. The minimum right-of-way for construction would be 85 feet wide, except on the Transfer-Bethany Pipeline along Armstrong Road where the work area could be restricted further to minimize impacts to vernal pool fairy shrimp habitat.

Pipeline materials (e.g., piping, backfill material) would be stored along the pipeline route within the construction easement. The active work area would generally be 25 to 50 feet on both sides of the trench.

Open-trench construction methods would be used for most pipeline installation, and bore-and-jack methods would be used for crossings where trenching methods are not feasible or where restrictions warrant other construction methods (e.g., major roadways and intersections, railroad lines, flood control channels). The as-built surface elevation would generally match the original ground surface elevation. Tunneling construction methods would be used for the southern portion of the Transfer-Bethany Pipeline (either the Westside Option or the Eastside Option).

Power Supply Infrastructure
Two options have been identified for constructing power infrastructure to provide additional power supply to the new and expanded facilities proposed under Alternatives 1-3.

Power Option 1: Western Only
Under this option, Western would provide all the additional electrical power required for the expanded Los Vaqueros Reservoir system. Western would supply additional power to both the new Delta Intake and Pump Station and the Expanded Transfer Facility.

Western would use its existing transmission line from the Tracy substation to supply power to a new substation. The new substation site would require about 2 acres near the terminus of Camino Diablo, though the exact location has not been determined. Therefore, a siting zone was defined for purposes of the impacts analysis. Figure 15 shows the proposed alignment and substation site for the power supply option. It is assumed that permanent impacts would not exceed 2 acres for the facility and that a permanent access road to the facility most likely from Camino Diablo Road or another auxiliary road would be required.

From the new substation, the existing single-circuit power line to the Old River Intake and Pump Station would be upgraded, replaced, or have an additional line added by one of the following methods: (1) placing new insulator arms and adding a second circuit on the existing poles; (2) replacing the existing poles with new poles to accommodate a double-circuit line; or (3) installing a new line parallel to the existing line.

For the Expanded Transfer Facility, a new distribution line would be installed from the new substation, paralleling the existing transmission line until it intersects with the Delta-Transfer Pipeline alignment. At that point, the new power line would head westward, generally traversing the same alignment as the Delta-Transfer Pipeline to the Expanded Transfer Facility.

For new circuits, it is assumed that if new poles are required, they would be about 50 feet tall and installed in up to 300-foot spans.

Power Option 2: Western & PG&E
Under this power option, Western would provide the additional electrical power supply for the new Delta Intake and Pump Station, but PG&E would provide the additional electrical power supply to the Expanded Transfer Facility (see Figure 16).

Western would use its existing transmission line corridor from the Tracy substation to supply power to the Delta intakes by constructing a single-circuit power line to the terminus of the existing single-circuit line that currently supplies power to the Old River Intake and Pump Station. From that point, the existing power line would be upgraded, replaced, or have an additional line added by one of the following methods: (1) placing new insulator arms and

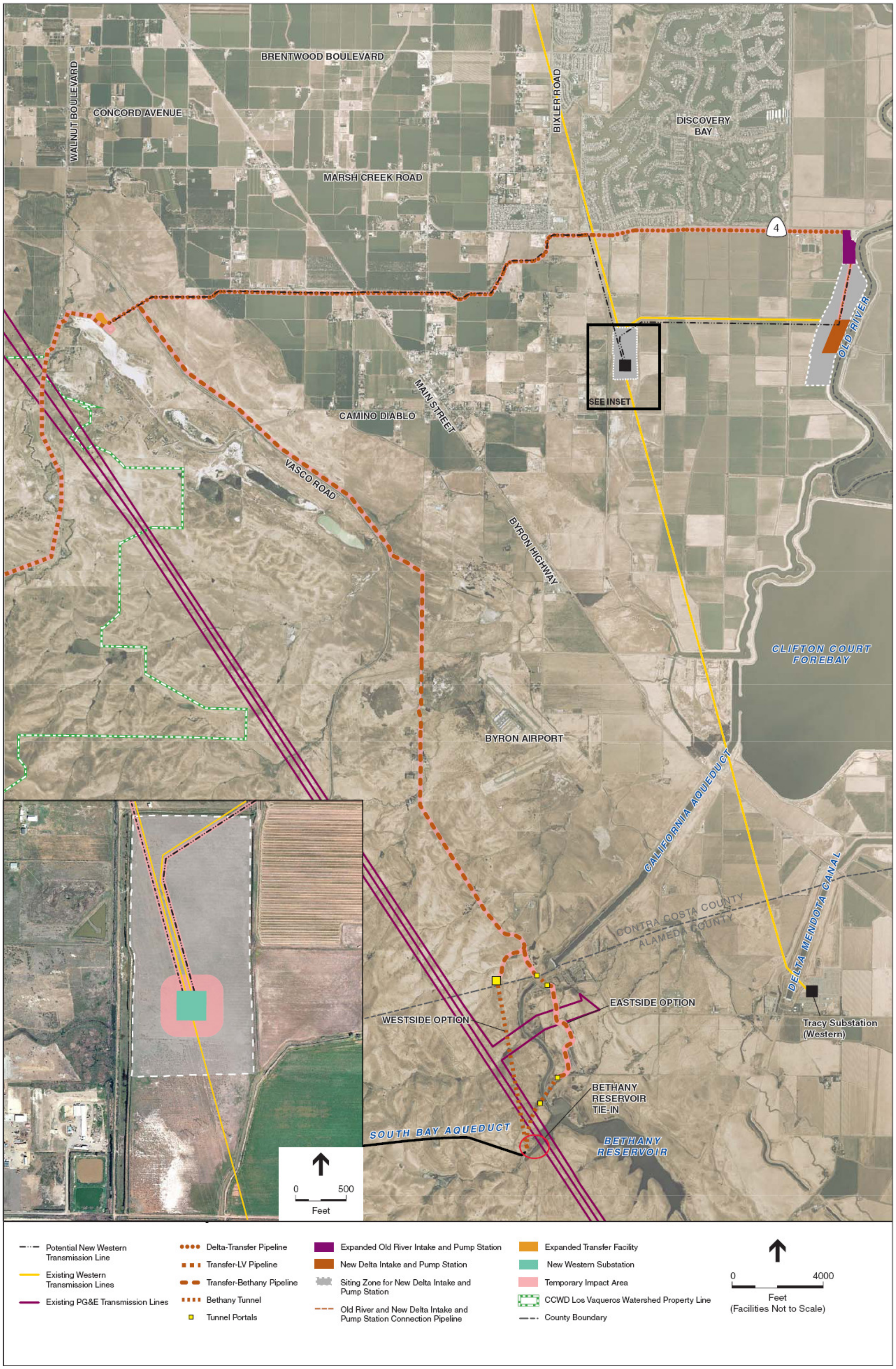


Figure 15. Power Supply Option 1 – Western Only Source: Reclamation and CCWD 2009

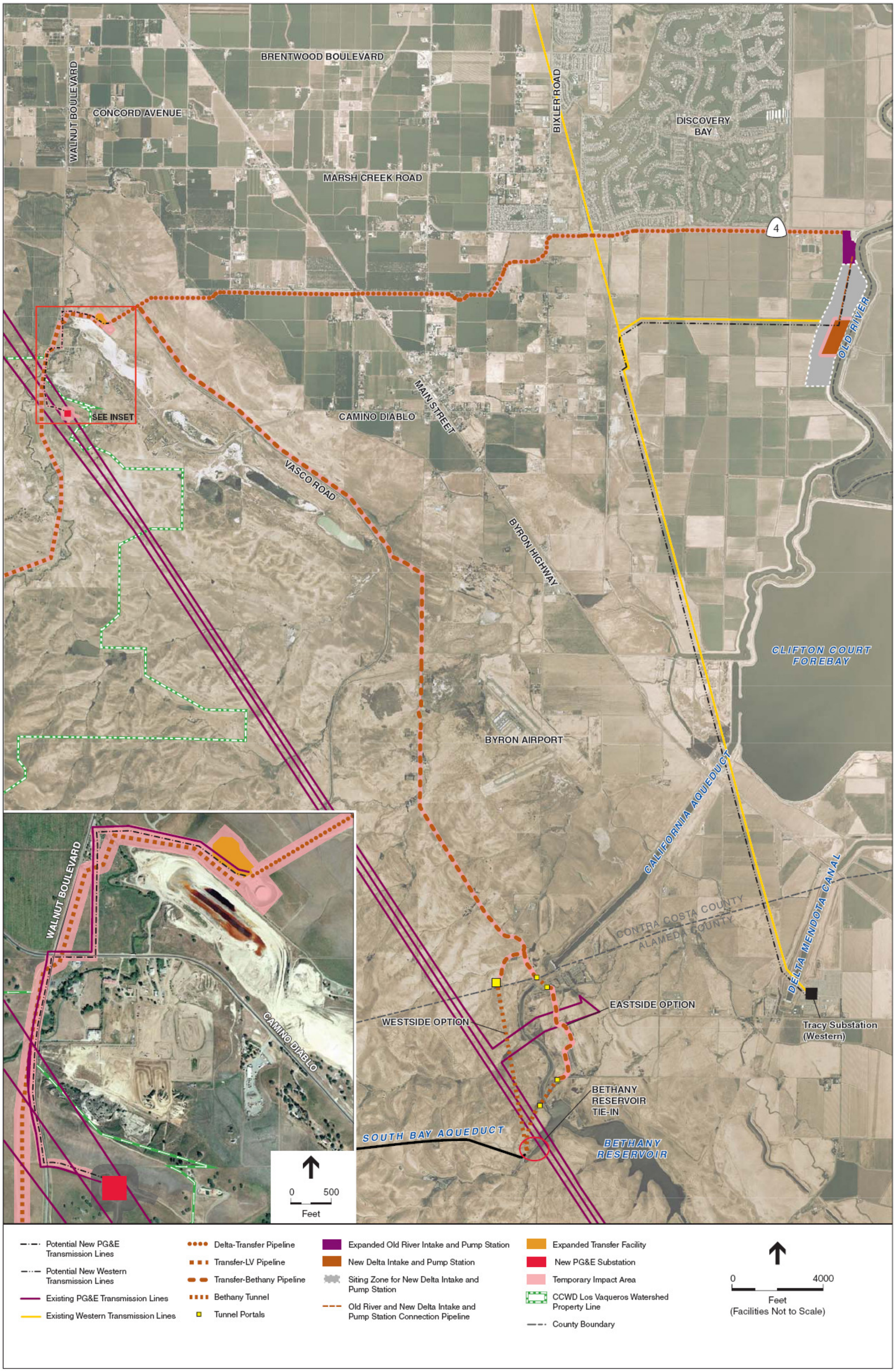


Figure 16. Power Supply Option 2 – PG&E and Western Source: Reclamation and CCWD 2009

adding a second circuit on the existing poles; (2) replacing the existing poles with new poles to accommodate a double-circuit line; or (3) installing a new line parallel to the existing line. There would be no new Western substation under Power Option 2. PG&E would provide power to the Expanded Transfer Facility through a new PG&E distribution substation constructed in the Los Vaqueros Watershed, as shown on Figure 16. The substation would require about 2 acres and would be enclosed with fencing. The tallest element, the power line poles, would be about 50 feet tall.

The approximately 1.5-mile-long distribution line would begin at the proposed PG&E substation about 2,600 feet south of the intersection of Walnut Boulevard and Camino Diablo Road. It would follow the route of PG&E's existing distribution line serving the Transfer Facility. This alignment is shown in the inset on Figure 16.

The existing distribution line described in the preceding paragraph would be upgraded by one of the following methods: (1) placement of new insulator arms and additional conductors on the existing poles; (2) pole for pole replacement of the existing distribution line and co-location of existing distribution line on the new poles; or (3) installation of a new distribution line paralleling the existing distribution line. If new poles were required, they would be about 50 feet tall and installed in increments of 200 to 300 feet apart.

Construction Schedule

The construction period would last about 8 to 10 months for either substation and about 3 to 6 months for the distribution line.

Recreational Facilities

Recreational facilities are included in Alternatives 1-3 to replace the facilities that would be displaced by reservoir expansion and, in some cases, to enhance recreational opportunities. Figure 17 shows the existing recreational facilities affected by the 275 TAF reservoir expansion and also shows the proposed relocation areas for these facilities, which include: shoreline hiking trails, marina facility, fishing piers, and parking and picnic areas. The proposed expanded recreational facilities include additional fishing access areas, trails, and an expanded Marina Complex including an additional interpretive center and more rental boat berths.

Marina Complex

The existing marina includes the following facilities that would be affected by expanding the Los Vaqueros Reservoir to 275 TAF.

- A series of docks for 30 aluminum electric-powered boats and 2 pontoon boats
- A small dock with boat service equipment
- Parking for 59 cars
- Flush restrooms
- Picnic tables
- A marina building with outdoor amphitheater
- Miscellaneous facilities such as a fish-cleaning station, pay phone, and drinking fountain
- A residence for the Marina Manager
- Boat house for water quality sampling boat

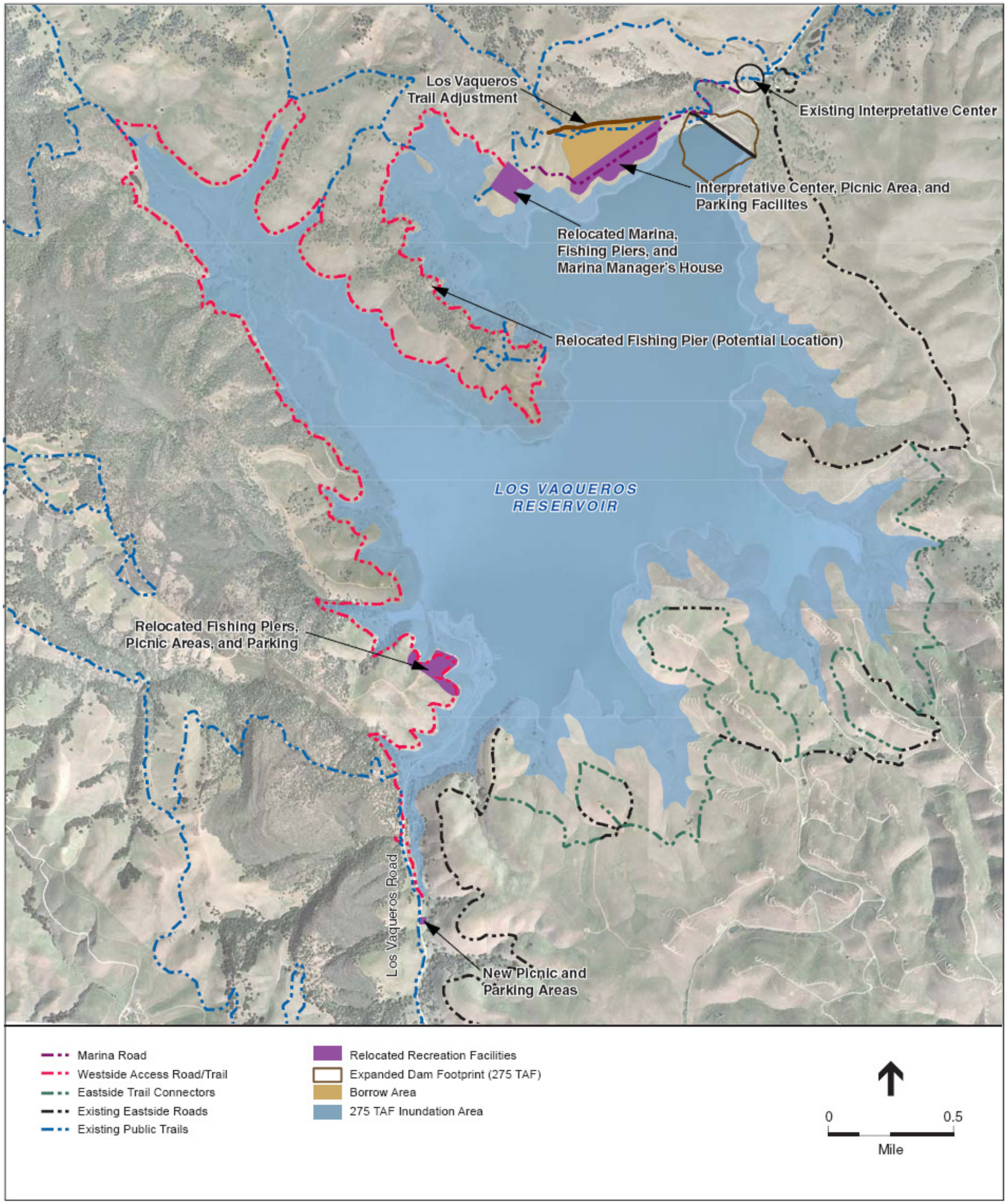


Figure 17. Proposed Recreation Facilities – 275 TAF Reservoir Expansion, Alternatives 1, 2, and 3 Source: Reclamation and CCWD 2009

The marina would be relocated from the southern end of the reservoir to the northern end of the reservoir near the dam. The new Marina Complex would replace the existing marina facilities and would provide additional or expanded facilities as well. An interpretative center, outdoor amphitheater, picnic tables, parking, and miscellaneous facilities would be built next to the dam. Farther west, the Marina Manager's residence, marina building, fishing piers, fish cleaning station, and docks with covered berths for three boats for rescue and water quality sampling would be constructed. Berths for 50 electric-powered rental boats and 2 pontoon boats would also be available.

Most of the Marina Complex would be built next to the site of the dam material borrow area. A flat area of about 11 acres would be created on the borrow area site near the dam. Once borrow materials have been excavated from this site, it would be graded to accommodate a new, second interpretive center, amphitheater, parking, staging, and picnic areas.

The new Marina Complex would be accessed from a new road about 1 mile long, constructed over the top of the raised dam, and extended westward to the facilities.

An additional 5-acre flat area would be graded due west to accommodate the Marina Manager's residence, marina building, docks, fishing piers, picnic area, and parking. Excess material would be disposed of within the reservoir prior to filling.

Fishing Piers
Expanding the Los Vaqueros Reservoir would require the relocation of four fishing piers. Some of these piers are associated with staging and picnic areas and share parking with these facilities. The four piers would generally be relocated upslope of their current location around the perimeter of the expanded reservoir. The addition of a new, fifth fishing pier is proposed on the peninsula south of the relocated marina. To facilitate fishing at the southern end of the reservoir, a fish cleaning station and bait shop are proposed.

Day-Use Facilities
Expanding the Los Vaqueros Reservoir under Alternatives 1-3 would inundate three day-use facilities.

One replacement picnic area would be placed at the new Marina Complex and a second would be placed at the fishing pier on the peninsula south of the new marina facility. A third picnic area would be established at the new parking area, and hiking trail access would be provided at the southern end of the reservoir, as shown in Figure 17 above.

User Parking
Under the 275 TAF reservoir expansion alternatives, parking would be provided at the Marina Complex, the Westside trail access point, and the southern end of the reservoir.

Access Roads
Under the 275 TAF reservoir expansion alternatives, about 2.25 miles of paved access road to the existing marina would be inundated. No other recreational access roadways would be affected.

A total of 12.5 miles of an unpaved, non-public, all-weather service road along the western shoreline would also be inundated and require relocation to provide access to the western area of the watershed for fire prevention and suppression activities, public safety, and environmental compliance. This westside access road would remain closed to the public.

Hiking Trails
Under the 275 TAF reservoir expansion alternatives, about 8.1 miles of existing hiking trails would be inundated in the northwestern portion of the reservoir. Based on the refined project description found in the EIS/EIR about 18.2 miles of replacement hiking trails would be installed to provide expanded access to the same areas and recreational experiences as were available before the reservoir expansion. Southern access to the Westside trail would be available from Los Vaqueros Road (off Vasco Road). The Eastside trail has been reduced in length from 14.5 miles to 5.1 miles while the Westside trail was increased in length from 11.1 miles to 13.0 miles. A new park bench would be installed along the Eastside trail. A parking lot would be built near the upper inundation limit and would provide direct access to the trailhead. The site would have picnic tables, toilets, and a water station.

Recreational Fisheries Management
When the expanded reservoir resumes operation, CCWD will restock the reservoir with fish.

Existing Biological Resources

Terrestrial and Wetland Habitats and Associated Species
Vegetation communities are assemblages of plant species that occur together in the same area, which are defined by species composition and relative abundance. To characterize plant communities in the watershed, vegetation series were mapped using the Sawyer and Keeler-Wolf (1995) classification system (see Table 3 and Figure 18).

Outside the watershed, the evaluation was based on the broader habitat classification system developed by the East Contra Costa County Habitat Conservation Plan/Natural Communities Conservation Plan (ECCC HCP/NCCP [East Contra Costa County Habitat Conservation Plan Association 2006]). To establish a consistent approach to vegetation and habitat classification throughout the study area, and to be compatible with CALFED Bay-Delta Program (CALFED) guidelines for habitat mitigation, plant community and habitat descriptions are presented for in-watershed and out-of-watershed areas using CALFED NCCP habitat types. The CALFED Ecosystem Restoration Program uses this classification system for evaluating ecosystems, broad habitats, and ecological functions within the CALFED planning area. The NCCP habitat types generally correlate with vegetation communities in the Sawyer and Keeler-Wolf system. These communities also share a relationship with wildlife habitat types, which were classified and evaluated using the CDFG Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988). The CALFED NCCP habitat types are used as the overarching classification system for this analysis and are described below (see Tables 3 and 4, and Figures 18 through 21). The analysis below presents NCCP Plant Community/Habitat Type designations with Sawyer and Keeler-Wolf equivalent vegetation series in parentheses.

The Los Vaqueros Watershed encompasses 18,535 acres of land and includes 20 distinct vegetation series. The watershed contains 1,489 acres of open-water habitat. Grasslands, including annual and native grasslands, are the most abundant NCCP habitat types in the watershed and cover more than 12,819 acres (see Table 3). Valley/foothill woodland and forest is the next most abundant habitat type, which mostly includes oak woodlands; blue oak is the most common oak woodland type within the watershed. The 3,009 acres of valley/foothill

Table 3. Plant Communities and Habitats in the Los Vaqueros Watershed
(Source: Reclamation and CCWD 2009)

NCCP Habitat Types	Acres	Sawyer and Keeler-Wolf Vegetation Series	Acres
Lacustrine	1,489.05	Open water	1,489.05
Nontidal Freshwater Permanent Emergent	54.66	Bulrush-cattail series[a]	50.54
		Spikerush	4.13
Natural Seasonal Wetland	299.95	Northern claypan vernal pool[a]	4.36
		Bush seepweed series[a]	50.27
		Saltgrass series[a, b]	245.31
Valley/Foothill Riparian	68.97	Fremont cottonwood series[a]	7.10
		Valley oak series[a]	67.93
Grassland	12,819.17	California annual grassland series	12,790.20
		Purple needlegrass series[a]	28.97
Upland Scrub	775.33	Common manzanita	161.08
		California sagebrush series	17.38
		Chamise series	596.88
Valley/Foothill Woodland Forest	3,008.77	Blue oak series[a]	1,941.10
		Mixed oak series	756.47
		Interior live oak series	122.69
		Coast live oak series	181.64
		California bay series	0.81
Urban/Disturbed	19.12	Disturbed	19.12
Total	**18,535.02**		**18,535.02**

[a] Classified as "Sensitive" by CDFG and/or CALFED.
[b] Includes alkali wetlands and meadow habitats.

SOURCE: ESA unpublished data, 2006-2008

woodland forest habitat are distributed primarily in the western and northern regions of the watershed. Upland scrub habitats are most abundant on the western side of the watershed and cover 775 acres (Reclamation and CCWD 2009).

Natural seasonal wetland habitat covers roughly 300 acres of habitat and includes just over 295 acres of alkali wetlands. Alkali wetlands are dominated by a variety of salt-tolerant plants such as saltgrass, bulrush, cattails, and seepweed. Natural seasonal wetland habitat is also

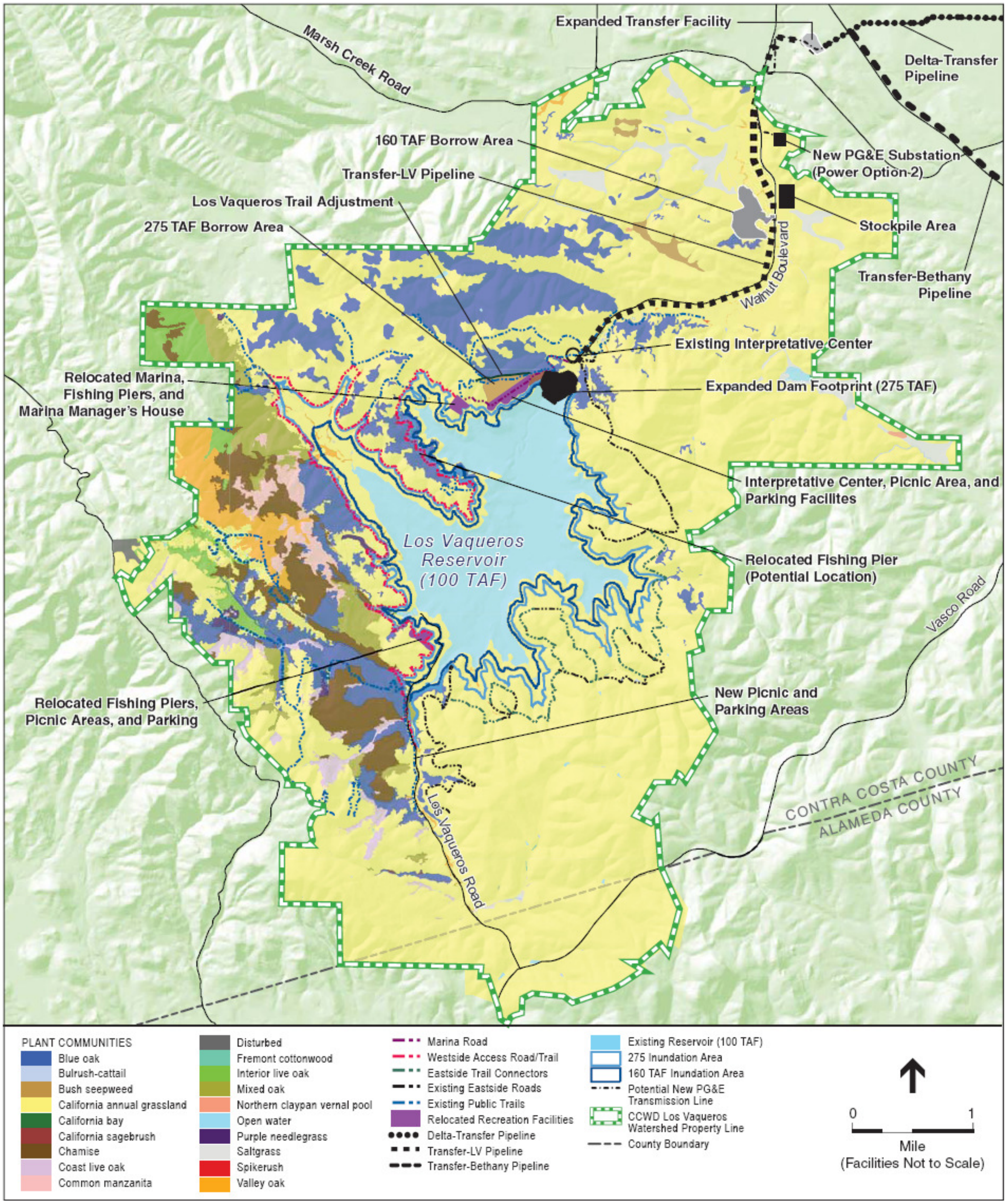


Figure 18. Distribution of Plant Communities and Habitats in the Los Vaqueros Watershed
Source: Reclamation and CCWD 2009

represented by vernal pools in the eastern portion of the watershed. Nontidal freshwater and saline emergent habitat covers nearly 55 acres of land in the watershed, and occurs mostly in created wetlands and stock ponds. Valley/foothill riparian habitat is predominantly represented by valley oak woodlands, though some areas are dominated by Fremont cottonwood. This habitat type covers nearly 69 acres and primarily occurs along Kellogg Creek both north and south of the reservoir as well as along Adobe Creek in the northwestern part of the watershed (Reclamation and CCWD 2009).

Table 4. Habitats in the Out-of-Watershed Facilities Study Areas (Acres)
(Source: Reclamation and CCWD 2009)

NCCP Plant Community/ Habitat Type	Pipelines				Facilities			
	Delta-Transfer	Transfer-LV	Transfer-Bethany	Expanded Old River Intake and Pump Station	New Delta Intake and Pump Station	Expanded Transfer Facility	Power Option 1	Power Option 2
Tidal Freshwater Emergent	0	0	0	0	<0.1	0	0	0
Natural Seasonal Wetland	0	0.01	19.84	0	0	0	0	0
Valley/Foothill Riparian	0	0.01	0	0	0	0	0	0
Grassland	39.38	19.61	154.93	0	0	11.55	2.0	2.0
Valley/Foothill Woodland and Forest	0.13	0	0	0	0	0	0	0
Upland Cropland	113.53	0	0	7.45	22.70	0	0	0

LV = Los Vaqueros]

SOURCE: ESA unpublished data, 2006-2008

*Table 4 does not include all habitats in the Delta Intake and Pump Station study area (tidal riverine and nontidal freshwater permanent emergent habitats), but they are discussed in this section and the Future Conditions with Project section.

**The Transfer-Bethany Pipeline study area includes associated tunnel boring pits, staging areas, access roads, and Bethany Reservoir Tie-In (J. Johnson, ESA, pers. comm. 2009).

Grassland (California Annual Grassland Series and Purple Needlegrass Series)

Grassland habitat includes upland vegetation communities dominated by introduced and native annual and perennial grasses and forbs, including non-irrigated and irrigated pasturelands. Grassland habitat includes perennial and alkali grassland habitat and the much more extensive annual grassland vegetation (Reclamation and CCWD 2008). Perennial grass species once dominated native grasslands, but introduced annual species have largely displaced native perennial and annual grasses. Annual grassland is dominated by nonnative Mediterranean annual grasses, native perennial bunch grasses, and an assemblage of native and non-native forbs. Scattered oak species may be present (CDFG 2005).

Grasslands dominated by perennial species were once common throughout the Sacramento and San Joaquin valleys. Perennial grasslands and associated vernal pools historically were present at drier, higher elevations in the Delta. Mesic grassland established in low-lying areas adjacent to wetland and riparian habitats. Native grassland habitat has been substantially reduced due to

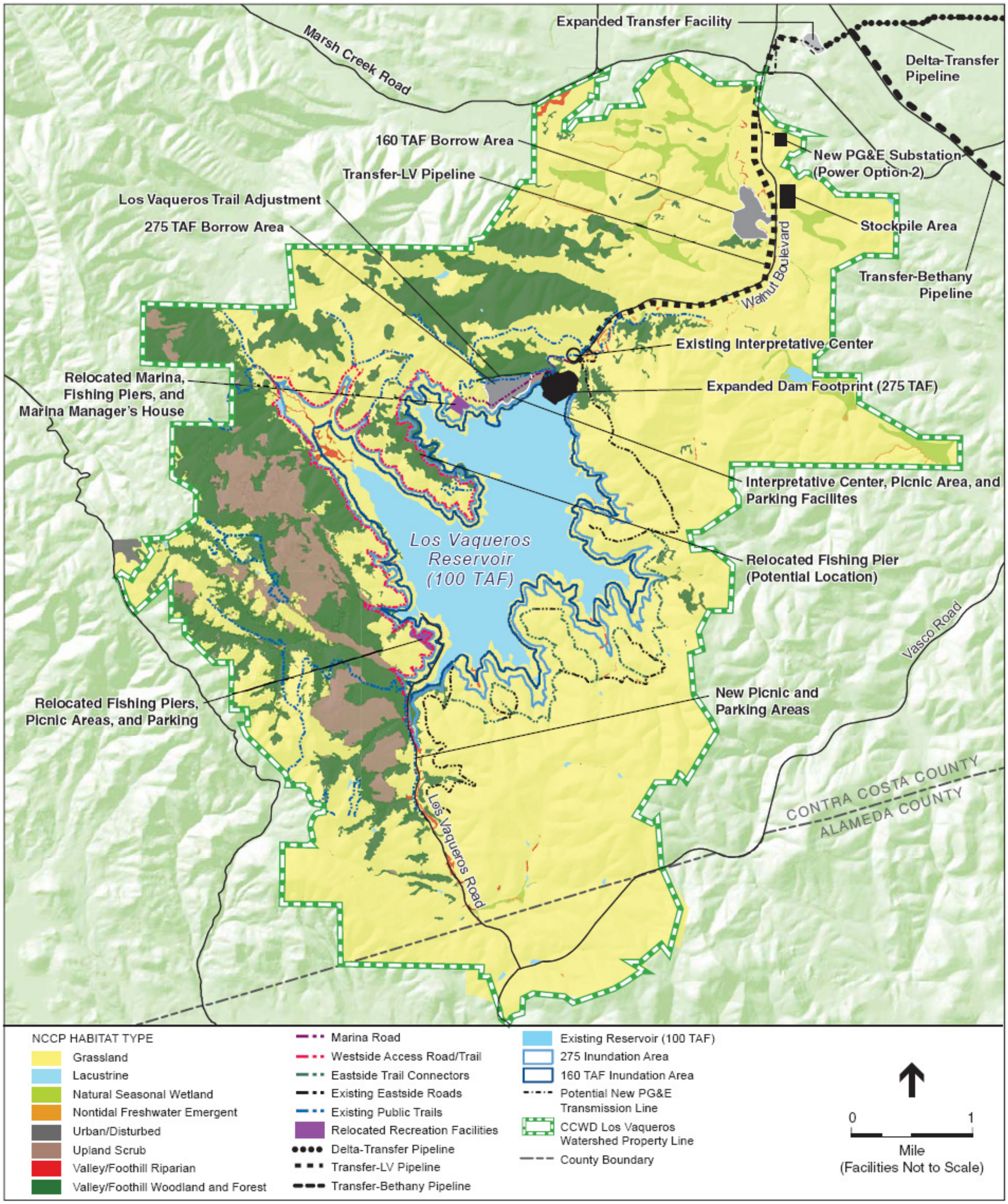
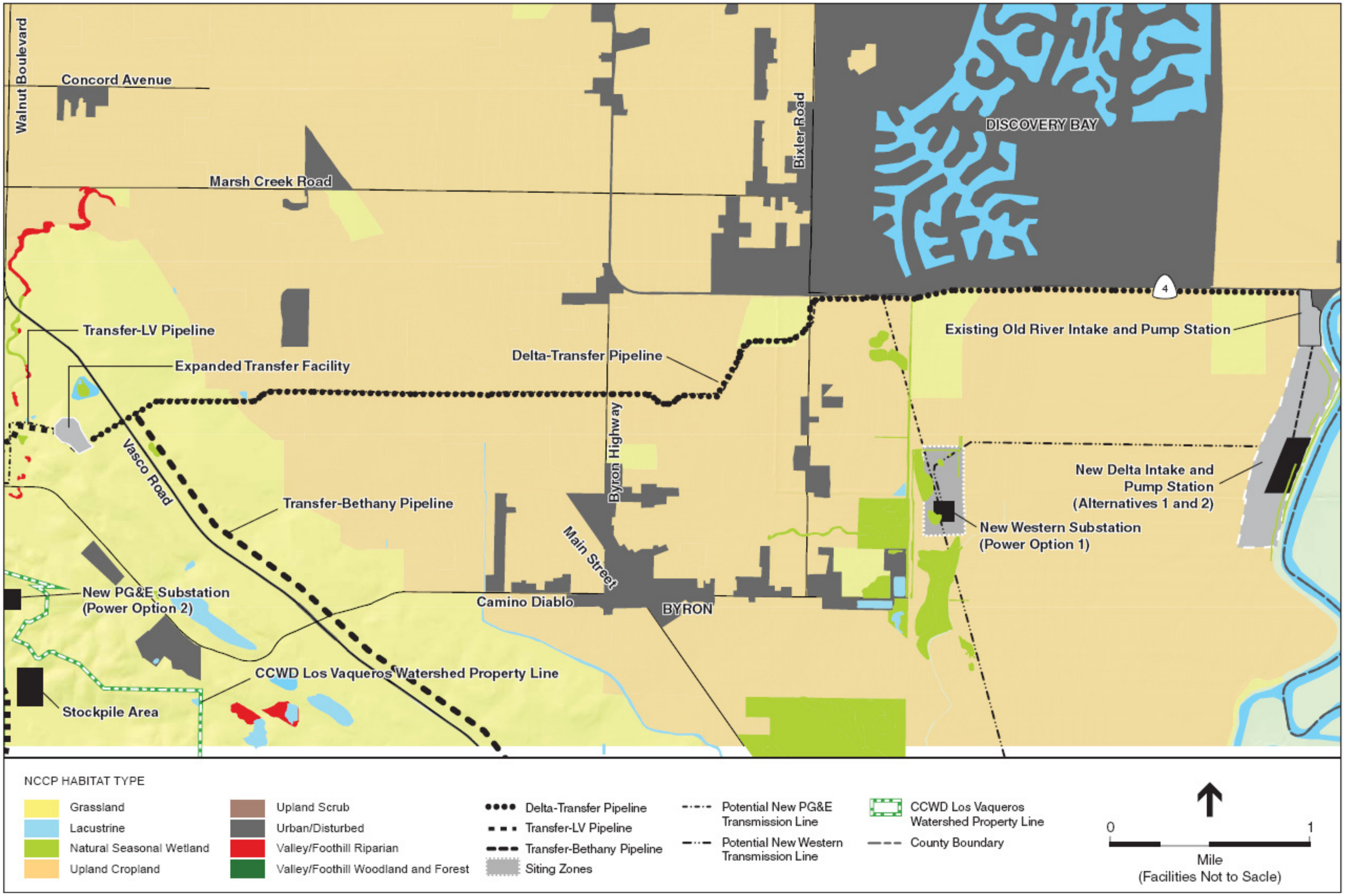


Figure 19. Distribution of NCCP Habitats in the Los Vaqueros Watershed
Source: Reclamation and CCWD 2009



*Old River is mislabeled as Lacustrine; Old River should be labeled as Tidal Riverine or Tidal Perennial Aquatic

Figure 20. Distribution of NCCP Habitats in the Los Vicinity of the Delta Intake Facilities, Delta-Transfer Pipelines, and the Expanded Transfer Facility

Source: Reclamation and CCWD 2009

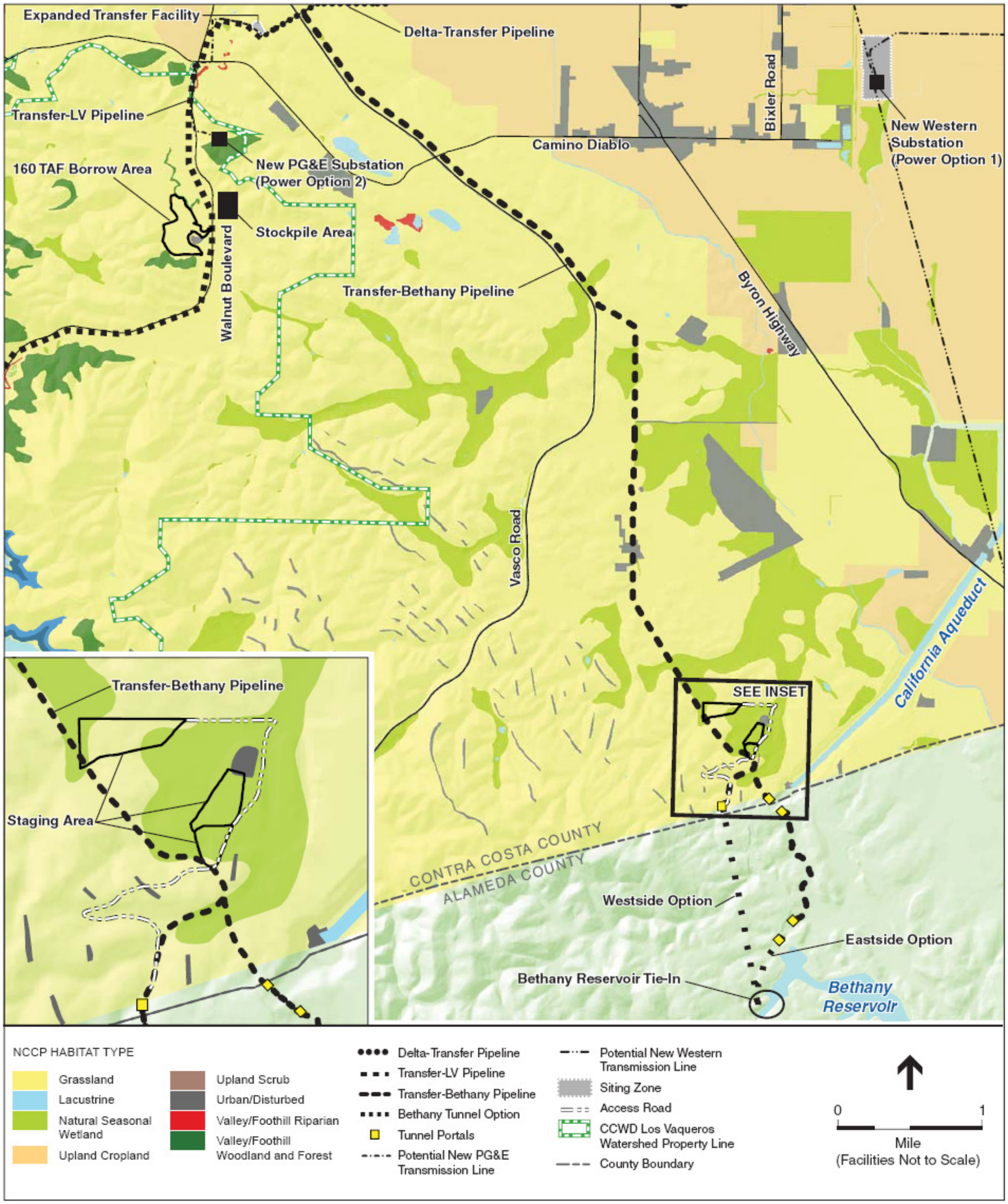


Figure 21. Distribution of NCCP Habitats along the Transfer-LV and Transfer-Bethany Pipelines
Source: Reclamation and CCWD 2009

development and introduction of non-native annual grasses. These annual grasses now dominate the majority of existing grasslands in the Central Valley. Existing perennial grassland in the Bay-Delta estuary are on the decline as it continues to be converted for other land uses and invaded by non-native species. In addition, fire suppression has altered ecosystem processes supporting many perennial grasses and native forbs and given non-native annual species the competitive advantage (CALFED 2000a).

Grassland habitat occurs extensively throughout the Watershed and along the proposed Transfer-Bethany Pipeline route. Grassland habitat also occurs along the segment of the proposed Transfer-LV Pipeline route located outside of the watershed and along the western extent of the proposed Delta-Transfer Pipeline route. Grasslands are the only vegetation-type present in the Expanded Transfer Facility study area. Under Power Option 1, a new substation would be placed within annual grasslands. From the new substation, the power line alignment to the Delta Intakes traverses annual grassland habitat. Under Power Option 2, the Western power line alignment would traverse within the transmission line corridor from the Tracy substation to supply power to the Delta Intakes. These facilities would traverse irrigated pasturelands and annual grasslands. PG&E facilities, including distribution lines and a substation, are entirely within annual grasslands.

These grasslands occur on gently rolling hills, valley bottoms, and adjacent to numerous ephemeral and intermittent drainages and channels. Annual grassland is dominated by nonnative Mediterranean annual grasses such as wild oats, slender oats, soft chess, ripgut brome, barley, Italian ryegrass, rattail fescue, and dogtail grass.

Native perennial bunch grasses including purple needlegrass, blue wildrye, and Idaho fescue occur sporadically throughout the annual grasslands. Native and non-native forbs commonly found in these grasslands include vetch, burclover, Spanish clover, fiddleneck, lupines, popcorn flower, California poppy, field hedge parsley, pitgland tarweed, yarrow, filaree, white brodiaea, and mariposa lily. Scattered blue oaks, live oaks, and valley oaks occur sporadically throughout this habitat type, particularly along drainages, in the lowlands, and along grassland-woodland ecotones.

Perennial bunchgrass stands generally occur on protected north-facing slopes and are dominated by purple needlegrass. Mixed stands of perennial grassland also include blue wildrye, nodding needlegrass, California melic, pine bluegrass, and Idaho fescue. Within these stands, native bunchgrasses comprise 25 to 50 percent of the total plant cover. Stands are scattered across the landscape throughout the watershed (Reclamation and CCWD 2008).

Alkali grassland occurs in the northern and eastern regions of the Watershed and along the proposed Transfer-LV and Transfer-Bethany pipeline routes. This habitat type is characterized by low-growing halophytic species including saltgrass, low barley, little alkali grass, sickle grass, and thin tail, in addition to halophytic forbs such as goldfields, saltbush/spearscale, popcorn flower, alkali mallow, and alkali heath. Alkali scalds, barren areas with salt-encrusted soil surfaces, are prevalent throughout the alkali grassland.

Many wildlife species use both native and non-native grasslands for refugia, nesting, dispersal, and as foraging habitat. Grassland habitat in the project study area may support several species of nesting birds. Western meadowlark, savannah sparrow, white-crowned sparrow, California horned lark, grasshopper sparrow, short-eared owl, and ring-necked pheasant conceal their nests in the vegetation, and burrowing owls may use abandoned ground squirrel holes as nest sites. Some waterfowl, such as mallard and cinnamon teal, nest in grassy areas, particularly where this interfaces with open water areas. Grassland areas provide foraging habitat for migratory shorebirds and geese. The annual grassland habitat in the project study area may provide suitable nesting and foraging habitat for predatory birds such as northern harrier, Swainson's hawk, white-tailed kite, red-tailed hawk, American kestrel, and short-eared owl (Service 1995). This habitat also provides important foraging habitat for the turkey vulture and prairie falcon (CDFG 2005).

Reptiles and amphibians known to use grassland habitat include coast horned lizard, Alameda whipsnake, San Joaquin whipsnake (= coachwhip), California tiger salamander, California red-legged frog, and western spadefoot toad. Reptiles that breed in annual grasslands include western fence lizard, common garter snake, western pond turtle, and western rattlesnake. Mammals found in grassland habitats include black-tailed jackrabbit, California ground squirrel, Botta's pocket gopher, western harvest mouse, California vole, American badger, black-tailed deer, and coyote. The San Joaquin kit fox is also found in and adjacent to this habitat type.

Upland Scrub Habitat (Common Manzanita Series, California Sagebrush Series, and Chamise Series)

Upland scrub habitat includes habitat areas dominated by shrubs characteristic of coastal scrub, chaparral, and saltbush scrub communities. Dominant species in chaparral include scrub oak, chaparral oak, and several species of ceanothus and manzanita. Commonly associated shrubs include chamise, mountain mahogany, toyon, yerba-santa, California buckeye, poison oak, buckthorn, and chaparral-pea (Mayer and Laudenslayer 1988).

Upland scrub communities occur on steep, dry slopes and require periodic fire to regenerate. As development encroached upon these habitats, fire suppression was necessary. Increased urbanization and development adjacent to and within this habitat type have resulted in fragmentation and degradation of existing stands. Without recurrent fire, scrub communities can degenerate and become less biologically active (Schoenherr 1992). Mixed chaparral generally occurs below 5,000 feet on mountain ranges throughout California, with the exception of desert regions. Elevation ranges vary significantly with climate, aspect, and substrate. Mixed chaparral occurs throughout the Coast Range and Tehachapi Mountains. In the Sierra Nevada, this habitat type occurs as a broken band along middle and lower elevations of the western slope. It also occurs as large patches in the Siskiyou Mountains and Cascade and Klamath Ranges. Coastal scrub occurs intermittently along a narrow strip throughout the length of California, within about 20 miles of the ocean. Elevation ranges from 0 to about 3,000 feet above mean sea level (Mayer and Laudenslayer 1988).

East- and north-facing steep, rocky slopes and ridge tops in the western portion of the Watershed are characterized by chaparral and, to a lesser degree, coastal scrub. Chaparral is dominated by evergreen shrubs, generally with little or no herbaceous ground cover or overstory trees. Chamise is usually the dominant or co-dominant species throughout chaparral, although in some areas it is absent (Reclamation and CCWD 2008).

Gaps in the dense shrub community support grassland species, both from the annual grassland series and the purple needlegrass series. Coastal scrub occurs on arid south-facing slopes in the Watershed. This community is typically composed of California sagebrush and chamise as co-dominants, with lesser amounts of black sage, poison-oak, bush monkey flower, and California buckwheat. Canopy openings support annual grassland species. Upland scrub habitat is limited to the upper Kellogg Creek Watershed, along the western and southern portion of the watershed (Reclamation and CCWD 2008).

Upland scrub habitat provides food and cover for many wildlife species, including loggerhead shrike, wrentit, sage sparrow, greater roadrunner, black-chinned sparrow, California quail, lesser nighthawk, golden eagle, barn owl, western screech owl, gopher snake, common garter snake, western rattlesnake, Alameda whipsnake, San Joaquin whipsnake (= coachwhip), coast horned lizard, black-tailed jackrabbit, brush rabbit, Botta's pocket gopher, California pocket mouse, California ground squirrel, coyote, American badger, greater western mastiff-bat, and a variety of other species (CALFED 2000a; CDFG 2008d; and CalPIF 2004).

Valley/Foothill Riparian (Fremont Cottonwood Series and Valley Oak Series)
Valley/foothill riparian habitat includes all successional stages of woody vegetation, commonly dominated by willow, Fremont cottonwood, valley oak, or sycamore, within the active and historical floodplains of low-gradient reaches of streams and rivers generally below an elevation of 300 feet. Valley/foothill riparian habitat includes portions of riparian and riverine aquatic habitat (CALFED 2000a). Historically, about 922,000 acres of riparian vegetation were present in the Central Valley basin in a watershed that extended over 40,000 square miles. Currently, the remaining riparian forests occur on 100,000 acres of the valley floor and about half of this riparian forest is significantly disturbed or degraded. The onset of riparian forest removal occurred from 1850 to the turn of the 20th century to provide fuel for ore mining and river navigation, and accommodate agricultural land development (CALFED 2000a).

Riparian woodland, including Fremont cottonwood and valley oak woodland, grows along the banks of the perennial and larger intermittent creek channels within the watershed. Within the watershed, riparian woodland occurs along segments of Kellogg Creek and in small, sporadically distributed pockets along the largest, lowest gradient streams and creeks. Riparian woodland also occurs along segments of Kellogg Creek paralleled by the Delta-Transfer Pipeline.

The riparian forest/riparian scrub vegetation community occurs on Kellogg Creek's banks. This vegetation community is characterized by riparian vegetation dominated by sycamore, valley oak, mulefat, and willow. This vegetation type often transitions into the arroyo willow habitat when gravel bars develop and willows are able to establish.

Arroyo willow habitat occurs in Kellogg Creek both within the watershed and in downstream reaches. This habitat type is characterized by riparian scrub dominated by arroyo willow and red willow. Associated species found within this habitat include California black walnut, California buckeye, Mexican elderberry, and Himalayan blackberry. This vegetation community often occurs in association with valley oak habitat along Kellogg Creek's banks.

Riparian areas provide important breeding and foraging habitat for many amphibians, reptiles, birds, and mammals including special-status species such as California red-legged frog, valley elderberry longhorn beetle, and Swainson's hawk. These areas also provide movement and dispersal corridors, allowing animals to move from upland and other aquatic habitats within the watershed.

Riparian habitats have high values for a variety of wildlife species including western pond turtle, western skink, Pacific chorus frog, acorn woodpecker, downy woodpecker, Nutall's woodpecker, belted kingfisher, Cooper's hawk, sharp-shinned hawk, red-shouldered hawk, osprey, bald eagle, long-eared owl, black phoebe, black-headed grosbeak, common yellowthroat, song sparrow, Swainson's thrush, tree swallow, tri-colored blackbird, yellow warbler, pallid bat, Townsend's big-eared bat, small-footed myotis bat, long-eared myotis bat, fringed myotis bat, long-legged myotis bat, and Yuma myotis bat (CALFED 2000a; CDFG 2008d; Service 1993a; and Riparian Habitat Joint Venture [RHJV] 2004).

Valley/Foothill Woodland and Forest (Blue Oak Series, Mixed Oak Series, Interior Live Oak Series, Coast Live Oak Series, and California Bay Series)
Valley/foothill woodland and forest habitat consists of non-riparian forest, woodland, and savannas. These vegetation communities are commonly dominated by valley oak, blue oak, interior live oak, and coast live oak. Other tree species typically found in this habitat type include foothill pine, California bay laurel, California buckeye, Douglas fir, madrone, and/or ponderosa pine (Sawyer and Keeler-Wolf 1995).

Blue oak woodlands occur along the western foothills of the Sierra Nevada-Cascade Ranges, the Tehachapi Mountains, and in the eastern foothills of the Coast Range, forming a nearly continuous ring around the Central Valley. The habitat is discontinuous in the valleys and on lower slopes of the interior and western foothills of the Coast Range from Mendocino County to Ventura County. It is generally found at elevations from 500 to 2,000 feet at the northern end of its range and on the western slopes of the Sierra Nevada, from 250 to 3,000 feet in the central Coast Range, and from 550 to 4,500 feet in the Transverse and Peninsular Ranges (Mayer and Laudenslayer 1988). Several wildlife species in blue oak woodland benefit from acorns as a food source (Schoenherr 1992), including the acorn woodpecker, wild turkey, western scrub jay, yellow-billed magpies, and western gray squirrel. Oak trees also provide shelter for cavity-nesting birds, such as woodpeckers and bluebirds. Blue oak is a slow growing, long lived species and is not regenerating in many parts of its range (Schoenherr 1992).

Coast live oak habitat occurs in the foothills and valleys of coastal regions of the northern and southern Coast Range, and the Transverse and Peninsular Range of southern California. They primarily are found at elevations ranging from sea level to about 5,000 feet in the interior regions (Mayer and Laudenslayer 1988). Interior live oak occurs on slopes and in valleys, on raised stream benches, and terraces where soils are shallow and moderately to excessively drained. They typically occur at elevations ranging from 500 to 4,500 in the Transverse Ranges, South Coast Ranges, Sierra Nevada, Cascade Range, and north to the Klamath and North Coast ranges

(Sawyer and Keeler-Wolf 1995). Mixed oak stands occur in valleys on gentle to steep slopes underlain by moderately deep soils. They typically occur at elevations ranging from 250 to 2,000 feet in the Sierra Nevada Range, Cascade Range, and north to the Klamath and North Coast ranges (Sawyer and Keeler-Wolf 1995). Relic stands of valley oak woodland occur in the Central Valley from Redding south into the Sierra Nevada foothills, in the Tehachapi Mountains, and in valleys of the Coast Range from Lake County to western Los Angeles County. Generally, this vegetation occurs below 2,000 feet (Mayer and Laudenslayer 1988).

The steeper hillsides and canyons throughout the western and northern portions of the watershed support valley/foothill woodland and forest, including stands dominated by blue oak, valley oak, coast live oak, and interior live oak, as well as some stands with no single dominant oak species. Valley oak habitat is found along a portion of the Delta-Transfer Pipeline alignment. Oak woodland occurs as a mosaic of the oak species mentioned above, with blue oak as the most widespread. Blue oak woodlands are the most common woodland community in the watershed. They occur primarily on south-, west-, and east-facing slopes. The understory is fairly open and is dominated by annual grassland species such as bromes, wild oat, and clover. Small ephemeral channels flow through many blue oak woodlands, but these channels typically do not support wetland or riparian vegetation.

Coast live oak woodlands are limited to the westernmost part of the watershed, where precipitation is higher and temperatures are cooler. These scattered woodlands are dominated by coast live oak and interior live oak with occasional occurrences of blue oak and foothill pine on drier sites. Interior live oak woodlands tend to occur in similar topographic, climatic, and edaphic (i.e., related to soil) settings as the coast live oak woodlands. These woodlands are dominated by open to dense stands of interior live oak, with coast live oak, blue oak and foothill pine frequent subdominants. Mixed oak woodlands are not dominated by any single oak species but consist of a mix of blue oak, coast live oak, and interior live oak, as well as foothill pine. These woodlands are typically less open than the blue oak series, sometimes forming a nearly closed canopy. The terrain in these areas is steep and undulating to gently rolling, and in some areas is rocky. Valley oak woodland occurs as both upland woodland and riparian woodland. In upland settings, valley oak woodland occurs as oak savannah with an expansive grassland understory.

Woodland and forest habitat provide food, cover, and nesting sites for a variety of wildlife species. Many of these species, including western gray squirrel, acorn woodpecker, and band-tailed pigeon, are dependent upon the mast (acorns) produced by oak trees for a significant portion of their annual forage requirements. Other species, such as black-tailed deer, depend on oak mast during the fall months when other forage is unavailable or is of low forage value. Bird species found in oak woodlands include bushtit, oak titmouse, blue-gray gnatcatcher, long-eared owl, Cooper’s hawk, sharp-shinned hawk, lark sparrow, western bluebird, western scrub jay, yellow-billed magpie, Nuttall’s woodpecker, and hermit thrush (CalPIF 2002). Cavity nesting birds and many raptor species rely on oaks and oak woodlands for nesting sites, including red-tailed hawks, American kestrels, and golden eagles (Service 1993a). Many amphibian and reptile species live in the cool, shady areas beneath oaks including ensatina, Gilbert’s skink, ringneck snake, and western yellow-bellied racer.

Upland Cropland (Cropland)
Upland cropland habitat consists of agricultural lands farmed for feed and grain, produce, orchard crops, and other crops that are not seasonally flooded. Common agricultural crops in the Central Valley include wheat, corn, beans, safflower, alfalfa, cotton, tomatoes, commercial grasses, orchard fruits and nuts, and grapes. Wildlife species supported by this habitat type varies according to season, crop type, and cover.

Agriculture has converted natural habitats throughout California, but particularly in areas that once supported fertile wetlands and riparian forests. More than one-fourth of California is now used for agriculture, including 5 million acres of Federal grazing land. About half of this is used as pasture and rangeland, about 40 percent is cropland, and the rest is divided between woodland and other land. In an average year California agriculture irrigates 9.6 million acres using roughly 34 million acre-feet (MAF) of water of the 43 MAF diverted from surface waters or pumped from groundwater (DWR 2009a). On average, agricultural irrigation accounts for about 80 percent of California water use, which is highly peaked in the summer (DWR 2009a). Agricultural land uses and crop types are often dictated by soil type, topography, and water availability. The more intensively managed agricultural areas are primarily located in valley floors on flat or slightly rolling terrain (CALFED 2000a). As natural habitats used by wildlife species have been converted or lost in California, an increasing number of wildlife have adapted to artificial wetland and upland habitats resulting from particular agricultural practices. Many species have now become adapted to and dependent upon these agricultural areas to sustain their populations (CALFED 2000a).

This habitat type occurs in and near major portions of the proposed Delta-Transfer Pipeline alignment and Electrical Power Facilities (Options 1 and 2), as well as in the vicinity of the Old River Intake and Pump Station and the proposed Delta Intake and Pump Station. Under Power Option 1, a new substation would be placed within annual grasslands that are surrounded by irrigated pasturelands and upland cropland. From the new substation, the power line alignment to the Delta Intakes principally traverses upland cropland and annual grassland habitat types. Under Power Option 2, the Western power line alignment would traverse within the transmission line corridor from the Tracy substation to supply power to the Delta Intakes. These facilities would traverse irrigated pasturelands, upland cropland, and annual grasslands.

Crops along these corridors include tomatoes, alfalfa, corn, and hay, and orchards of English walnut and persimmon. Croplands on the alignment are closely situated to grassland habitats and freshwater permanent emergent habitat. Thus, many of the wildlife species associated with these habitats also forage in croplands (Reclamation and CCWD 2008). Common species occurring in cropland include small mammals such as voles and mice, and birds such as mourning dove, pheasant, and several blackbird species. Croplands are important foraging habitat for numerous raptors including the Swainson's hawk, red-tailed hawk, northern harrier, white-tailed kite, and western burrowing owl. Other species found in cropland include sandhill crane, Canada goose, long-billed curlew, mountain plover, horned lark, and California ground squirrel.

Lacustrine (Open Water)
Lacustrine habitat includes portions of permanent deepwater bodies that do not support emergent vegetation and are not subject to tidal exchange. Such features include lakes, ponds, oxbows, gravel pits, and flooded islands. Lacustrine habitat includes areas defined as nontidal perennial aquatic habitat. Submerged and floating aquatic plant species associated with lacustrine habitats include water lilies, pondweed, duckweed, and plankton. This habitat type is commonly used by a wide variety of birds, mammals, reptiles, and amphibians for reproduction, food, water, and cover (CALFED 2000a).

Lacustrine habitat occurs in some low-lying areas of the Bay-Delta estuary. Historically, the majority of wetlands in the Bay-Delta estuary were subject to tidal influence, and nontidal perennial aquatic habitats were uncommon. Naturally formed perennial aquatic habitat included isolated oxbows, and drainage divide ponds in tidal wetlands that were subjected to minor tidal action. Much of the nontidal perennial aquatic habitat in the Delta was created by dike and levee construction. Once isolated, these former tidal riverine habitats were converted for alternate land uses including agriculture and development. Converted perennial aquatic habitats mainly occur in large agricultural drains, farm and industrial ponds, wildlife and waterfowl ponds, and flooded in-stream islands (created by accidental and deliberate levee breaches) (CALFED 2000a).

Los Vaqueros Reservoir is an engineered feature that is characterized by lacustrine habitat. This reservoir is a created water body within a stream system that is controlled by the dam and pumping facilities (Reclamation and CCWD 2008). Seasonal operations of the reservoir for water supply storage/release cause wide variations in surface water elevation and create barren shoreline areas (Reclamation and CCWD 2008). Wave action can cause erosion along the shoreline and create barren areas. These barren areas provide low habitat value and receive minimal use by native wildlife species. Lacustrine habitat also occurs in perennial ponds in the watershed and along the proposed Delta-Transfer and Transfer-Bethany pipelines.

Aquatic habitat quality for fish is low to moderate due to poorly developed cover vegetation along the shoreline. The reservoir has been stocked with more than 300,000 game fish, principally rainbow trout and Kokanee (sockeye) salmon. Other fish introduced to the reservoir include striped bass, largemouth bass, sunfish, brown bullhead catfish, and channel catfish, among others (Reclamation and CCWD 2008).

Waterfowl species that forage, overwinter, rear their brood, or otherwise rely on aquatic habitats provided by lacustrine habitat in the reservoir at some time in the year include Canada goose, wood duck, gadwall, American wigeon, mallard, northern shoveler, northern pintail, green-winged teal, canvasback, redhead, ring-necked duck, greater scaup, lesser scaup, bufflehead, common goldeneye, hooded merganser, common merganser, and ruddy duck. Other birds associated with the reservoir include grebes, sandpipers, pelicans, cormorants, egrets, herons, and gulls. Birds use the reservoir throughout the year.

Other species that use lacustrine habitat for cover, foraging, and/or breeding include bald eagle, osprey, merlin, peregrine falcon, tree swallow, barn swallow, cliff swallow, northern roughwinged swallow, violet-green swallow, western pond turtle, small-footed myotis bat, long-eared myotis bat, fringed myotis bat, long-legged myotis bat, Yuma myotis bat, river otter, beaver, raccoon, and common muskrat.

Palustrine (Nontidal Freshwater Permanent Emergent [Bulrush-Cattail Series and Spikerush Series])

Nontidal freshwater permanent emergent includes permanent (natural and managed) wetlands and meadows dominated by wetland plant species that are not tolerant of saline or brackish conditions. Nontidal freshwater permanent emergent habitat includes fresh emergent wetland (nontidal) and nontidal perennial aquatic habitats (CALFED 2000a). These marshes are dominated, to varying degrees, by common tule, American tule, big bulrush, and cattail. Wildlife species that are associated with this habitat include black-crowned night heron, green heron, and various waterfowl. Special-status species supported by nontidal freshwater permanent emergent include California red-legged frog, tri-colored blackbird, and western pond turtle.

During the previous 150 years, greater than 300,000 acres of fresh emergent wetlands have been lost in the Sacramento-San Joaquin Delta Ecological Management Zone. Vast areas of fresh emergent habitat occurred throughout the Central Valley prior to the mid-1800s, especially in the Delta. An intricate network of rivers, sloughs, and channels linked low-lying islands and basins that supported highly varied freshwater emergent vegetation. This freshwater emergent vegetation supported a diversity of fish and wildlife species and ecological functions (CALFED 2000a).

Within the watershed, nontidal freshwater permanent emergent marsh is limited to the margins of perennial stock ponds and shallow, low gradient sections of upper Kellogg Creek along the edge of the Reservoir. These marshes are dominated, to varying degrees, by common tule, American tule, big bulrush, broad-leaved cattail, and narrow-leaved cattail. Commonly encountered smaller emergent monocots include sedges, spikerush, rushes, and nutsedge. Additional freshwater marsh occurs in small ponds, creek segments, drainage ditches in agricultural areas, and several natural drainages along the proposed pipeline routes and in the Delta Intake and Pump Station study area.

Wildlife species that typically use this community include pacific chorus frog, California red-legged frog, western pond turtle, fringed myotis, long-eared myotis bat, long-legged myotis bat, small-footed myotis bat, Yuma myotis bat, and common muskrat. Bird species that use this habitat include marsh wren, common yellowthroat, white-tailed kite, short-eared owl, black-crowned night heron, snowy egret, sandhill crane, long-billed curlew, sora, Virginia rail, tri-colored blackbird, and red-winged blackbird. Other mammals may use these aquatic features for water or forage.

Palustrine (Natural Seasonal Wetland [Northern Claypan Vernal Pool, Bush Seepweed Series, and Saltgrass Series])

Natural seasonal wetland habitat consists of vernal pools, alkali marshes, alkali sink scrub habitats, and other unmanaged seasonal wetlands with natural hydrologic conditions that are dominated by herbaceous vegetation and that annually pond surface water or maintain saturated soils at the ground surface for enough of each year to support facultative or obligate wetland plant species. Alkaline and saline seasonal wetlands that were not historically part of a tidal regime are included in natural seasonal wetlands (CALFED 2000a).

Seasonal wetlands were once prevalent throughout the Central Valley. Their extent and function has substantially declined due to cumulative impacts of land use practices (e.g., disking, leveling, overgrazing, and development), the use of herbicides, invasion of non-native species, flood control activities that reduce and restrict water movement onto river and stream floodplains, and lowered groundwater levels (CALFED 2000a).

Seasonal wetland habitats in the project area include northern claypan vernal pools, valley rock outcrop intermittent pools, alkali marsh, alkali meadows, and alkali sink scrub.

Vernal pools are seasonal wetlands that occur in grasslands. These wetlands are typically located in slight depressions that form over bedrock or hardpan soils that allow water to pool during winter and spring rains. Vernal pools typically have an impervious layer of silicate-based hardpan underlying them that prevents water from percolating into the soil. Although vernal pools occur naturally in grassland and woodland settings, they may also occupy disturbed locations where the underlying soil conditions remain intact. Vernal pools are considered unique habitat and often support species that are endemic to vernal pools or other shallow pools in that particular geographic region. Vernal pool communities have been greatly reduced due to conversion of grasslands to agriculture or urban development and are identified as a Significant Natural Community by CDFG. Many vernal pool dependent plants and animal species receive special-status protection by the state or Federal government. Plant species common to vernal pools include coyote thistle, dwarf blennosperma, spike rush, and California hairgrass.

Within the watershed, vernal pools are generally confined to valley bottoms and on lowland benches in the vicinity of intermittent and ephemeral creek channels. Valley rock outcrop pools occur in depressions in sandstone outcrops along ridge tops of the watershed and adjacent foothills to the west. Outside of the watershed, known and potential vernal pool and swale habitats occur along the proposed Delta-Transfer and Transfer-Bethany Pipelines. Vernal pool conditions occur in a portion of the Transfer-Bethany Pipeline alignment on Armstrong Road near Byron Airport, and in areas further south along this alignment.

Alkali meadow and alkali sink scrub habitats occur within grasslands in limited locations and favor a unique set of characteristics. Alkali meadow is a persistent emergent saline wetland that occurs on valley bottoms and alluvial slopes. Alkali meadows form in shallow basins where soils are particularly alkaline relative to surrounding grasslands and where soil types are seasonally inundated and slow to drain. This series is dominated by halophytes (salt-tolerant species) including saltgrass, hare barley, alkali heath, toad rush, saltbush, bush seepweed, and iodine bush. Other species associated with this series include pepperweed, rushes, goldfields, and popcorn-flower. Plant species found in alkali meadows are typically adapted to soil conditions and seasonal ponding. Common or ruderal species that may occur within the alkali meadow community include curly dock and Italian ryegrass, with alkali milk-vetch, heartscale, recurved larkspur, and San Joaquin spearscale as less common special-status species. Alkali meadows occur within the northern region of the Watershed and along the proposed Transfer-Bethany pipeline route.

Alkali sink scrub is a plant community dominated by halophytic species. This community occurs in low-lying areas with poorly drained alkaline soils that are typically supported by the occasional heavy winter rainfall that evaporates fairly quickly. Representative plants of this community include allscale saltbush, big saltbush, bush seepweed, pickleweed and iodine bush. Alkali sink occurs in topographic depressions in which salts have concentrated. Alkali sink habitat in the project vicinity generally occurs on the saline-alkaline soils of the Pescadero and Solano soil series. This habitat occurs in an isolated channel on the proposed Delta-Transfer Pipeline alignment and on the proposed Western alignment (Power Options 1 and 2).

Alkali marsh habitats are highly variable systems and occur in scattered locations throughout the Central Valley and along California's south coast extending into Baja Norte, all at elevations below 300 m (1000 feet). They are found in old lake beds or in floodplains of river systems where seasonal water inputs are limited, and often include some groundwater seepage. High rates of evaporation lead to alkaline water and soil conditions, with layers of salt encrusted soils often accumulating near seeps. These are highly variable in plant composition, but often include saltgrass, Baltic rush, yerba mansa, chairmaker's bulrush, saltbush species, seaside arrowgrass, and thistle species (NatureServe 2008). Within the watershed, alkali marsh habitat occurs north of the 160-TAF borrow area (Alternative 4) and within and adjacent to the staging area, as well as in the mitigation ponds in the Inlet/Outlet Pipeline area in Kellogg Creek downstream of the dam. Such habitat also occurs outside the watershed, in isolated pockets on the proposed Delta-Transfer Pipeline south of State Route 4 and on the proposed Transfer-Bethany Pipeline alignment near Byron Airport.

Vernal pool communities and alkali meadows provide habitat for those species adapted to seasonal ponding and drying which may include California tiger salamander, vernal pool fairy shrimp, longhorn fairy shrimp, and mid-valley fairy shrimp.

Seasonal wetland habitats provide food, cover, and breeding habitat for a variety of wildlife species. Amphibian species found in this habitat type include California red-legged frog, Pacific chorus frog, and western spadefoot toad. Common mammal species include raccoon, common muskrat, California vole, and western harvest mouse. Birds found in seasonal wetland habitats include shorebirds, wading birds, waterfowl, songbirds, including tri-colored blackbird, and raptors, including short-eared owl, Swainson's hawk, white-tailed kite, and northern harrier. Other species include snakes and aquatic invertebrates.

The proposed Transfer-Bethany pipeline would be located within designated Critical Habitat for the federally-threatened vernal pool fairy shrimp and the federally-endangered Contra Costa goldfields (Reclamation and CCWD 2008). Kellogg Creek watershed is also within Critical Habitat for the federally-threatened California red-legged frog.

Tidal Aquatic Habitats and Associated Species

Palustrine (Tidal Freshwater Emergent [Bulrush-Cattail Series])

Tidal freshwater emergent habitat includes portions of the intertidal zones of the Delta that support emergent wetland plant species that are not tolerant of saline or brackish conditions. Tidal freshwater emergent habitat includes fresh emergent wetland tidal and Delta sloughs, and mid-channel islands and shoals habitats (CALFED 2000a). Dominant plant species in tidal freshwater emergent habitat include cattails, tules, and common reedgrass (Reclamation and CCWD 2008). Special-status plants that occur in tidal freshwater emergent habitat include delta mudwort, delta tule pea, Mason's lilaeopsis, rose mallow, and Suisun Marsh aster.

The extensive network of rivers and water channels commonly caused vast areas of the Central Valley to flood in winter by a slow- moving layer of silt-laden water. Flood control measures and land settlements around the turn of the century led to the creation of leveed-Delta islands. The construction of numerous levees in addition to land use conversion resulted in the loss of fresh emergent wetlands in the Delta. Today, there are less than 15,000 acres of this habitat remaining (CALFED 2000a).

Tidal freshwater emergent habitat occurs in interrupted patches along the shoreline of Old River, where the existing Old River Intake and Pump Station and the proposed New Delta Intake and Pump Station would be located. The banks of Old River at this location have isolated patches of freshwater marsh dominated by common tule. The east side of Old River, outside of the project area, also supports a large expanse of diverse marsh vegetation (Reclamation and CCWD 2008). Wildlife species typically found in this habitat type include pacific chorus frog, western toad, garter snake, western pond turtle, and bird species such as northern harrier, white-tailed kite, short-eared owl, snowy egret, great blue heron, tricolored blackbird, song sparrow, marsh wren, and black phoebe. Fish species known to use this habitat type include delta smelt, longfin smelt, Sacramento splittail, green sturgeon, Central Valley steelhead, Central Valley fall-run Chinook salmon, Central Valley late fall-run Chinook salmon, Central Valley spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon (CALFED 2000a).

Tidal Riverine Habitat (Tidal Perennial Aquatic/Riverine)

Tidal riverine habitat is classified as deepwater habitat contained within a channel with ocean-derived salts less than or equal to 0.5 percent (Cowardin *et al*. 1979). Tidal perennial is classified as deepwater aquatic (greater than 3 meters [9.7 feet] deep from mean low tide), shallow aquatic (less than or equal to 3 meters deep from mean low tide), and unvegetated intertidal (i.e., tide flats), zones of estuarine bays, river channels, and sloughs (CALFED 2000a).

Historic expanses of shallow tidal waters have been substantially lost primarily due to reclamation and channel dredging activities and scouring. All major habitat types in the Delta, Suisun Bay, Suisun Marsh, and San Francisco Bay have been reduced to a small fraction of the area they once occupied, resulting in a large number of at-risk plant and animal species and an increased susceptibility of the remaining areas to irreversible degradation (e.g., invasion by non-native species) (CALFED 2000a).

The habitat functions and values of Delta sloughs have been severely impeded over the years. Urban and industrial development on lands adjacent to sloughs have destroyed historic riparian habitat. Degradation of sloughs is also attributed to the invasion and spread of non-native plant species such as water hyacinth, reduced water quality, and reduced freshwater outflows. Existing natural sloughs require protection and habitat improvement (CALFED 2000a).

Both the existing and new water intake structures would be located in the south Delta in the vicinity of Old and Middle rivers, which provides shallow tidal open-water and emergent marsh habitat for a variety of resident and migratory fish and macroinvertebrates. The primarily open-water habitat within the Delta is relatively shallow (typically less than 20 feet deep) and has a relatively uniform channel bottom comprised of silt, sand, peat, and decomposing organic matter. Tules and other emergent and submerged aquatic vegetation occur both within the open-water areas and along the shoreline margins of sloughs and channels that provide habitat for fish migration, spawning, juvenile rearing, and adult holding and foraging (Reclamation and CCWD 2009).

Waters within the south Delta are characterized by low salinity levels under most environmental conditions; however, saltwater intrusion upstream into the central and south Delta does occur under low outflow conditions, and as a result of levee breaching. Although much of the Delta provides shallow open-water aquatic habitat, the channels within the south Delta vary in size and hydraulic complexity. Levees surrounding the sloughs and channels within the south Delta have been stabilized by riprap and other materials placed along the channel margins. These levees are typically vegetated by native and non-native grasses and shrubs. Mature riparian trees are not abundant along south Delta levees.

The water quality and hydrodynamic conditions that affect fishery habitat within the south Delta are influenced by a variety of factors, including the magnitude of seasonal freshwater inflow to the Bay-Delta estuary from the Sacramento and San Joaquin rivers and east-side tributaries, tidal circulation patterns within the south Delta, salinity, and seasonal variation in water temperature. Turbidity and suspended sediment concentrations within the south Delta are influenced by wind and wave-induced turbulence and river flows. Specifically, large open-water surface areas such as Mildred Island and Franks Tract promote wind-generated waves, which can re-suspend sediments within these shallow open waters (Reclamation and CCWD 2009).

Sampling for fish populations has been conducted throughout the Delta, including at sampling locations within the project area (Reclamation and CCWD 2009). These locations are shown in Figure 22. Results of fishery sampling and salvage within the Bay-Delta estuary have shown that 56 fish species inhabit the estuary, of which about half are non-native introduced species (Reyes 2008; Moyle 2002; CDFG 2009a). These species are shown in Table 5. Many of these nonnative species, such as striped bass and American shad, were purposefully introduced to provide recreational and commercial fishing opportunities. Other non-native fish species, such as threadfin shad and inland silversides, were accidentally introduced into the estuary through the movement of water among connecting waterways; a number of other fish species, including yellowfin and chameleon gobies, were introduced through ballast water discharges from commercial cargo transports traveling primarily from Asia and the Orient (Reclamation and CCWD 2009). In addition, an estimated 100 macroinvertebrate species have been introduced into the estuary, primarily through ballast water discharges (Carlton 1979). Many non-native

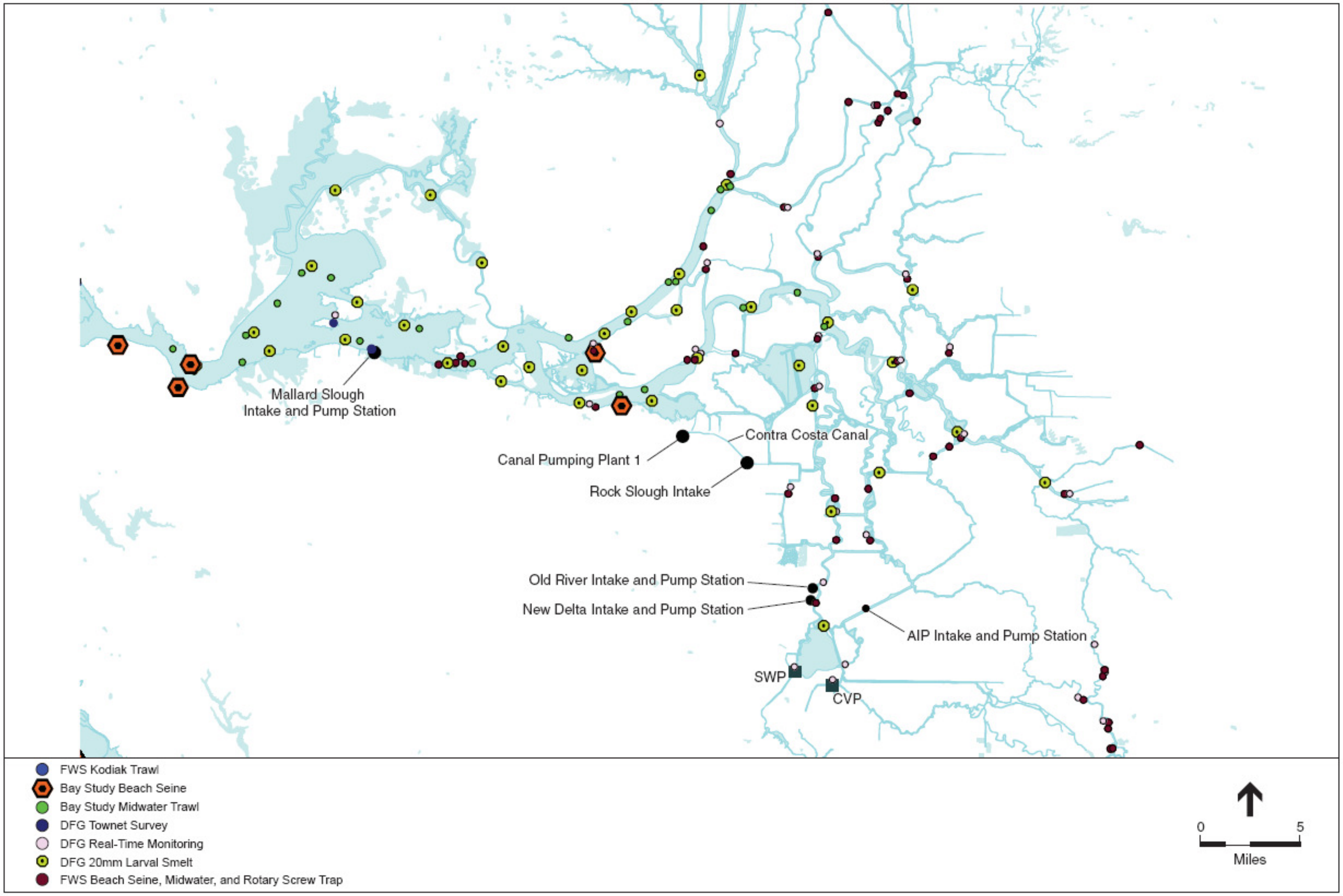


Figure 22. Major Delta Fish Sampling Survey Locations within the Delta
Source: Reclamation and CCWD 2008

Table 5. Fishes of the Sacramento-San Joaquin River Delta potentially affected by construction or operation of the proposed Los Vaqueros Reservoir Expansion Project
Source: Reyes 2008; Moyle 2002; and CDFG 2009a

Common Name	Scientific Name	Distribution
American shad	*Alosa sapidissima*	introduced
threadfin shad	*Dorosoma petenense*	introduced
striped bass	*Morone saxatilis*	introduced
largemouth bass	*Micropterus salmoides*	introduced
smallmouth bass	*Micropterus dolomieu*	introduced
spotted bass	*Micropterus punctulatus*	introduced
Chinook salmon (winter, spring, fall, and late fall runs)	*Oncorhynchus tshawytscha*	native
Central Valley steelhead (rainbow trout)	*Oncorhynchus mykiss*	native
Sacramento sucker	*Catostomus occidentalis*	native
wakasagi	*Hypomesus nipponensis*	introduced
longfin smelt	*Spirinchus thaleichthys*	native
delta smelt	*Hypomesus transpacificus*	native
prickly sculpin	*Cottus asper*	native
riffle sculpin	*Cottus gulosus*	native
staghorn sculpin	*Leptocottus armatus*	native
Shokihaze goby	*Tridentiger barbatus*	introduced
yellowfin goby	*Acanthogobius flavimanus*	introduced
shimofuri goby	*Tridentiger bifasciatus*	introduced
warmouth	*Lepomis gulosus*	introduced
green sunfish	*Lepomis cyanellus*	introduced
pumpkinseed	*Lepomis gibbosus*	introduced
bluegill	*Lepomis macrochirus*	introduced
redear sunfish	*Lepomis microlophus*	introduced
white crappie	*Pomoxis annularis*	introduced
black crappie	*Pomoxis nigromaculatus*	introduced
Sacramento perch[1]	*Archoplites interruptus*	native
starry flounder	*Platichthys stellatus*	native
Sacramento blackfish	*Orthodon microlepidotus*	native
Sacramento pikeminnow	*Ptychocheilus grandis*	native
goldfish	*Carassius auratus*	introduced
hitch	*Lavinia exilicauda*	native
hardhead	*Mylopharodon conocephalus*	native
common carp	*Cyprinus carpio*	introduced
Sacramento splittail	*Pogonichthys macrolepidotus*	native
California roach	*Hesperoleucus symmetricus*	native
Topsmelt[2]	*Atherinops affinis*	native
western mosquitofish	*Gambusia affinis*	introduced
speckled dace	*Rhinichthys osculus*	native
golden shiner	*Notemigonus crysoleucas*	introduced
red shiner	*Cyprinella lutrensis*	introduced
inland silverside	*Menidia beryllina*	introduced
rainwater killifish	*Lucania parva*	introduced
bigscale logperch	*Percina macrolepida*	introduced
fathead minnow	*Pimephales promelas*	introduced
threespine stickleback	*Gasterosteus aculeatus*	native
tule perch	*Hysterocarpus traskii*	native
blue catfish	*Ictalurus furcatus*	introduced
channel catfish	*Ictalurus punctatus*	introduced

Common Name	Scientific Name	Distribution
brown bullhead	*Ameiurus nebulosus*	introduced
black bullhead	*Ameirus melas*	introduced
white catfish	*Ameiurus catus*	introduced
river lamprey	*Lampetra ayresii*	native
Pacific lamprey	*Lampetra tridentata*	native
American eel[3]	*Anguilla rostrata*	introduced
North American green sturgeon	*Acipenser medirostris*	native
white sturgeon	*Acipenser transmontanus*	native

1 Sacramento perch are extirpated from the Delta
2 Topsmelt are mainly euryhaline, but young are sometimes found in brackish and freshwater
3 American eels are fish that have escaped ponds or fish markets. Reproducing populations are unlikely in the Pacific Ocean.

aquatic plants have also become established within the estuary. The purposeful and unintentional introductions of non-native fish, macroinvertebrates, and aquatic plants have contributed to a substantial change in the species composition, trophic dynamics, and competitive interactions affecting the population dynamics of native Delta species. Many of these introduced fish and macroinvertebrates inhabit the central and south Delta (Reclamation and CCWD 2009).

Tidal riverine habitat occurs in Old River, where the existing Old River Intake and Pump Station and the proposed New Delta Intake and Pump Station would be located. Old River is the principal deepwater aquatic feature that supplies water to Los Vaqueros Reservoir. This wide Delta channel principally supports freshwater tidal riverine habitat. The existing and proposed intakes would be located on Old River within an area of the estuary influenced by freshwater inflow from the Sacramento and San Joaquin River systems, CVP and SWP export operations, and tidal effects from coastal marine waters and San Francisco Bay. The CCWD currently operates the existing Old River Intake and Pump Station that has been designed and is operated in compliance with CDFG and NOAA Fisheries criteria (e.g., screen mesh size, approach velocity of 0.2 ft/sec, screen cleaning, etc.). The CCWD is currently constructing a similar intake structure located on Victoria Canal (Alternative Intake Project [AIP]), which is located in the south Delta, that has also been designed to meet the screen design criteria for delta smelt and other fish species (Reclamation and CCWD 2009).

In the vicinity of the two intake sites, Old River is characterized by water depths ranging from about 15 to 20 feet deep (measured at low slack tide) within 20 feet of the shoreline. Substrate on the channel bottom is characterized by silt and fine- and coarse-grained sand. The channel banks consist of a combination of natural earthen berm and armored riprap. Vegetation is characterized by intermittent stands of tules and submerged aquatic vegetation along the shoreline margins, grass, weedy vegetation along the channel banks, and sparse riparian (shrubs and trees) vegetation along the channel margins.

Open water provides resting and escape cover for many species of waterfowl, and near-shore waters provide food for waterfowl, herons, egrets, and shorebirds. Many species of insectivorous birds (swallows, swifts, flycatchers) catch prey over water. Common mammals that use shallow and deepwater habitats for foraging and escape cover include the river otter, mink, common muskrat, and beaver.

Areas of deeper water provide foraging and roosting habitat and escape cover for diving ducks, cormorants, grebes, and other waterbirds that are permanent residents or that winter in the project area. This cover-type also provides habitat for reptiles and amphibians, including western pond turtle and western garter snake. Shallow aquatic areas provide rearing and foraging areas and escape cover for reptiles and amphibians.

Native species of fish found in this habitat type include Pacific lamprey, river lamprey, white sturgeon, Central Valley steelhead, Chinook salmon (winter, spring, fall, and late-fall runs), green sturgeon, longfin smelt, delta smelt, starry flounder, hitch, hardhead, Sacramento blackfish, Sacramento splittail, Sacramento pikeminnow, Sacramento sucker, tule perch, threespine stickleback, and prickly sculpin. Some of the non-native species found in this habitat type include striped bass, largemouth bass, and catfish, which are of value for sport fishing.

The location for the existing and proposed intakes is along a river segment designated as Critical Habitat for the federally-threatened delta smelt and the federally-threatened Central Valley steelhead. The proposed in-water construction activities would occur during the summer and early fall (August 1 through November 30) which is consistent with the seasonal work window identified by the Service, NOAA Fisheries, and CDFG for reducing the potential for significant adverse impacts to sensitive fishery resources within the Delta (Reclamation and CCWD 2009). Though, the greatest numbers of young of the year Sacramento splittail are caught in the south Delta pumping plants from April through August; there is potential for this California species of special concern to be in the area during the in-water construction timeframe (Moyle 2002). Salvage results also show that low numbers of Central Valley steelhead and longfin smelt may be found in the vicinity during in-water construction (CDFG 2009a, 2009b, and 2009c).

The proposed project would be located within the area of the south Delta identified as Essential Fish Habitat for Pacific salmon, northern anchovy, Pacific sardine, and starry flounder (Pacific Fishery Management Council [PFMC] 1998, PFMC 2000, and PFMC 2005). The seasonal occurrence of juvenile Chinook salmon (all runs) observed during CVP and SWP fish salvage operations shows that they may occur in the south Delta during in-water construction (Reclamation and CCWD 2009). Northern anchovy and Pacific sardine can be found in coastal waters of the Pacific Ocean and in the San Francisco Bay, but it is highly unlikely that they would be found in the project area due to the typical salinity gradient in the Delta (PFMC 1998). Starry flounder are relatively uncommon in the Delta, but they may occur in the vicinity of the project area during the in-water construction work window (PFMC 2005 and CDFG 2009a).

The federally-threatened green sturgeon has the potential to be in the area during the in-water construction timeframe. The southern population of green sturgeon is rare and little is known about their biology, behavior, and life history, but they can be found anywhere in the Delta throughout the year (Moyle 2002; J. Stuart, NOAA Fisheries, pers. comm. 2008). Similarly, habitat requirements of white sturgeon are not well understood, but older juveniles and adults are commonly found in rivers, estuaries, and marine environments, and could potentially be in the project area during the in-water construction work window.

Special-Status Species

A summary of special-status species with the potential to be affected by the 275 TAF reservoir expansion alternatives are listed in Tables 6 through 9 below. This summary includes Federal and State special-status species, in addition to special-status species listed by organizations such as the California Native Plant Society (CNPS) and the Western Bat Working Group (WBWG).

Special-status bird species are those that are: 1) federally-listed as endangered, threatened, or a candidate for listing under the Federal Endangered Species Act (FESA); 2) listed as having designated Critical Habitat under the FESA in or near the proposed project area; 3) State-listed as endangered, threatened, or a candidate for listing under the California Endangered Species Act (CESA); 4) a California Fully Protected Species; 5) a California Species of Special Concern or

on the CDFG Watch List; 6) listed in the CALFED Multi-Species Conservation Strategy (MSCS) (in CALFED 2000a); 7) protected under the Bald and Golden Eagle Protection Act; 8) listed by the Service as a Bird of Management Concern under the Migratory Bird Treaty Act (50 CFR 10.13) (*e.g.*, Bird of Conservation Concern at the National or Regional level or a Game Bird Below Desired Condition [Service 2002; Service, Undated]); or 9) listed in the United States Bird Conservation Watch List (includes the Partners in Flight Watch List, the United States Shorebird Conservation Plan Watch List, and the Waterbird Conservation for the Americas Watch List). Common migratory bird species are those that are protected by the Migratory Bird Treaty Act, but are not special-status bird species as defined above.

Special-status invertebrate, amphibian, and reptile species are those that are: 1) federally-listed as endangered, threatened, or a candidate for listing under the FESA; 2) listed as having designated Critical Habitat under the FESA in or near the proposed project area; 3) State-listed as endangered, threatened, or a candidate for listing under the CESA; 4) a California Fully Protected Species; 5) a California Species of Special Concern or on the CDFG Watch List; or 6) listed in the CALFED MSCS (in CALFED 2000a).

Special-status mammal species are those that are: 1) federally-listed as endangered, threatened, or a candidate for listing under the FESA; 2) listed as having designated Critical Habitat under the FESA in or near the proposed project area; 3) State-listed as endangered, threatened, or a candidate for listing under the CESA; 4) a California Fully Protected Species; 5) a California Species of Special Concern or on the CDFG Watch List; 6) listed in the CALFED MSCS (in CALFED 2000a); or 7) a Western Bat Working Group High or Medium Priority Species.

Special-status fish species are those that are: 1) federally-listed as endangered, threatened, or a candidate for listing under the FESA; 2) listed as having designated Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act in or near the proposed project area; 3) listed as having designated Critical Habitat under the FESA in or near the proposed project area; 4) a NOAA Fisheries Species of Concern; 5) State-listed as endangered, threatened, or a candidate for listing under the CESA; 6) a California Fully Protected Species; 7) a California Species of Special Concern or on the CDFG Watch List; 8) listed in the CALFED MSCS (in CALFED 2000a); or 9) listed as endangered, threatened, or vulnerable by the American Fisheries Society (AFS [Musick *et al.* 2001]).

Special-status plant species are those that are: 1) federally-listed as endangered or threatened or a candidate for listing under the FESA; 2) listed as having designated Critical Habitat under the FESA in or near the proposed project area; 3) State-listed as endangered, threatened, or rare or a candidate for listing under the CESA; 4) on the CNPS List 1A, 1B, 2, 3, or 4; or 5) listed in the CALFED MSCS (in CALFED 2000a).

The information for Tables 6-9 was obtained from Reclamation's and CCWD's August 2008 *Los Vaqueros Reservoir Expansion Project Administrative Draft Environmental Impact Statement/Environmental Impact Report*, prepared by ESA (Reclamation and CCWD 2008); the *CALFED Bay-Delta Program Final Programmatic Environmental Impact Statement/Environmental Impact Report*; July 2000 (Appendix D, Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures, and Appendix E, Multi-Species Conservation Strategy Prescriptions and Conservation Measures for Evaluated Species, in CALFED 2000a); CDFG's *Rarefind, California Department of Fish and Game Natural Diversity Database* (CDFG 2008a); CDFG's *Special Animals* list (CDFG 2008b); *CDFG's California Natural Diversity Database (gov) [ds45]* (CDFG 2008c); CDFG's *Life History Accounts and Range Maps - California Wildlife Habitat Relationships System* (CDFG 2008d); the Service's *Endangered Species Lists* for Brentwood, Byron Hot Springs, Clifton Court Forebay, Tassajara, and Woodward Island U.S.G.S. 7 ½ Minute Quads (Service 2008c); the Service's *Birds of Conservation Conern 2002* (Service 2002); the Service's *Game Birds Below Desired Condition (GBBDC)* (Service, Undated); the Service's *Threatened and Endangered Species Accounts* (Service 2008a); NOAA Fisheries' *Marine/Anadromous Fish Species Under the Endangered Species Act, List of Fish Species Under NMFS' Jurisdiction* (NOAA Fisheries 2008); CNPS' *Inventory of Rare and Endangered Plants* (CNPS 2008); *Inland Fishes of California* (Moyle 2002); the Service's *Birds Protected by the Migratory Bird Treaty Act* (Service 2008b); U. S. Geological Survey's *North American Breeding Bird Survey*, 1966-2007 Analysis, Livermore Route 14203 (Sauer, J. R., J. E. Hines, and J. Fallon 2008); the National Audubon Society's *Christmas Bird Count Historical Results*, East Contra Costa County Count Circle, Count Years: 98-108 (National Audubon Society 2008); *A Field Guide to the Mammals, North America north of Mexico* (Burt and Grossenheider 1980); and *All About Birds, Bird Guide* (Cornell Lab of Ornithology 2003).

Future Conditions without Project

For landside resource issues, it is assumed that future conditions without the project would mostly be the same as existing conditions. Under the No Project/No Action Alternative, there are no major development or facilities projects proposed in the area of the proposed project facilities that is different from existing conditions relating to landside resources. No new facilities would be constructed and no existing facilities would be altered, expanded, or demolished (Reclamation and CCWD 2009). It is assumed that future land management would not change from current use.

Table 6. Summary of special-status invertebrate, reptile, amphibian, and mammal species known to occur or with potential to be affected by the proposed Los Vaqueros Reservoir Expansion Project

SPECIES	STATUS[4]	HABITAT ASSOCIATIONS
Invertebrates		
Longhorn fairy shrimp *Branchinecta longiantenna*	FE, m	Vernal pools and depressions in grassland, rock outcrops, and claypans. Inhabit clear to rather turbid vernal pools.
Vernal pool fairy shrimp *Branchinecta lynchi*	FT, m	Depression pools, seasonal wetlands, grassed swales, tire ruts, and other areas capable of ponding water seasonally. The proposed Transfer-Bethany Pipeline would go through designated Critical Habitat for vernal pool fairy shrimp.
Mid-valley fairy shrimp *Branchinecta mesovallensis*	m	Vernal pools, swales, and ephemeral water bodies. Tends to inhabit shallower pools than other special-status branchiopod species.
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT, R	Inhabit elderberry shrubs (*Sambucus sp.*), typically associated with riparian habitat, but they can be found in other habitats.
Reptiles and Amphibians		
Western pond turtle *Actinemys marmorata*	CSC, m	Lakes, ponds, reservoirs, marshes, rivers, streams, and irrigation ditches with slow-moving water. Woody debris (basking sites) and grassy open fields.
California tiger salamander (central population) *Ambystoma californiense*	FT, CSC, m	Grasslands and low foothill regions where lowland aquatic sites (natural ephemeral pools or ponds) are available for breeding.
Silvery legless lizard *Anniella pulchra pulchra*	CSC	Found in loose-textured soil, or under leaf litter, in chaparral, coastal scrub, coastal dune, valley-foothill riparian, and pine-oak woodland. Soil moisture is essential for legless lizards.
San Joaquin whipsnake (=coachwhip) *Masticophis flagellum ruddocki*	CSC, m	Grassland, pasture, desert, chaparral, saltbush, and shadscale scrub habitats. Uses mammal burrows for refuge.
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT, CT, m	Coastal ranges, in chaparral, grasslands, scrub, and woodland habitats. May also use stream channels for dispersal/movement (50 CFR Part 17). Uses rock outcrops and rodent burrows as refugia.
Coast horned lizard *Phrynosoma coronatum*	CSC	Grassland, chaparral, saltbush scrub, sandy washes with scattered shrubs, alkali flats, valley woodland, and coniferous forest habitats. Uses mammal burrows for hibernation.
California red-legged frog *Rana aurora draytonii*	FT, CSC, m	Dense, shrubby, or emergent riparian habitat near deep, still or slow moving water lacking bullfrogs. Kellogg Creek watershed is within Critical Habitat for the California red-legged frog.
Foothill yellow-legged frog *Rana boylii*	CSC, m	Found in or near rocky or gravelly streams within valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadows. Sometimes found in streams without a rocky or gravelly substrate.
Western spadefoot toad *Spea hammondii*	CSC, m	Oak woodlands, grasslands, coastal scrub, chaparral, sandy washes, river floodplains, alluvial fans, playas, alkali flats, and vernal pool complexes. Breed in shallow, temporary pools, includes man-made ephemeral impoundments and pools in intermittent streams.
Mammals		
Pallid bat *Antrozous pallidus*	CSC, WBH	Occupies a wide variety of habitats, including grasslands, shrublands, woodlands, and forests from sea level up through mixed conifer forests. Most common in open, dry habitats with rocky areas for roosting. Roosts in caves, crevices, mines, hollow trees, and buildings.
Ringtail *Bassariscus astutus*	CFP, m	Widely distributed in various riparian habitats, and in brush stands of most forest and shrub habitats, at low to middle elevations.
Townsend's big-eared bat *Corynorhinus townsendii*	CSC, WBH	Found in all but alpine and sub-alpine habitats. Most abundant in mesic habitats. Roosts in caves, mines, tunnels, buildings, or other human-made structures.
Greater western-mastiff bat *Eumops perotis californicus*	CSC, WBH, m	Occurs in many semi-arid to arid habitats, including chaparral, coastal scrub, desert scrub, palm oases, coniferous woodlands, oak woodland, grassland, and agricultural areas. Roosts in cliffs, rocky crevices, buildings, trees, and tunnels.

SPECIES	STATUS[4]	HABITAT ASSOCIATIONS
Western red bat *Lasiurus blossevillii*	CSC, WBH	Roosting habitat includes forests and woodlands from sea level up through mixed conifer forests. Forages in grasslands, shrublands, open woodlands and forests, and agricultural areas.
Hoary bat *Lasiurus cinereus*	WBM	May be found at any location in California, although distribution is patchy in southeastern deserts. Habitats suitable for bearing young include woodlands and forests with medium to large-size trees and dense foliage.
Western small-footed myotis bat *Myotis ciliolabrum*	WBM	Occurs in a wide variety of habitats, primarily in relatively arid wooded and brushy uplands near water. Often seen foraging among trees and over water. Roosts in caves, buildings, mines, crevices, and occasionally under bridges and under bark.
Long-eared myotis bat *Myotis evotis*	WBM	Found in nearly all brush, woodland, and forest habitats, but coniferous woodlands and forests seem to be preferred. Forages among trees, over water, and over shrubs. Roosts in buildings, crevices, spaces under bark, snags, and caves.
Fringed myotis *Myotis thysanodes*	WBH	Pinyon-juniper, valley foothill hardwood and hardwood-conifer. Roosts in caves, mines, buildings, and crevices. Uses open habitats, early successional stages, streams, lakes, and ponds as foraging areas.
Long-legged myotis bat *Myotis volans*	WBH	Most common in forests and woodlands above 4,000 feet. Also found in chaparral, coastal scrub, Great Basin shrub habitats, and early successional stages of forests and woodlands. Feeds over water, close to trees and cliffs, and in openings in woodlands and forests. Roosts in rock crevices, buildings, under tree bark, in snags, mines, and caves.
Yuma myotis bat *Myotis yumanensis*	WBLM	Found in a wide variety of habitats ranging from sea level to 11,000 feet, but it is uncommon to rare above 8000 feet. Optimal habitats are open forests and woodlands with sources of water over which to feed. Roosts in buildings, mines, caves, crevices, abandoned swallow nests, and under bridges.
American badger *Taxidea taxus*	CSC	Drier open stages of most shrub, forest, and herbaceous habitats.
San Joaquin kit fox *Vulpes macrotis mutica*	FE, CT, m	Grasslands and scrub habitats.

[4]**Status:**

State Status Definitions

CFP	California Fully Protected	CT	California Threatened	CR	California Rare
CE	California Endangered	CSC	California Species of Special Concern	WL	California Department of Fish and Game Watch List

Federal Status Definitions

FE	Federally Endangered	FSC	Federal Species of Concern
FT	Federally Threatened	FD	Federally Delisted

CALFED Status Definitions

R	CALFED MSCS Recovery goal species. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.
r	CALFED MSCS Contribute to Recovery goal species. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.
m	CALFED MSCS Maintain goal species. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species.

Western Bat Working Group Status Definitions

WBH	High Priority Species	WBM	Medium Priority Species
WBMH	Medium-High Priority Species	WBLM	Low-Medium Priority Species

Table 7. Summary of special-status avian species known to occur or with potential to be affected by the proposed Los Vaqueros Reservoir Expansion Project

SPECIES	STATUS[5]	HABITAT ASSOCIATIONS
Cooper's hawk *Accipiter cooperii*	WL, m	Year-round resident. Breeds March-August. Occurs most frequently in dense stands of live oak, riparian, and other forest habitats near water. Usually nests in conifer stands, or in deciduous riparian areas, usually near streams.
Sharp-shinned hawk *Accipiter striatus*	WL	Winters downslope, summers upslope or north of California. Breeds April-August (peak in late May-July). Breeds in riparian, ponderosa pine, black oak, deciduous, mixed conifer, and Jeffrey pine habitats. Uses all habitats except alpine, open prairie, and bare desert in winter.
Tricolored blackbird *Agelaius tricolor*	CSC, BCC, USBCWL, m	Year-round resident. Breeds mid-April-late July. Breeds near fresh water, preferably in emergent wetlands with tall, dense cattails or tules, but also in thickets of willow, blackberry, wild rose, and tall herbs. Feeds in grassland and cropland habitats, as well as along pond edges. Roosts in large flocks in emergent wetlands or in trees.
Wood duck *Aix sponsa*	GBBDC	Year-round resident or winter migrant. Breeds April-August. Occurs in lacustrine, slow-moving riverine, and emergent wetland habitats bordered by willows, cottonwoods, or oaks. Nests in cavities in trees, pileated woodpecker nest-cavities, or old, rotted flicker cavities near water.
Grasshopper sparrow *Ammodramus savannarum*	CSC, BCC, m	Summer resident March-September. Breeds April-mid-July (peak May-June). Occurs in dry, dense grasslands with tall forbs and scattered shrubs.
Bell's sage sparrow *Amphispiza belli belli*	WL	Year-round resident. Breeds from late March to mid-August with a peak in May and June. Occurs in chaparral dominated by chamise, coastal scrub dominated by sage.
Northern pintail *Anas acuta*	GBBDC	Winters July-April. Remains to breed in summer in small numbers. Occurs in lacustrine, estuarine, fresh and saline emergent wetland, wet cropland, pasture, grassland, and meadow habitats.
Mallard *Anas platyrhynchos*	GBBDC	Year-round resident. Occurs in fresh emergent wetland, estuarine, lacustrine, and riverine habitats. Also occurs in ponds, pastures, croplands, and urban parks.
American wigeon *Anas americana*	GBBDC	Common September-April. Occurs in lacustrine, freshwater emergent wetlands, and nearby herbaceous and cropland habitats. Rarely nests in California.
Tule greater white-fronted goose *Anser albifrons elgasi*	CSC, GBBDC	Winters in the Central Valley October-early May. Found in moist and wet grasslands, pastures, croplands, meadows, fresh emergent wetlands, lacustrine habitat and, less commonly, in estuarine and saline emergent habitats.
Golden eagle *Aquila chrysaetos*	CFP, WL, BGE, m	Winters in the Central Valley; migrates upslope to breed. Year-round resident in most of the rest of California. Breeds late January-August (peak in March-July). Needs open terrain for hunting; grasslands, savannahs, deserts, early-successional forest and shrub habitats. Nests in canyons, on cliffs, and in large trees in open areas.
Great egret (rookery) *Ardea alba*	m	Year-round resident. Nests March-July in large trees near water. Occurs in estuarine, fresh and saline emergent wetlands, lacustrine, croplands, pastures, salt ponds, and riverine habitats.
Great blue heron (rookery) *Ardea herodias*	m	Year-round resident. Breeds February-March. Most nestlings fledge June-July. Occurs in estuarine, fresh and saline emergent wetlands, croplands, pastures, salt ponds, and riverine habitats. Nests in colonies in the tops of secluded large snags or live trees, usually among the tallest available.
Western burrowing owl *Athene cunicularia hypugea*	CSC, BCC, m	Year-round resident. Breeds March-August with peak April-May. Occurs in grassland, desert, and shrub habitats characterized by low-growing vegetation. Mammal burrows, especially California ground squirrel burrows, are used for roosting and nesting.
Short-eared owl *Asio flammeus*	CSC, USBCWL, m	Winter or year-round resident. Breeds early March-July. Usually found in open areas with few trees, such as grasslands, dunes, meadows, irrigated lands, saline and freshwater emergent wetlands. Nests on dry ground in a depression concealed in vegetation; occasionally nests in a burrow. Roosts in dense vegetation such as tall grasses, brush, ditches, and wetlands.

SPECIES	STATUS[5]	HABITAT ASSOCIATIONS
Long-eared owl *Asio otus*	CSC, m	Year-round resident or winter visitor. Breeds early March-late July. Riparian habitat required; also uses live oak thickets and other dense stands of trees.
Lesser scaup *Aythya affinis*	GBBDC	Winters September-May in estuarine and lacustrine habitat in California.
Redhead *Aythya americana*	CSC, GBBDC	Winter or year-round resident. Breeds April-August. Occurs in lacustrine and emergent wetland habitats. Nests in fresh emergent wetlands bordering open water.
Ring-necked duck *Aythya collaris*	GBBDC	Winters September-May. Occurs in freshwater lacustrine habitat. Uncommonly found in estuarine and marine habitats along the coast.
Greater scaup *Aythya marila*	GBBDC	Winters October-May. Occurs in bays, estuaries, lakes, and emergent wetland habitats.
Canvasback *Aythya valisneria*	GBBDC	Winters September-May. Occurs in estuarine and lacustrine habitats.
Oak titmouse *Baeolophus inornatus*	USBCWL	Year-round resident. Occurs in montane hardwood-conifer, montane hardwood, blue, valley, and coastal oak woodlands, and montane and valley foothill riparian habitats in cismontane California. Nests in cavity in tree or snag.
Aleutian Canada goose *Branta Canadensis leucopareia*	FD, m	Winters in California. Occurs in lacustrine, wetlands, moist grasslands, croplands, pastures, and meadows.
Barrow's goldeneye *Bucephala islandica*	CSC	Winters October-March in riverine and lacustrine waters. Formerly nested in California, in tree cavities near lakes or slow-moving rivers with abundant submerged aquatic vegetation and open water.
Ferruginous hawk *Buteo regalis*	WL, BCC	Winters September-mid-April. Occurs in open grasslands, sagebrush flats, desert scrub, low foothills, surrounding valleys, and fringes of pinyon-juniper habitats. Roosts in open areas, usually in a lone tree or on a utility pole.
Swainson's hawk *Buteo swainsoni*	CT, BCC, USBCWL, r	Summer resident March-October. Breeds late March-late August. Breeds in stands with few trees in juniper-sage flats, riparian areas, and in oak savannah in the Central Valley. Forages in adjacent grasslands, suitable grain or alfalfa fields, or livestock pastures. Roosts in large trees, but will roost on ground if none are available. Nests in trees, shrubs, or on utility poles between 4-100 feet in height. Typical habitat is open desert, grassland, or cropland containing scattered, large trees or small groves.
Lawrence's goldfinch *Carduelis lawrencei*	BCC, USBCWL	Present April-September. Breeds in open oak or other arid woodland and chaparral, near water. Typical habitats include valley foothill hardwood and valley foothill hardwood-conifer. Forages in grasslands and shrublands.
Mountain plover *Charadrius montanus*	CSC, BCC, USBCWL, m	Winters September-March. Wintering habitat consists of sparse, short, grasslands, and plowed fields in the Central Valley.
Northern harrier *Circus cyaneus*	CSC, BCC, m	Year-round or winter resident. Breeds April-September. Occurs in meadows, grassland, open rangeland, desert sink, fresh and saltwater emergent wetlands, and agricultural habitats. Roosts on ground, uses tall grasses and forbs in or adjacent to wetlands for cover. Nests on ground, mostly nests in emergent wetland or along rivers or lakes, but may nest in grasslands, grain fields, or on sagebrush flats several miles from water.
Yellow warbler *Dendroica petechia brewsteri*	CSC, r	Present April-October. Breeds mid-April-early August (peak in June). Breeds in low open-canopy riparian woodlands, montane chaparral, open ponderosa pine and mixed conifer habitats with substantial amounts of brush.
Snowy egret (rookery) *Egretta thula*	USBCWL, m	Year-round resident. Breeds late April-late August. Occurs in estuarine, fresh and saline emergent wetlands, ponds, lacustrine, irrigation ditches, croplands, pastures, salt ponds, and riverine habitats. Nests in trees, dense marshes, or at ground level.
White-tailed kite	CFP, m	Year-round resident. Breeds February-October with peak May-August. Forages in open grasslands, river

SPECIES	STATUS[5]	HABITAT ASSOCIATIONS
Elanus leucurus		bottomlands, marshes, meadows, emergent wetlands, and agricultural lands. Roosts in trees with dense canopies. Nests near top of dense oak, willow, or other tree stand. Nest located near open foraging area.
California horned lark *Eremophila alpestris actia*	WL	Year-round resident. Breeds March-July. Found in a variety of open habitats, usually where trees and large shrubs are absent; grasslands, deserts, alkali flats, meadows, fallow grain fields, and alpine dwarf-shrub habitat. Nests in depression on the ground in the open.
Merlin *Falco columbarius*	WL	Winters September-May. Frequents coastline, grassland, savannah, woodland, lacustrine, and wetland habitats. Dense tree stands close to bodies of water are needed for cover.
American peregrine falcon *Falco peregrinus anatum*	CE, CFP, FD, BCC, m	Year-round resident along coast, Coast Ranges, and Sierra Nevada. Winter resident in Central Valley. Breeds in early March-late August. Occurs in woodland, forest, coastal, riparian, lacustrine, wetlands. Nests in high cliffs near lakes, rivers, or wetlands or in tall buildings or bridges. Forages in croplands and annual grasslands.
Prairie falcon *Falco mexicanus*	WL, BCC	Year-round resident. Breeds mid-February-mid-September (peak in April-early August). Distributed from annual grasslands to alpine meadows, but associated primarily with grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Uses open terrain for foraging. Nests in open terrain with canyons, cliffs, escarpments, and rock outcrops.
Lesser sandhill crane *Grus canadensis canadensis*	CSC	Winters September-April. Occur in grasslands, irrigated pasture, shallow seasonal wetlands, and cropland (rice, corn, wheat, barley, oats, rye, sorghum, buckwheat, legumes, alfalfa). Lesser sandhill cranes are particularly attracted to alfalfa (Central Valley Joint Venture 2006).
Greater sandhill crane *Grus canadensis tabida*	CT, CFP, r	Winters September-April. Occur in grasslands, irrigated pasture, shallow seasonal wetlands, and cropland (rice, corn, wheat, barley, oats, rye, sorghum, buckwheat, legumes, alfalfa) (Central Valley Joint Venture 2006).
Bald eagle *Haliaeetus leucocephalus*	CE, CFP, BGE, m	Year-round resident or winter migrant. Occur in a wide range of habitats, including lacustrine, riverine, riparian, coastline, wetland, woodland, forest, desert, rangeland, and flooded field habitats. Hunts from snags or other perches near water bodies. Perches high in large, stoutly-limbed trees, on snags or broken-topped trees, or on rocks near water. Roosts in dense, sheltered tree stands. Nests in large, old-growth, or dominant live tree with open branches, usually near a permanent water source. Ground nests in treeless areas (Buehler 2000).
Yellow-breasted chat *Icteria virens*	CSC, m	Summer resident April-late September. Breeds early May-early August (peak in June). Nests in dense riparian understory and other dense shrub habitats (willows and blackberry especially) near water.
California gull *Larus californicus*	WL, m	Winters August-April. Occurs in lacustrine, estuarine, salt ponds, coastal, fresh and saline emergent wetland, riverine, and cropland habitats. California's nesting population is scattered across the northeastern plateau region, Mono Lake, and a salt pond in San Francisco Bay. Formerly bred in the Central Valley.
Loggerhead shrike *Lanius ludovicianus*	CSC, BCC	Year-round resident. Lays eggs March-May, young become independent July-August. Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. Highest density occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Also occurs in grassland, scrub, and cropland habitat with open country for hunting. Nests in densely-foliaged shrub or tree.
Lewis' woodpecker *Melanerpes lewis*	BCC	Year-round resident. Breeds May-July in the Sierra Nevada, Klamath Mountains, Cascades, and eastern slope of the Coast Range. Also winters in the Central Valley, Modoc Plateau, and the Transverse and other Ranges in southern California. Occurs in open oak savannahs, broken deciduous, and coniferous habitats. Requires snags and dead limbs for nest excavation. Cavity nester.
Long-billed curlew *Numiensis americanus*	WL, BCC, USBCWL, m	Winters early July-early April along most of the California coast, and in the Central and Imperial valleys. Breeds April-September in Siskiyou, Modoc, and Lassen counties. Breeding also reported from Inyo County. Occurs in estuarine, grassland, wet meadows, cropland, and salt ponds.
Black-crowned night heron	m	Year-round resident. Breeds February-July. Occurs in lacustrine, estuarine, fresh and saline emergent wetland,

SPECIES	STATUS[5]	HABITAT ASSOCIATIONS
(rookery) *Nycticorax nycticorax*		and riverine habitats. Nests in dense foliaged-trees and dense emergent wetlands.
Osprey *Pandion haliaetus*	WL, m	Year-round resident or summer visitor. Breeds March-September. Occurs in lacustrine, riverine, estuarine, riparian and open forest habitats. Forages over rivers, lakes, reservoirs, bays, estuaries, and surf zones. Uses large trees, snags, and dead-topped trees in open forest habitats for nesting and roosting. Also nests on cliffs and on man-made structures. Occasionally nests on ground.
American white pelican *Pelecanus erythrorhynchos*	CSC	Year-round resident or winter migrant. Lacustrine, estuarine, and salt pond habitats. Formerly bred in large number in the Central Valley.
Double-crested cormorant (Rookery) *Phalacrocorax auritus*	WL, m	Winters August-May in the Central Valley. Breeds April-August along the coast, inland lakes, and estuaries. Occupies diverse aquatic habitats. Nests in trees, on the ground on islands, or on man-made structures (Hatch *et al*. 1999). Roosts on rocks, pilings, or trees.
Yellow-billed magpie *Pica nuttalli*	USBCWL	Year-round resident. Breeds late February-mid July (peak in May-June). Occurs in valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, orchard, vineyard, cropland, pasture, and urban habitats.
Nuttall's woodpecker *Picoides nuttalli*	USBCWL	Year-round resident. Breeds late March-early July. Low-elevation oak and deciduous riparian habitats. Requires snags and dead limbs for nest excavation. Cavity nester.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	CSC	Year-round or summer resident in Central Valley. Breeds mid-April-late June. Occurs in fresh emergent wetland with dense vegetation and deep water, lakes, ponds, and cropland habitats.

[5]**Status:**

State Status Definitions

CFP	California Fully Protected	CT	California Threatened	CR	California Rare
CE	California Endangered	CSC	California Species of Special Concern	WL	California Department of Fish and Game Watch List

Federal Status Definitions

FE	Federally Endangered	FD	Federally Delisted	GBBDC	Game Birds Below Desired Condition
FT	Federally Threatened	BGE	Bald and Golden Eagle Protection Act		
FSC	Federal Species of Concern	BCC	Bird of Conservation Concern (Region 32)		

USBCWL United States Bird Conservation Watch List (the Partners in Flight Watch List, the United States Shorebird Conservation Plan Watch List, and the Waterbird Conservation for the Americas Watch List).

-- No special-status but protected under the Migratory Bird Treaty Act

CALFED Status Definitions

R CALFED MSCS Recovery goal species. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.

r CALFED MSCS Contribute to Recovery goal species. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.

m CALFED MSCS Maintain goal species. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species.

Table 8. Summary of special-status fish species inhabiting the Delta potentially affected by construction or operation of the proposed Los Vaqueros Reservoir Expansion Project

SPECIES	STATUS[6]	HABITAT ASSOCIATIONS
		Fish
North American Green sturgeon *Acipenser medirostris*	FT, CSC, R, AFSE	Anadromous life history, freshwater, estuarine, and marine habitat requirements at different life history stages (UC Davis Cooperative Extension 2003). The proposed project area in Old River is included within proposed Critical Habitat for green sturgeon (50 CFR 226.216).
White sturgeon *Acipenser transmontanus*	AFST	Anadromous life history, freshwater, estuarine, and marine habitat requirements at different life history stages (UC Davis Cooperative Extension 2003).
Northern anchovy *Engraulis mordax*	-	Occupies marine and estuarine habitats. Northern anchovy Essential Fish Habitat east-west geographic boundary is defined as all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the exclusive economic zone and above the thermocline where sea surface temperatures range between 10° C to 26° C (Pacific Fishery Management Council [PFMC]1998).
Delta smelt *Hypomesus transpacificus*	FT, CT, R, AFST	Occurs in estuarine and freshwater habitats, primarily living in or just upstream of the mixing zone between fresh and salt water (UC Davis Cooperative Extension 2003). The proposed project area in Old River would be within delta smelt Critical Habitat. Recently petitioned for up-listing under the Federal Endangered Species Act.
River lamprey *Lampetra ayersi*	CSC	Occupies, marine, estuarine, and freshwater habitats.
Hardhead *Mylopharodon conocephalus*	CSC, m	Typically found in small to large streams in a low to mid-elevation environment. May also inhabit lakes or reservoirs (University of California Cooperative Extension 2003).
Central Valley steelhead *Oncorhynchus mykiss*	FT, R	Anadromous and/or freshwater life history. The project area on Old River is within Central Valley steelhead Critical Habitat (50 CFR Part 226).
Central Valley fall/late-fall run Chinook salmon *Oncorhynchus tshawytsha*	FSC, CSC, R	Anadromous life history, freshwater, estuarine, and marine habitat requirements at different life history stages. Chinook salmon freshwater Essential Fish Habitat includes all those streams, lakes, ponds, wetlands, tributaries, and other water bodies currently viable and most of the habitat historically accessible within Washington, Oregon, Idaho, and California (PFMC 2000). Chinook salmon marine Essential Fish Habitat includes all marine waters within the exclusive economic zone north of Point Conception, California and the marine areas off Alaska designated as salmon Essential Fish Habitat by the North Pacific Fishery Management Council (PFMC 2000).
Central Valley spring-run chinook salmon *Oncorhynchus tshawytsha*	FT, CT, R	Anadromous life history, freshwater, estuarine, and marine habitat requirements at different life history stages. Central Valley spring-run Chinook salmon Critical Habitat includes portions of San Francisco-San Pablo-Suisun Bay estuarine complex, and watersheds east and north up into Shasta County (50 CFR Part 226).
Sacramento River winter-run chinook salmon *Oncorhynchus tshawytsha*	FE, CE, R	Anadromous life history, freshwater, estuarine, and marine requirements at different life history stages. Central Valley winter run Chinook salmon Critical Habitat ranges from San Pablo Bay, east to Chipps Island, and north into Shasta County (50 CFR 226.21).
Starry flounder *Platichthys stellatus*	-	Occupies marine, estuarine, and freshwater habitats. Starry flounder Essential Fish Habitat includes marine and estuarine habitats between latitudes 33.7° N-55° N, and between depths 0 meters-375 meters (PFMC 2005).
Sacramento splittail *Pogonichthys macrolepidotus*	FD, CSC, R	Occurs in estuarine and freshwater habitats. Also commonly occurs in habitats with higher salinities (between 10-18 parts per thousand [ppt]). Tolerates low dissolved oxygen levels (< 1.0 mg/L) (University of California Cooperative Extension 2003).
Pacific sardine *Sardinops sagax caerulea*	-	Occupies marine and estuarine habitats. Pacific sardine Essential Fish Habitat east-west geographic boundary is defined as all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the exclusive economic zone and above the thermocline where sea surface

SPECIES	STATUS[6]	HABITAT ASSOCIATIONS
		temperatures range between 10° C-26° C (Pacific Fishery Management Council 1998).
Longfin Smelt *Spirinchus thaleichthys*	CSC, R, AFST	Primarily an anadromous estuarine species that can tolerate salinities ranging from freshwater to nearly pure sea water. Most longfin smelt occupy the middle or bottom of a water column and tend to favor temperatures in the range of 16-18° C and salinities ranging from 15-30 ppt (University of California Cooperative Extension 2003). Candidate for listing under the Federal Endangered Species Act and the California Endangered Species Act.

[6]**Status:**

State Status Definitions

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CE	California Endangered	CSC	California Species of Special Concern	WL	California Department of Fish and Game Watch List

Federal Status Definitions

FE	Federally Endangered	FSC	Federal Species of Concern
FT	Federally Threatened	FD	Federally Delisted

CALFED Status Definitions

R	CALFED MSCS Recovery goal species. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.
r	CALFED MSCS Contribute to Recovery goal species. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.
m	CALFED MSCS Maintain goal species. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species.

American Fisheries Society

AFSE	American Fisheries Society – Endangered
AFST	American Fisheries Society – Threatened
AFSV	American Fisheries Society – Vulnerable

Table 9. Summary of special-status plant species known to occur or with potential to be affected by the proposed Los Vaqueros Reservoir Expansion Project

SPECIES	STATUS[7]	HABITAT ASSOCIATIONS/ADDITIONAL NOTES
Large-flowered fiddleneck *Amsinckia grandiflora*	FE, CE, 1B.1, m	Blooming period April-May. Grasslands.
Mt. Diablo manzanita *Arctostaphylos auriculata*	1B.3, m	Blooming period January-March. Chaparral, sandstone.
Contra Costa manzanita *Arctostaphylos manzanita* ssp. *laevigata*	1B.2, m	Blooming period January-March. Chaparral, rocky slopes.
Alkali milk-vetch *Astragalus tener var. tener*	1B.2, r	Blooming period March-June. Low ground, alkali flats, alkaline vernal pools, grassland on clay soils, and playas.
Heartscale *Atriplex cordulata*	1B.2, m	Blooming period April-October. Chenopod scrub, saline or alkaline grasslands, meadows, seeps, and seasonal wetlands.
Brittlescale *Atriplex depressa*	1B.2, m	Blooming period April-October. Alkaline or clay grasslands, chenopod scrub, playas, meadows, seeps, and vernal pools.
San Joaquin spearscale *Atriplex joaquiniana*	1B.2, m	Blooming period April-October. Seasonal alkali wetlands, chenopod scrub, alkali grasslands, and alkali meadows and seeps.
Big tarplant *Blepharizonia plumose* ssp. *plumosa*	1B.1, m	Blooming period July-October. Grasslands.
Round-leaved filaree *California macrophylla*	1B.1	Blooming period March-May. Upland scrub and grasslands on clay soils.
Mt. Diablo fairy lantern *Calochortus pulchellus*	1B.2, m	Blooming period April-June. Grasslands, chaparral, valley foothill woodland, riparian woodland.
Recurved larkspur *Delphinium recurvatum*	1B.2, m	Blooming period March-June. Fine, poorly drained soils in grasslands, chenopod scrub.
Delta-button celery *Eryngium racemosum*	1B.1	Blooming period June-September. Seasonally flooded clay depressions in riparian scrub.
Diamond-petaled California poppy *Eschscholzia rhombipetala*	1B.1, m	Blooming period March-April. Valley and foothill grasslands on alkaline and clay soils.
Stinkbells *Fritillaria agrestis*	4.2	Blooming period March-June. Chaparral, grasslands, valley foothill woodland, clay and sometimes serpentine soils.
Diablo helianthella *Helianthella castanea*	1B.2, m	Blooming period March-June. Grasslands, chaparral, coastal scrub, valley foothill woodland, riparian woodland.
Congdon's tarplant *Hemizonia parryi* ssp. *congdonii*	1B.2, m	Blooming period May-October. Grasslands.
Brewer's western flax (=Brewer's dwarf flax) *Hesperolinon breweri*	1B.2, m	Blooming period May-July. Chaparral, grasslands, valley foothill woodland, sometimes on serpentine soils.
Rose-mallow	2.2, m	Blooming period June-September. Tidally-influenced coastal and freshwater marsh; freshwater-soaked

SPECIES	STATUS[7]	HABITAT ASSOCIATIONS/ADDITIONAL NOTES
Hibiscus lasiocarpus		river banks.
Contra Costa goldfields *Lasthenia conjugens*	FE, 1B.1, m	Blooming period March-June. Valley grasslands, playas, and vernal pools. The proposed Transfer-Bethany Pipeline portion of the project area would be within Contra Costa goldfields Critical Habitat.
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	1B.2	Blooming period May-July. Freshwater or brackish marsh.
Mason's lilaeopsis *Lilaeopsis masonii*	CR, 1B.1, R	Blooming period April-November. Brackish or freshwater tidal zones, marsh, riparian scrub, stream banks, muddy or silty soil formed through river deposition.
Delta mudwort *Limosella subulata*	2.1, r	Blooming period May-August. Tidal zones with muddy or sandy soils.
Chaparral ragwort *Senecio aphanactis*	2.2	Blooming period January-April. Chaparral, coastal scrub, sometimes found on alkaline soils.
Suisun Marsh aster *Symphyotrichum lentum*	1B.2	Blooming period May-November. Brackish or freshwater marsh.
Caper-fruited tropidocarpum *Tropidocarpum capparideum*	1B.1	Blooming period March-April. Valley and foothill grasslands on alkaline soils.

[7]Status:

State Status Definitions

CFP	California Fully Protected	CT	California Threatened	CR	California Rare
CE	California Endangered	CSC	California Species of Special Concern	WL	California Department of Fish and Game Watch List

Federal Status Definitions

FE	Federally Endangered	FSC	Federal Species of Concern
FT	Federally Threatened	FD	Federally Delisted

CALFED Status Definitions

R CALFED MSCS Recovery goal species. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.

r CALFED MSCS Contribute to Recovery goal species. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.

m CALFED MSCS Maintain goal species. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species.

CNPS Status Definitions

1B.1	Rare, threatened, or endangered in California and elsewhere; seriously endangered in California elsewhere	2.1	Seriously endangered in California, but more common
1B.2	Rare, threatened, or endangered in California and elsewhere; fairly endangered in California elsewhere	2.2	Fairly endangered in California, but more common
1B.3	Rare, threatened, or endangered in California and elsewhere; not very endangered in California California	4.2	Limited distribution (Watch List), fairly endangered in

For water-related issues (i.e., Delta water resources, water quality, fisheries and aquatic resources), future-without-project conditions are not expected to be the same as existing conditions. Conditions in 2030 are expected to include increased water demand and select future projects that could affect Delta water supply and/or water quality. In addition, existing and "Future without Project" conditions could differ in several respects with regard to water export operations.

The Draft EIS/EIR includes the following list of reasonably foreseeable future projects and actions affecting Future without Project conditions:

- The 2030 Level of Development – Projection of 2030 demands for Delta water supply and 2030 land use changes.

- South Delta Improvement Project, Phase I – Installation of permanent operable barriers in the south Delta (Phase II is not included in this analysis).

- South Bay Aqueduct Enlargement – Enlargement of conveyance capacity for the South Bay Aqueduct from 300 cfs to 430 cfs (now under construction).

- The CCWD Canal Replacement Project – Replacement of the unlined portion of the Contra Costa Canal with a pipeline.

- Delta-Mendota Canal-California Aqueduct Intertie – Increase of Delta water supply conveyance capacity from 4,200 cfs to 4,600 cfs.

- Freeport Regional Water Project – Implementation of a water supply project by the Sacramento County Water Agency and the East Bay Municipal Utility District (EBMUD).

- The CCWD-EBMUD Intertie – Diversion of up to 3.2 TAF per year of CCWD/ CVP water via the Freeport Regional Water Project with delivery to CCWD via the CCWD-EBMUD Intertie.

- Level 2 Federal Refuge Water Supply – Assumption of firm Level 2 refuge water supply needs within the Sacramento and San Joaquin valleys.

- Placer County Water Agency Pump Station Expansion Project – Expansion of Placer County Water Agency's pump station on the American River to divert up to 35 TAF/year of CVP supply.

- Phase 8 Settlement Agreement – A Sacramento Valley groundwater substitution program that supplies up to 185 TAF/year to the SWP and CVP.

- Dedicated CVP Conveyance at SWP Banks Pumping Plant –SWP conveyance of 50 TAF/year of Level 2 refuge water for the CVP in July and August of each year.

- North-of-Delta Accounting Adjustments – Through adjustments to the 1986 Coordinate Operations Agreement, release by the CVP of up to 37.5 TAF/year from Shasta Reservoir for the SWP to meet in-basin requirements.

The CCWD operations in the near-term would be unchanged. To maintain supply reliability to its customers over time, CCWD would implement actions identified in its Future Water Supply Plan, including acquisition of water transfers as needed to provide reliable dry-year water supply. No increase in fish entrainment would occur at the CCWD intakes in the near term. However, under future levels of CCWD demand, it is expected there would be an expected increase in direct losses from these intakes (Reclamation and CCWD 2009).

Future conditions without the project are those conditions that are expected to occur over the life of the project if the project were not implemented. Future conditions for fish and wildlife in the project study area would be determined by physical, biological, social, and economic factors. Because the project study area is part of the Delta system and has hydrologic ties to much of the State, its future must reflect the interactions of these factors on a State-wide basis. Because of the complexity with which these factors interact, and the possibilities for future scenarios, it is impossible to predict the future of the Delta with certainty. Globally, climate change is projected to raise sea level 3 feet or more over the next century, change precipitation and storm patterns, and raise local temperatures. Locally, population growth, land subsidence, earthquakes, and species invasions are likely to drive ecological change and increase risks of flooding (CALFED Science Program 2008).

Terrestrial and Wetland Habitats and Associated Species

Under the future conditions without the project scenario, it is assumed that overall, existing cover-types would not significantly change in size (acreage) over the life of the project. It is assumed that existing habitats within the Kellogg Creek watershed would continue to provide valuable services for wildlife, including food, cover, breeding habitat, and dispersal corridors. It is also assumed blue oaks, valley oaks, and Fremont cottonwoods planted within the watershed as mitigation for the existing Los Vaqueros Reservoir would continue to grow in height and crown cover, and would eventually provide snags and fallen logs, improving habitat quality for wildlife.

Oak regeneration in California is most problematic in the Central Coast region, which includes Contra Costa and Alameda counties (Gaman and Firman 2006; Gaman 2009). Studies show that oak regeneration rates are poor, particularly for blue oak and valley oak species (Gaman 2009). Blue oaks were found to have unsustainable rates of regeneration (Gaman and Firman 2006). If this continues into the future, oak woodlands and forests may decrease in size and density, potentially impacting wildlife species that depend on oak habitats for food, cover, and breeding habitat.

Wetland and riparian systems are examples of community types providing a wealth of ecosystem services that may be vulnerable to changing climatic conditions. Riparian and wetland habitats in the Western U.S. comprise less than 2 percent of the landscape yet provide habitats for greater than 80 percent of wildlife species (McKinstry, Caffrey, and Anderson 2001). Riparian wetlands, located along rivers and streams, typically contain cottonwoods, willows, and shrubs such as American dogwood and California wild rose, and are natural corridors utilized by a variety of wildlife, providing food and shelter. Wetlands associated with riparian corridors also help to attenuate and store floodwaters, provide a source of recharge during low flow periods, and filter sediment contributions to streams and rivers (Manci 1989). Additionally, coastal and estuarine wetlands provide important wildlife habitat and corridors, flood and pollution control, and buffers against sea level rise and storm surges (Western Governors Association [WGA] 2008). Isolated and seasonal wetlands also provide valuable habitat and dispersal corridors for wildlife. Climatic changes that alter precipitation patterns and river flows are likely to directly modify these biodiverse areas (WGA 2008).

Waterfowl are an example of a vulnerable group of species that are tightly linked to climatic regimes and that also have a high profile due to their biological, social, and economic importance in the Western U.S. (WGA 2008). Temperature and precipitation determine the abundance and duration of wetland habitats and waterfowl corridors, and directly influence waterfowl reproduction and population size (WGA 2008). Alteration of wetland abundance and duration due to climate change, coupled with conversion of wetland habitat and grassland nesting habitat for municipal, agricultural, and industrial development, are likely to reduce the availability of waterfowl habitat in the future (WGA 2008).

Tidal Aquatic Habitats and Associated Species

Under without project conditions, the quantity and quality of Delta in- and outflow, a major determinant of habitat conditions for fish, would likely continue to be altered by future State, Federal, and private water development projects. The Service issued their final BO for OCAP on December 15, 2008. The outcome of the FESA, section 7 consultations for OCAP with the Service and NOAA Fisheries has resulted in changes in Delta operations. It is expected that these BOs will continue to affect future Delta diversions and future aquatic conditions within the Delta.

Under without project conditions, it is expected that habitat conditions would improve for delta smelt as net reverse flows[3] in Old and Middle rivers are reduced during critical delta smelt life stages and as tidal marsh habitat is restored. Habitat improvements for delta smelt may also benefit longfin smelt, Sacramento splittail, and other aquatic species in the area.

Climate Change

Scientific research to date indicates that observed climate change is most likely a result of increased emission of atmospheric greenhouse gases (GHGs) associated with human activity (Intergovernmental Panel on Climate Change [IPCC] 2007a, 2007b). Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated

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[3] The reference net flow in Old and Middle rivers is normally defined to be in the northerly direction, i.e. towards San Francisco Bay. A net reverse flow condition can occur within Old and Middle rivers as the rate of water exported at the SWP and CVP export facilities exceeds tidal and downstream flows within the central region of the Delta. This condition would be represented by a negative value of net flow in Old and Middle rivers. There have been concerns regarding the effects of net reverse flows on fish populations and their food supply, as well as the effects of net reverse flows on delta smelt salvage.

with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors (Reclamation and CCWD 2008). The IPCC reports in their *Summary for Policymakers – Synthesis Report of the IPCC Fourth Assessment Report* (IPCC 2007a) that "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."

The IPCC's most recent Assessment Report recounts evidence of the effects of warming on natural systems across the world (IPCC 2007b). Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases. Although much uncertainty remains regarding the specific timing and magnitude and, in some cases, nature of potential changes to natural resources as a result of climate change, several trends are evident.

- Rising temperatures are causing earlier seasonal melting and reduced snowpack in the mountains. This would likely increase the intensity and length of late summer droughts and reduce the availability of water in the future.
- Heavy precipitation events are likely to increase in frequency and augment flood risk.
- Temperature changes are expected to alter seasonal timing; spring is expected to arrive earlier in the year than previously.
- Rising temperatures are likely to shift the distribution of plants and wildlife farther north and to higher elevations than their historic ranges.
- Warming of oceans, estuaries, lakes, and streams is expected to alter the distribution of algae, plankton, and fish, as well as change salinity, oxygen levels, and circulation.
- Sea level rise is likely to cause increased loss of coastal lands to erosion, washing away wetlands and other habitat for coastal fish and wildlife species. Sea level rise is also likely to cause salinization of estuaries and fresh water systems.
- Warming of waters in rivers and streams may make these habitats less able to support the spawning of salmon, trout, and other anadromous fish species that have significant economic value to recreational and commercial fisheries.

Effects of Climate Change on the Sacramento – San Joaquin Watershed

According to DWR, mean sea level at the Golden Gate Bridge rose by at least 8 inches since the year 1900 (Roos and Anderson 2006). This is in line with a report by the IPCC, which indicates average increases of 3.9 to 7.9 inches globally during the last century (IPCC 2007c). The observed sea level rise likely results from a combination of factors, including melting of polar and terrestrial ice and snow, and thermal expansion of ocean water as the earth's temperature increased (IPCC 2007d).

The IPCC (2007d) midrange projection for sea level rise this century is 8-17 inches, with a full range of variability of 7-23 inches. However, after the IPCC reports were released in early 2007, projections released later that year indicated a mid-range rise this century of 28-39 inches with a full range of variability of 20-55 inches, which is substantially higher than IPCC projections (Mount 2007).

Climate warming projections, combined with recent global sea level rise estimates suggest increases in California coastal sea levels that range from 1.5 feet to over 3 feet by the year 2100 (Cayan *et al.* 2008a). Storm events and tides will continue to accentuate water level-related impacts, and the duration and amplitude of sea level extremes is projected to increase (Cayan *et al.* 2008a). Events that have high tide surges combined with large freshwater flows into the Delta are projected to increase in frequency and intensity (Cayan *et al.* 2008a).

Higher sea levels would affect the Delta, the hub of the CVP/SWP water transfer system. A rise in sea level would mean more salinity intrusion from the ocean via San Francisco Bay, which would affect the water quality of exports or require more fresh water to be released from upstream reservoirs to hold incoming salinity in check (Roos and Anderson 2006). In the Delta and in San Francisco Bay, sea level rise is projected to inundate new areas of shoreline and increase the risk of levee failure in the weak Delta levee system (Cayan *et al.* 2008b; Roos and Anderson 2006). Many of the islands within the Delta are well below sea level and a summer levee breach could cause an inrush of saline water, temporarily disrupting water transfers and exports (Roos and Anderson 2006).

Knowles and Cayan (2004) modeled the effects climate change may have on Sacramento – San Joaquin watershed precipitation for the years 2050-2069, and determined how salinity levels in the San Francisco estuary would change as a result. They determined higher temperatures would likely result in more precipitation falling as rain rather than snow, increasing winter estuarine inflows and reducing spring-summer inflows. From October through February, estuarine inflows from the Sacramento–San Joaquin watershed are projected to increase an average of about 8,475 ft^3/s, or 20 percent, and from March through September flows are projected to decrease ~4,238 ft^3/s, or about 20 percent. This projection demonstrates conservation of total annual flows, with winter inflow gains balanced by spring–summer inflow losses.

Declining spring–summer freshwater inflows would result in higher spring–summer salinities in the estuary (Knowles and Cayan 2004). Under this projection, the average May–August salt content of the estuary of about 100 million metric tons would increase by nearly 5.7 million metric tons, or about 6 percent. Beyond the inter-annual variability in impacts, the general result of a warmer climate and the associated changes in the seasonality of outflow is to raise salinity in the San Francisco estuary, regardless of whether the water year is dry or wet. Nearly all of the freshwater inflow change is a result of shifts in Sacramento River runoff patterns. In part, this reflects the relatively small contribution of the San Joaquin River to spring–summer estuarine inflows under current freshwater management conditions. However, implementation of the court-ordered San Joaquin River Restoration Project could potentially increase future San Joaquin River flows into the Delta.

In addition, implementation of the Service's and NOAA Fisheries' OCAP BOs has transformed the way water is managed in the Sacramento – San Joaquin watershed. In order to protect declining fishery populations, the timing of southern Delta water exports has been modified, the amount of carryover storage in north-of-Delta reservoirs is likely to continue to be changed or modified, and the timing of releases from north-of-Delta reservoirs has been modified form previous operations. The Bay Delta Conservation Plan (BDCP) and Delta Vision committees are also evaluating alternative means of conveying water through or around the Delta in order to meet California's water supply demands. These potential water management modifications could alter future conditions in the Delta.

In conjunction with an altered hydrologic regime, rising temperatures are also expected to result in longer fire seasons with more frequent and intense fires (WGA 2008). Fire is a natural component of many ecosystems and natural community types, including grasslands, chaparral/northern coastal scrub, oak woodlands, and conifer woodlands. For each of these natural communities, fire frequency and intensity influence community regeneration, composition, and extent. It is possible that larger, more intense, and more frequent fires could have an impact on natural communities. For example, more frequent, intense fires could cause natural community-type conversion, increasing the extent of certain natural communities, such as grassland, at the expense of others, such as chaparral or oak woodlands (County of Santa Clara Planning Office 2008; Lenihan *et al*. 2003).

There is a great deal of uncertainty regarding how climate change may affect a wide array of variables. Even though there is general consensus that global temperatures are increasing, predictions of future rates of increase are uncertain. Projected scenarios cannot predict the future effects of global and regional climate change, but they can anticipate a range of effects that may be encountered. These types of studies provide useful information on the sensitivity of a complex, managed watershed/estuarine system to potential climate changes. Future climate change may have profound effects on hydrologic and fire regimes in the Sacramento – San Joaquin watershed, and may result in ecosystem-level changes that would impact fish, wildlife, and plant populations, in addition to impacting the human population.

Implications for the Existing Los Vaqueros Reservoir and Operations
The Kellogg Creek watershed, as well as other minor tributaries to Los Vaqueros Reservoir, could receive increased flood flows during storm events, and these local storm flows would be collected in the existing Los Vaqueros Reservoir. The existing reservoir is sized and designed appropriately to either contain flood flows from Kellogg Creek and other minor tributaries to the reservoir, or release these flows downstream (Reclamation and CCWD 2008).

Portions of the existing Old River pipeline are located within the current 100-year flood zone, according to FEMA Federal Insurance Rate Maps (FIRM). Therefore, these areas could be subject to additional Delta flooding associated with potential future sea level rise. However, the existing Old River pipeline is buried underground, such that flooding, if it did occur, is not expected to disturb, obstruct, or otherwise damage the existing buried pipeline. The existing Transfer Pipeline alignment is located at elevations above the area potentially affected by sea level rise or associated flooding (Reclamation and CCWD 2008).

The CCWD's existing intake and pump stations may be affected by climate-induced sea level rise, increased flow of water from upstream areas during winter months, and also by salinity intrusion during the summer months. Salinity intrusion could potentially affect water quality at all CCWD's intake and pump stations, but water quality is likely to be most affected at the intakes nearest to the central Delta. The Mallard Slough intake and pump station is at the southern end of a 3,000-foot-long channel running due south from Suisun Bay, near Mallard Slough (across from Chipps Island), and is more likely to be affected by projected climate-induced sea level rise and salinity intrusion due to its proximity to the central Delta. Currently, CCWD has a license and permit from the SWRCB for diversions of up to 26,780 acre-feet per year at this location, but rarely uses the intake due to poor water quality. When CCWD diverts water at the Mallard Slough Intake and Pump Station, it typically reduces pumping of CVP water at its other intakes, primarily at the Rock Slough Intake (Reclamation and CCWD 2008).

Because water quality at the Old River Intake and Pump Station is generally better than at the Rock Slough Intake, and because the Old River Intake is screened, the Rock Slough Intake is used less frequently than in the past. When the AIP Intake and Pump Station on Victoria Canal becomes operational, use of the Rock Slough Intake will drop even further. However, the Old River Intake and Pump Station and the AIP Intake and Pump Station do not have sufficient capacity to meet all CCWD's demands now and in the future, so the Rock Slough Intake will continue to be an important component of CCWD's system (Reclamation and CCWD 2008).

The existing Old River Intake and Pump Station is located along Old River in an area that would potentially be subject to a projected climate-induced sea level rise. The AIP Intake and Pump Station is also located in an area that may be affected by projected sea level rise.

These potential hydrologic changes, in combination with the new OCAP BO rules and potential new conveyance facilities proposed by the BDCP and Delta Vision committees, may affect the timing, quantity, and location of future CCWD diversions.

Effects of Climate Change on Fish, Wildlife, and Plants

Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of plants, wildlife, and fish would also change. However, it is difficult to estimate with any degree of precision which species would be affected by environmental change, or exactly how species would be affected by environmental change. Though, some species are already demonstrating population shifts attributed to climate change. The WGA's June 2008 Wildlife Corridor Initiative summarizes the following observations and predicted effects of climate change on plants, fish, and wildlife.

Climatic changes over the 20th century have already had significant effects on wildlife species throughout the Western U.S., and in the coming decade these effects are expected to intensify (Root *et al*. 2005). Shifts in the geographic patterns of wildlife habitat use and movement with increased annual temperatures have already been documented. Two western butterflies, many western bird species, and hundreds of other species, have shown evidence of shifting their range limits northward or upward in altitude (Parmesan 2006; Parmesan and Galbraith 2004; Crozier 2003; Crozier and Dwyer 2006; Parmesan and Yohe 2003; La Sorte and Thompson 2007; Hitch and Leberg 2007; and Neven *et al.* 2009). These range shifts are significant because they may disconnect species from their food sources (or prey from their predators), and they may also shift the timing of life history events.

Shifts in the timing of wildlife mating, migration, and other life-history traits (phenological shifts) may continue to occur as climate conditions change, and these shifts may lead to potential mismatches between wildlife and their food sources or other habitat attributes. Evidence demonstrates that phenological shifts are already underway for a wide array of species. Out of 677 species studied, 62 percent show trends toward earlier spring breeding, flowering, budburst, or seasonal migration (Parmesan and Yohe 2003). For species showing change in spring phenology, the estimated mean number of days changed per decade is 5.1 days earlier, with larger shifts at higher latitudes where warming is exacerbated (Root et al. 2003). As with shifting distributions, changes in phenology can lead to important changes in species interactions. For example, amphibians that produce eggs and move to breeding ponds based on temperature and moisture may encounter mismatches between breeding phenology, pond drying, and arrival at the pond. These mismatches, in turn, may lead to changes in types of plants and animals present and alterations in aquatic nutrient flow (Beebee 1995; Wilbur 1997).

All freshwater life history stages of cold-water fish are expected to be impacted by climate destabilization (WGA 2008). For example, a greater frequency of flood flows is likely to scour fish nests (‘redds’) (WGA 2008). Increased winter water temperatures may accelerate the time of embryo emergence and out-migration of juvenile salmon and trout at a smaller size (WGA 2008). As a result, they would be more susceptible to predation losses and may reach saltwater and rearing areas at an inopportune time for optimum survival (WGA 2008). Further, warmer temperatures cause stream water to retain less oxygen, a vital factor for all aquatic species (WGA 2008).

According to Lindley *et al.* (2007), climate change poses additional risk to the survival of salmonids in the Central Valley. A literature review suggests that by 2100, mean summer temperatures in the Central Valley may increase by 2-8°C, precipitation will likely shift to more rain and less snow, with possible declines in total precipitation, and likely hydrograph changes (Lindley *et al.* 2007). Warming at the lower end of the predicted range may allow spring-run Chinook salmon to persist in some Central Valley streams, while making some currently utilized habitat inhospitable (Lindley *et al.* 2007). At the upper end of the range of predicted warming, very little spring-run Chinook salmon habitat is expected to remain suitable (Lindley *et al*. 2007).

There are currently no published analyses of how ongoing climate change has affected the current condition of any of the primary constituent elements of delta smelt critical habitat (Service 2008d). Climate change could cause shifts in the timing of flows and water temperatures in the Delta, which could lead to a change in the timing of migration of adult and juvenile delta smelt (Service 2008d).

Climatic changes in the Central Valley may restructure the composition of wildlife populations as some species adapt and proliferate while others are displaced or die out, and the changes may alter the functions and values of habitats and wildlife corridors. The effects on vegetation and wildlife are expected to manifest at the community-level (e.g. chaparral, vernal pool complex, oak woodland, stream, lake) as well as at the level of individual species. Also, temperature and precipitation changes are expected to facilitate the northward expansion of exotic and invasive species and pests that can cause major shifts in the types of plants and animals present.

Climate change seldom acts alone on wildlife populations but rather operates synergistically with other stressors, including habitat fragmentation, roads, development, and disease. These synergistic interactions increase uncertainty and complicate actions to mediate climate change effects, but also offer the possibility that treatment of other stressors could help alleviate the negative effects of climate change.

Future Conditions with Project

Future conditions with the project are those conditions in the project study area that are expected to occur over the life of the project if the structural/physical components of the Los Vaqueros Reservoir Expansion Project were constructed and operated according to the elements of the proposed action.

Implementing the physical/structural components of the Los Vaqueros Reservoir Expansion Project would include enlarging the dam and expanding the inundation area, constructing access roads, and relocating expanding recreational facilities (all Alternatives); constructing additional water conveyance pipelines, constructing a new intake and pump station along Old River, constructing a new power substation and extending power transmission lines (Alternatives 1 and 2). These actions would affect fish and wildlife resources in the project area and may affect fish and wildlife resources in the vicinity of the project area. These impacts would stem primarily from the permanent or temporary loss of fish and wildlife habitat. Permanent losses or an overall reduction in habitat value would depress fish and wildlife values accordingly. The analysis in this report is restricted to addressing future conditions from the perspective of the Los Vaqueros Reservoir Expansion Project proposed alternative impacts on fish and wildlife resources and habitats in the project study area.

The project study area for which wetland and biological resources were analyzed are as follows: for pipelines- a 500-foot-wide corridor centered on the alignment; for facilities- the footprint of the facility plus a 150-foot buffer; for the reservoir- a roughly 1,000-foot buffer was added to the maximum inundation area; and for the other in-watershed facilities (i.e., recreational facilities, borrow areas and stockpile/staging area, Westside access road, and Eastside trail) – the overall Los Vaqueros Watershed (watershed) was considered. For impact analysis purposes, a 200-foot-wide construction easement was assumed for the Delta-Transfer Pipeline and the Transfer-LV Pipeline, while a 300-foot-wide construction easement was assumed for the Transfer-Bethany Pipeline. The discussion of Delta aquatic resources also extends beyond the Delta Intake and Pump Station footprint to include potential impacts to plants, fish, and wildlife resulting from construction and operation of the proposed project. This study area is generally consistent with that found in the EIS/EIR.

The discussion below also includes potential impacts to the project area resulting from future climate change, and greenhouse gas emissions resulting from project construction and operations. Potential climate change impacts to fish, wildlife, plants, and their habitats are described in greater detail under the Future Conditions without Project section above.

Reclamation's and CCWD's February 2009, Draft EIS/EIR defines direct effects as impacts occurring within the project footprint, and indirect effects as impacts extending beyond the project footprint (such as construction noise, light, or erosion). The Service also considers impacts occurring later in time (after construction) as indirect impacts. Examples of this include oak trees outside the inundation area dying due to increased soil moisture; non-native invasive plants moving into disturbed areas; or human disturbance to wildlife along public trails.

The following terms are used in this analysis to distinguish areas of potential direct impact from areas of potential indirect impact: "project area" or "project site" refers to the area of potential direct effects that could be physically modified by proposed facilities or activities; "project study area" refers to the area where biological resources were evaluated outside of the proposed facility site boundaries, but where potential indirect effects could occur.

Table 10 below defines the areas studied for direct project impacts and the areas studied for indirect project impacts.

Table 10. Definitions of the Project Area and the Project Study Area
Source: Reclamation and CCWD 2009

Project Component	Project Area (Surveyed for Direct Project Impacts)	Project Study Area (Area Surveyed to Assess Indirect Project Impacts)
Expanded Reservoir	Maximum extent of surface water inundation, plus 25-feet	A 1,000-foot buffer was physically surveyed for biological resources; the Los Vaqueros Watershed and surrounding watersheds were analyzed to assess regional impacts to special status wildlife species
Facilities within Los Vaqueros Watershed	Footprint of proposed facilities	150-foot buffer surrounding facilities was physically surveyed; the Los Vaqueros Watershed and surrounding watersheds were analyzed to assess regional impacts to special status wildlife species
New Delta Intake and Pump Station and Power Supply Infrastructure	Footprint of proposed facilities	A 150-foot buffer surrounding facilities was physically surveyed; areas up to 1.0 mile were assessed for special status wildlife species
Pipelines	200-foot-wide easement for the Delta-Transfer Pipeline and Transfer-LV Pipeline; 300-foot wide easement for the Transfer-Bethany Pipeline	500-foot wide corridor centered on the alignment was physically surveyed; areas up to 1.0 mile were assessed for special status wildlife species

SOURCE: ESA, 2008

Habitat disturbance impacts are defined as temporary or permanent. A temporary impact lasts less than one growing season. To better distinguish long-term impacts from permanent impacts, the Draft EIS/EIR used the category "long-term-temporary impact." This term is used to describe habitat disturbances with a duration lasting longer than one growing season, but not lasting beyond the construction time period. Permanent impacts, as used in the Draft EIS/EIR, are those that would permanently alter the landscape with no return to pre-project conditions.

The Service considers breaking through the aquaclude layer beneath vernal pools as a permanent impact.

Terrestrial and Wetland Habitats and Associated Species

The proposed alternatives would impact existing cover-types in the project study area. The following discusses the general types of impacts that would likely occur, and the existing cover-types that would be impacted by project construction and operation. Avoidance, minimization, and compensation measures proposed in the EIS/EIR, the Service's biological opinion and CCWD's Los Vaqueros Reservoir Expansion Project Mitigation Monitoring and Reporting Program, are not included in this section, but are included in Appendix C: Proposed Mitigation Measures for the Los Vaqueros Reservoir Expansion.

All alternatives would directly impact plant communities within the Los Vaqueros Watershed including mitigation plantings that compensated for impacts from the existing Los Vaqueros Reservoir. Grassland habitat would see the greatest impacts by area; however, impacts would also be incurred to oak woodland and savanna, riparian, chaparral, emergent and seasonal wetlands. Alternative 4 due to its smaller footprint, would minimize these affects.

Alternatives 1-3 would directly impact plant communities within and outside the Los Vaqueros Watershed, and affect mitigation plantings that compensated for impacts from the existing Los Vaqueros Reservoir. Grassland habitat would see the greatest impacts by area; however, impacts would also be incurred to oak woodland and savanna, riparian, chaparral, emergent and seasonal wetlands, tidal riverine, lacustrine, and cropland habitats (temporary).

The impacts described in Table 11 and Table 12 below include the total calculated temporary and permanent impacts for each habitat type from acreages provided in the EIS/EIR, and may be subject to change. If impact acreages were inconsistently described in the EIS/EIR, the highest impact acreage was chosen. Indirect impact acreages are not included for most habitats because they were not quantified in the EIS/EIR.

Grassland (includes California Annual Grassland Series and Purple Needlegrass Series)

Grassland habitat would be the primary plant community affected by inundation from reservoir expansion. Implementation of Alternatives 1 and 2 would result in 1,505.6 acres of impacts to grassland habitat (Reclamation and CCWD 2009). The expansion of the Los Vaqueros Reservoir and associated in-watershed facilities would cause the direct and permanent loss of 976.2 acres of annual grasslands, and the out-of-watershed facilities would cause the direct and permanent loss of 1.2 acres of annual grasslands. Temporary in-watershed impacts from construction would affect up to 46.8 acres of annual grassland habitat, and temporary out-of-watershed impacts would affect 266.8 acres of annual grassland habitat. There would also be permanent, indirect impacts to 214.6 acres of grassland habitat in the watershed. The above

Table 11. Alternatives 1-2 Impact Summary[d]

NCCP Habitat	Project Component		
Impact Type	**In-Watershed Facilities[a]**	**Out-of-Watershed Facilities**	**Total**
Grassland			
Temporary/Direct	46.80	266.8	313.6
Permanent[b]/Direct	976.2	1.200	977.4
Permanent/Indirect	214.6	0.000	214.6
Upland Scrub			
Temporary	0.500	0.000	0.500
Permanent	6.900	0.000	6.900
Valley/Foothill Riparian (primarily Fremont cottonwood)			
Temporary	2.500	1.630	4.130
Permanent	0.990	0.000	0.990
Valley/Foothill Woodland and Forest (primarily blue oak and valley oak)			
Temporary	28.60	0.000	28.60
Permanent	287.0	0.000	287.0
Upland Cropland			
Temporary	Not Provided	Not Provided	Not Provided
Permanent	Not Provided	Not Provided	Not Provided
Lacustrine (excluding the reservoir)			
Temporary	0.000	0.000	0.000
Permanent	1.250	0.000	1.250
Nontidal Freshwater Permanent Emergent			
Temporary	0.000	<0.650	<0.650
Permanent	2.540	0.220	2.760
Natural Seasonal Wetland			
Temporary	0.600	6.210	6.810
Permanent	1.850	0.860[c]	2.710
Tidal Freshwater Emergent			
Temporary	0.000	0.000	0.000
Permanent	0.000	0.220	0.220
Tidal Perennial Aquatic			
Temporary	0.000	0.500	0.500
Permanent	0.000	0.180	0.180
Total	1570.3	278.5	1848.8

[a] In-Watershed Facilities include the PG&E substation.
[b] Temporary impacts in this table combine both "temporary" and "long-term temporary" impacts as calculated in the Draft EIS/EIR.
[c] Transfer-Bethany Pipeline construction impacts to northern claypan vernal pools were categorized as "Permanent" because the claypan layer potentially may not be successfully restored post-construction.
[d] These calculations include impacts to both mitigation/compensation areas and non-mitigation/compensation areas.

Table 12. Sensitive Plant Community Impacts by Project Component under Alternatives 1 and 2[a] Source: Reclamation and CCWD 2009

Project Component	Temporary (Acres)	Permanent (Acres)	Total (Acres)
Reservoir Inundation Footprint and Dam			
Blue Oak Series	0.00	68.61	68.61
Bulrush-Cattail Series	0.00	2.54	2.50
Fremont Cottonwood Series	0.00	0.94	0.94
Purple Needlegrass Series	0.00	0.34	0.34
Saltgrass Series	0.00	0.08	0.08
Valley Oak Series	0.00	29.15	29.15
Valley Oak Mitigation Plantings	0.00	128.03	128.03
Blue Oak Mitigation Plantings	0.00	9.02	9.02
Subtotal	**0.00**	**238.67**	**238.67**
Other In-Watershed Facilities[b]			
Bush Seepweed Series	0.38	0.00	0.38
Blue Oak Series	5.73	18.79	24.53
Bulrush-Cattail Series	0.00	0.00	0.00
Fremont Cottonwood Series	0.02	0.05	0.07
Purple Needlegrass Series	0.09	0.23	0.32
Valley Oak Series	0.31	0.64	0.95
Valley Oak Mitigation Plantings	0.00	4.1	4.1
Subtotal	**6.53**	**19.71**	**26.25**
Delta Intake Facilities			
Bulrush-Cattail Series	0.08	0.22	0.30
Subtotal	**0.08**	**0.22**	**0.30**
Delta-Transfer Pipeline			
Saltgrass Series	0.30	0.00	0.30
Valley Oak Series	1.63	0.00	1.63
Subtotal	1.93	0.00	1.93
Transfer-LV Pipeline			
Bulrush-Cattail Series	0.24	0.00	0.24
Fremont Cottonwood Series	0.11	0.00	0.11
Saltgrass Series	0.22	0.00	0.22
Valley Oak Series	0.10	0.00	0.10
Subtotal	**0.67**	**0.00**	**0.67**
Transfer-Bethany Pipeline			
Bulrush-Cattail Series	0.23	0.00	0.23
Bush Seepweed Series	0.22	0.00	0.22
Saltgrass Series	0.95	0.00	0.95
Northern Claypan Vernal Pool Series[e]	0.00	0.86	0.86
Subtotal	**1.40**	**0.86**	**2.26**
Power Option 1[c]			
Northern Claypan Vernal Pool Series	0.00	0.00	0.00
Bulrush-Cattail Series	<0.1	0.00	<0.1
Bush Seepweed Series	0.00	0.00	0.00
Subtotal	**<0.1**	**0.00**	**<0.1**

Project Component	Temporary (Acres)	Permanent (Acres)	Total (Acres)
Power Option 2[c]			
Northern Claypan Vernal Pool Series	0.00	0.00	0.00
Bulrush-Cattail Series	<0.1	0.00	<0.1
Bush Seepweed Series	0.00	0.00	0.00
Fremont Cottonwood Series[d]	0.00	0.00	0.00
Subtotal	**<0.1**	**0.00**	**<0.1**
Total Impacts to Sensitive Habitats[d]			
Bush Seepweed Series	0.6	0.0	0.6
Blue Oak Series	5.73	87.40	93.14
Bulrush-Cattail Series	<0.65	2.76	3.41
Fremont Cottonwood Series	0.13	0.99	1.12
Northern Claypan Vernal Pool Series	0.86	0.00	0.86
Purple Needlegrass Series	0.09	0.56	0.66
Saltgrass Series	1.47	0.08	1.55
Valley Oak Series	2.04	29.79	31.83
Valley Oak Mitigation Plantings	0.00	132.13	132.13
Blue Oak Mitigation Plantings	0.00	9.02	9.02

[a] "Temporary" impacts, as used in this table, include habitats that would be degraded or similarly impaired, with features being restored *in situ* to emulate pre-project conditions. "Permanent" impacts are those that would permanently destroy features, with compensatory mitigation provided in alternate locations (Draft EIS/EIR).

[b] Other in-watershed facilities under Alternative 1and 2 includes the marina, marina access road, borrow area, picnic areas, trailhead parking, westside access road, Eastside trail, stockpile area, and parking areas.

[c] Plant community impacts for Power Supply infrastructure do not include the acreage of features that will be avoided by facilities or spanned by powerlines (this table does not include indirect impacts).

[d] These acreages differ from the Draft EIS/EIR, the correct acreages were obtained from ESA (B. Pittman, ESA, pers. comm. 2009)

[e] Transfer-Bethany Pipeline construction impacts to northern claypan vernal pools were categorized as "Permanent" because the claypan layer may not be successfully restored post-construction.

impact acreages include 686.9 acres of impacts to existing conservation easements for the existing Los Vaqueros Reservoir, which were to be maintained in perpetuity.

Reservoir expansion would permanently flood about 0.34 acre of purple needlegrass series habitat (see Figure 23). For other in-watershed facilities, the Westside access road would permanently affect 0.23 acre and temporarily affect 0.09 acre of this habitat type. The permanent impact area for purple needlegrass habitat includes 0.06 acre that could be periodically affected by wave action along the shoreline during reservoir operations. This impact is considered permanent because it would periodically result in the degradation or removal of grassland throughout the lifetime of reservoir operations.

Two large grassland areas (118.5 acres and 96.1 acres) on the west side of the reservoir would not be inundated or directly affected by the project; however, reservoir inundation would isolate these areas from surrounding grasslands. As a result, the project would contribute to the indirect loss of 214.6 acres of grassland habitat for habitation and dispersal of certain wildlife species.

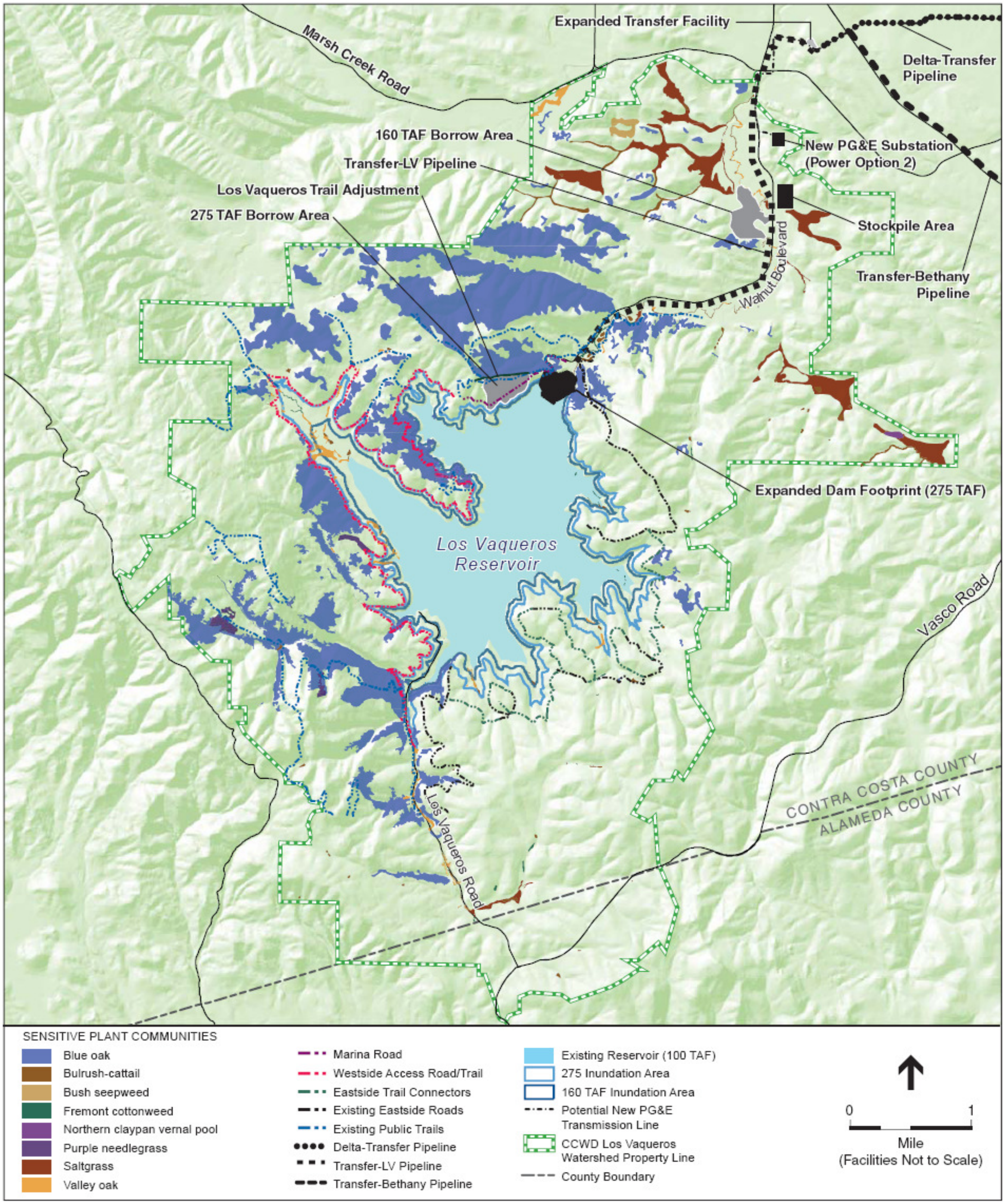


Figure 23. Potential Direct Impacts to Sensitive Plant Communities in Los Vaqueros Watershed
Source: Reclamation and CCWD 2009

In the Inlet/Outlet Pipelines construction area, construction activities would last for 2 years. The areas of disturbance would ultimately be restored to annual grasslands or oak woodland after project construction.

The Draft EIS/EIR states that permanent habitat impacts would be limited along pipeline alignments because the pipeline areas would be restored after construction. Permanent upland disturbances would be associated with small access vaults (about 100 square feet or 0.002 acre) and would be placed about every 1,000 feet along pipelines. Valve structures (roughly 10-foot square) would also be permanently placed every few hundred feet along pipeline routes, with less than an acre of anticipated habitat loss. Permanent habitat impacts due to access vault, blow-off valve, and vent installations along the pipeline alignments would equal less than 0.5 acre total. Other than these features, Reclamation and CCWD do not expect the pipelines to have permanent habitat impacts.

Under Power Option 1: Western Only, the proposed powerline alignment would traverse primarily agricultural areas in use for crops, irrigated pasturelands, and grazed annual grasslands. The Western substation would permanently affect 2.0 acres of annual grasslands habitat. The permanent access road to the substation facility, most likely from Camino Diablo Road, would likely use existing road easements with minimal habitat impacts.

As with Option 1, under Power Option 2: Western and PG&E, the proposed powerline alignment would traverse primarily agricultural areas in use for crops, irrigated pasturelands, and grazed annual grasslands. The PG&E substation would affect an estimated 2 acres annual grasslands habitat.

Species Impacts
The following special-status plant species were identified in and near the proposed project area and may be affected by the proposed project. Brittlescale and San Joaquin spearscale are found in alkali grasslands and occur near the staging and stockpile areas; in the Transfer-Bethany Pipeline alignment; and along the Western powerline alignment (see Figures 24 and 25).

Grassland habitat in the project area supports special-status wildlife species that may be affected by the proposed project. These include California red-legged frog, California tiger salamander, San Joaquin kit fox, Alameda whipsnake, western pond turtle, western burrowing owl, golden eagle, Swainson's hawk, prairie falcon, and American badger, among others. Project construction has the potential to directly affect these species by permanently or temporarily altering or inundating grassland habitat which provides, cover, foraging, roosting, denning, breeding, aestivation, wintering, and dispersal habitat. Of particular concern is the loss of foraging habitat for golden eagles. Based on information provided by CCWD, 7 to 8 pairs of eagles nest in or around the Los Vaqueros Reservoir watershed (CCWD 2009). Golden eagles in central California prey largely on black-tailed jack rabbits and California ground squirrels both of which are largely found in grassland communities. The loss of habitat and prey due to

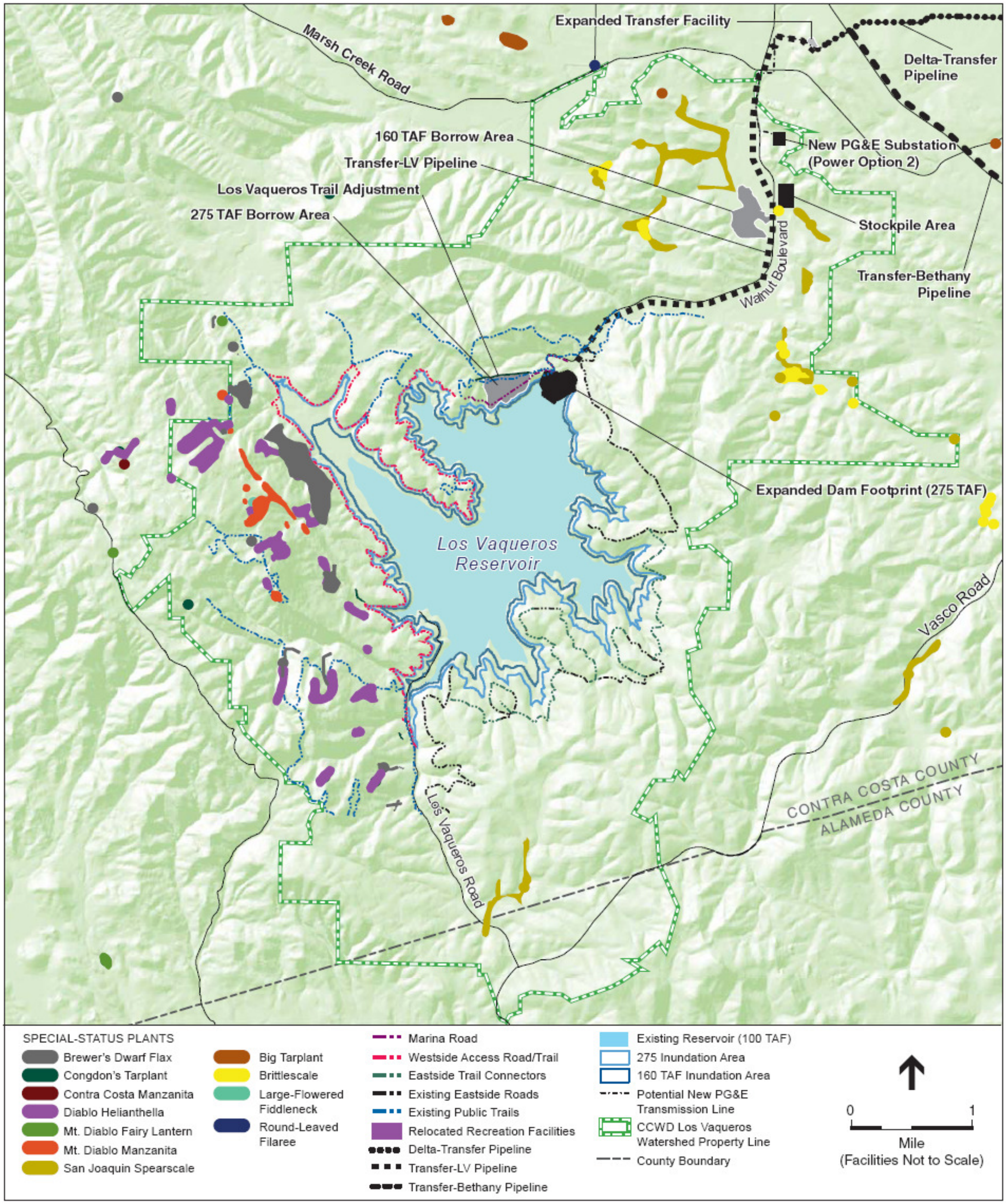


Figure 24. Distribution of Special-Status Plants in the Los Vaqueros Watershed
Source: Reclamation and CCWD 2009

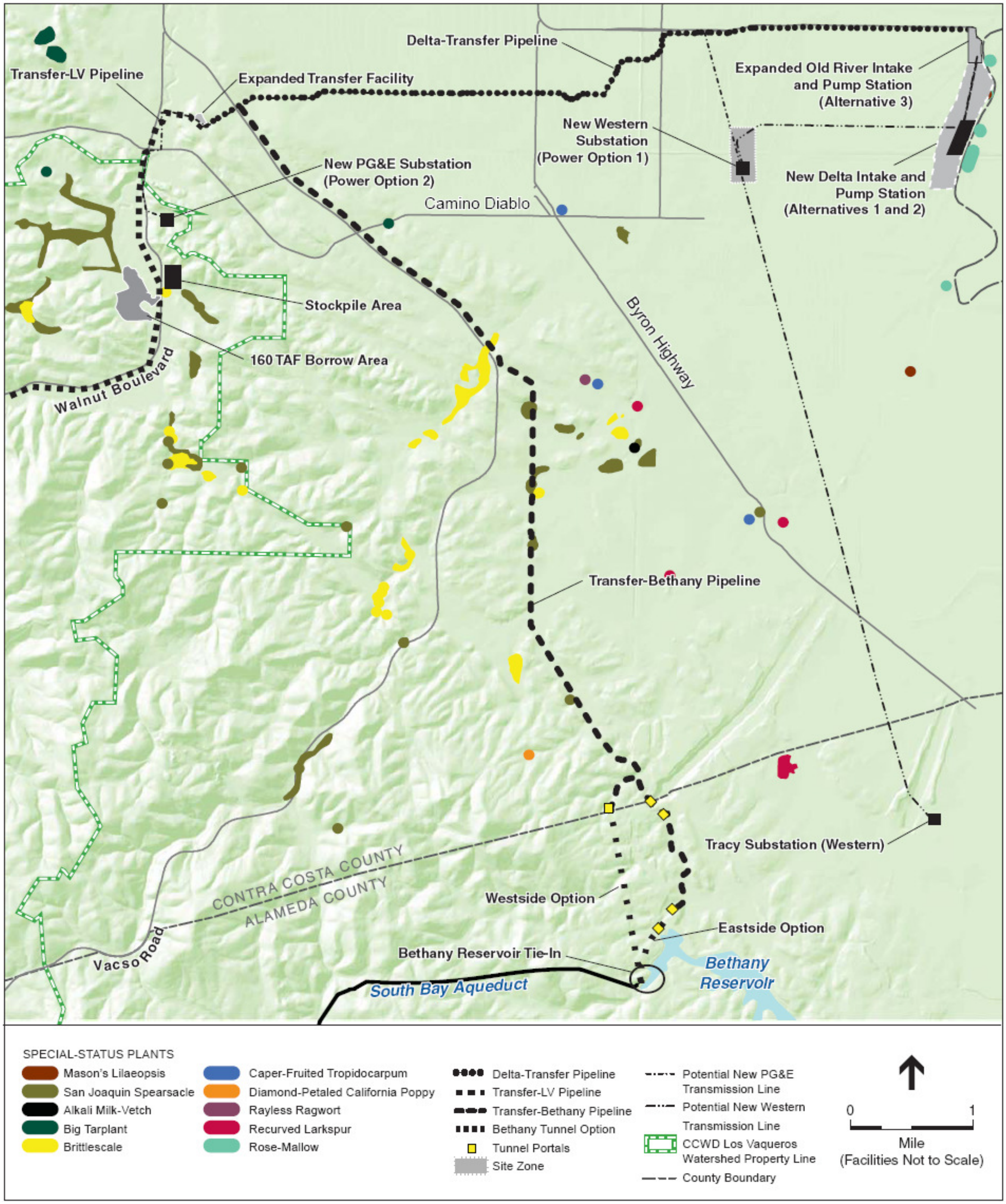


Figure 25. Distribution of Special-Status Plants along Pipeline Routes Outside of the Los Vaqueros Watershed

Source: Reclamation and CCWD 2009construction impacts and inundation could reduce prey availability and affect one or more pairs of golden eagles. Of particular concern is the pair of golden eagles which occupy the territory referred to by CCWD as Los Vaqueros. The Los Vaqueros pair will lose about 168 acres of foraging habitat as a result of Alternative 4, this represents about 10 percent of the pairs total territory. Due to the high density of breeding golden eagles within this area if this pair is displaced it is unlikely they would move to another area without displacing another pair of eagles.

All alternatives would result in varying amounts of both temporary and permanent impacts to existing San Joaquin kit fox easements within the watershed.

Within the watershed, large tracts of grassland surrounding the reservoir on the north, east, and south, and a smaller tract of grassland on the west provide corridors for wildlife movement in the watershed. Reservoir expansion to 275 TAF would inundate the remaining grassland area on the western side of the reservoir, thereby eliminating a potential wildlife movement corridor. This area is currently a 1,000 to 2,000-foot-wide strand of annual grassland habitat, with a few areas of oak woodland intrusion. With reservoir expansion, the waterline would seasonally inundate annual grasslands along this corridor and advance into upslope oak woodland. The oak woodland habitat may represent a movement barrier for certain wildlife species, such as San Joaquin kit fox. Mitigation through land acquisition and habitat protection is proposed to preserve and enhance other existing regional movement corridors, particularly those with documented San Joaquin kit fox use. However, the Draft EIS/EIR identified that the direct loss of this potential western movement corridor would be considered a potentially significant and unavoidable impact on San Joaquin kit fox movement opportunities.

Additionally, habitat disturbances in the Inlet/Outlet Pipelines construction area could extend for 3 years and render this area unusable as a wildlife movement corridor during that period.

Currently, no public access is allowed on the eastern side of the reservoir. The proposed Eastside trail would allow recreational use in this area, which could increase disturbance and make this area less attractive to wildlife. While the Draft EIS/EIR states that use of this Eastside trail is expected to be relatively low, opening this area to the public could have indirect effects on wildlife species that use these grassland areas such as increased disturbance, litter, and trespass into sensitive areas.

Upland Scrub Habitat (includes Common Manzanita Series, California Sagebrush Series, and Chamise Series)

Chaparral habitat comprises about 775 acres, or about 4 percent, of the watershed. Direct project impacts on scrub habitat include 6.9 acres of permanent impacts and about 0.5 acre of temporary impacts. Areas that would be affected include the borrow area (3.8 acres), marina road (0.6 acre), dam (1.9 acre), and reservoir inundation footprint (0.6 acre). Assuming that some affected areas could be re-vegetated, scrub habitat would be temporarily affected at the marina road (0.3 acre), inundation footprint (0.2 acre), and westside access road (0.01 acre). All of these impacts would occur within existing conservation lands.

Species Impacts
Brewer's dwarf-flax, a special-status plant species, was identified in and near the proposed project area and may be affected by the proposed project. Brewer's dwarf-flax was found in upland scrub habitat and could be directly affected by reservoir inundation and by relocation of the Westside access road (see Figure 24).

Upland scrub habitat in the project area supports special-status wildlife species that may be affected by the proposed project. These include Alameda whipsnake, San Joaquin whipsnake, golden eagle, California thrasher, loggerhead shrike, and Bell's sage sparrow, among others. Project construction has the potential to directly affect these species by permanently or temporarily altering or inundating upland scrub habitat which provides, cover, foraging, roosting, breeding, aestivation, and dispersal habitat. Indirect impacts from grading and other construction activities in scrub and non-scrub habitat could include noise or vibration that could disturb wildlife such as reptiles.

Valley/Foothill Riparian (includes Fremont Cottonwood Series and Valley Oak Series)
Alternative 1 would impact a total of 5.12 acres of valley/foothill riparian habitat (principally cottonwood habitat). Direct, permanent impacts to riparian habitat include 0.99 acres and direct, temporary impacts include 4.13 acre. These impacts include 3.05 acres of permanent impacts to existing valley/foothill riparian conservation areas (see Figures 26-31).

Reservoir expansion to 275 TAF would inundate and permanently eliminate 0.94 acre of Fremont cottonwood habitat. An additional 0.07 acre of cottonwood habitat could be directly affected during construction of the Westside access road (permanent 0.05 acre) and Eastside trail (temporary 0.02 acre).

During construction the reservoir would be drained and flows to Kellogg Creek would be bypassed around the dam at a flow rate of about 5 cubic feet per second. The downstream reach of Kellogg Creek would receive bypassed flows during the construction period and would also continue to receive flows from the lower watershed during this period.

About 0.78 acre of the prior onsite wetland mitigation commitments for riparian habitat would be permanently flooded to accommodate an increase in reservoir levels to 275 TAF. In addition, about 2.27 acres of riparian mitigation habitat would be impacted by grading, dewatering, trenching, and other construction activities within the Inlet/Outlet Pipelines construction area. In the Inlet/Outlet Pipelines construction area, construction activities would last for 2 years.

After the project is implemented, the expanded reservoir would increase the amount of available open-water habitat.

Bald eagles forage and winter within the watershed, but currently do not nest in the watershed. Expansion of the reservoir is expected to have negative effects on bald eagle habitat during construction, but may have beneficial effects on this species in the long-term. Potential adverse impacts would include loss of wintering and foraging habitat during construction, and loss of some roosting trees. Reservoir draining and refilling would directly impact habitat availability for bald eagles. However, the increased inundation area would result in the creation of more

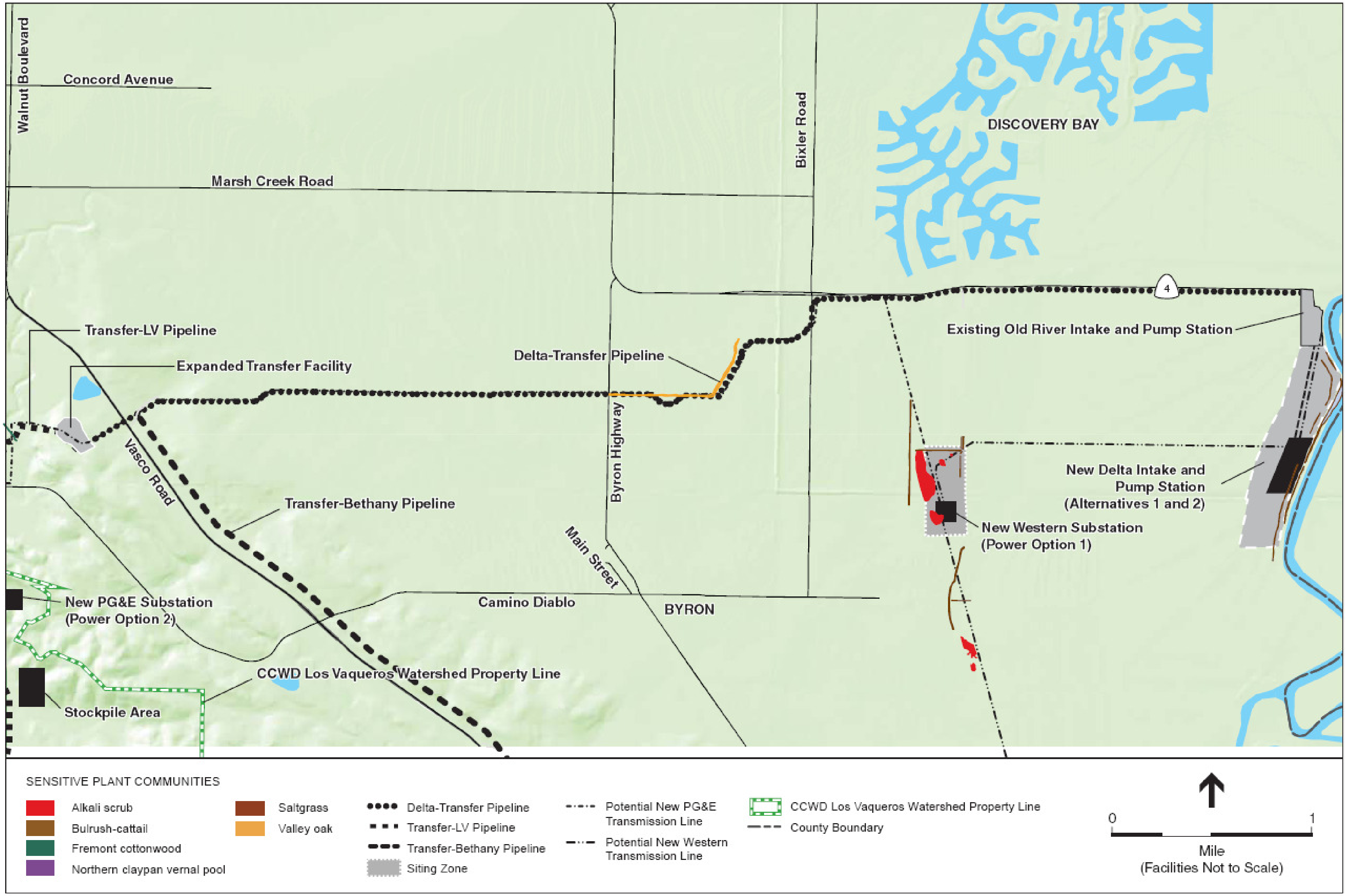


Figure 26. Potential Direct Impacts to Sensitive Plant Communities in Vicinity of the Delta Intake and Pump Station Facilities and Along the Delta-Transfer Pipeline
Source: Reclamation and CCWD 2009

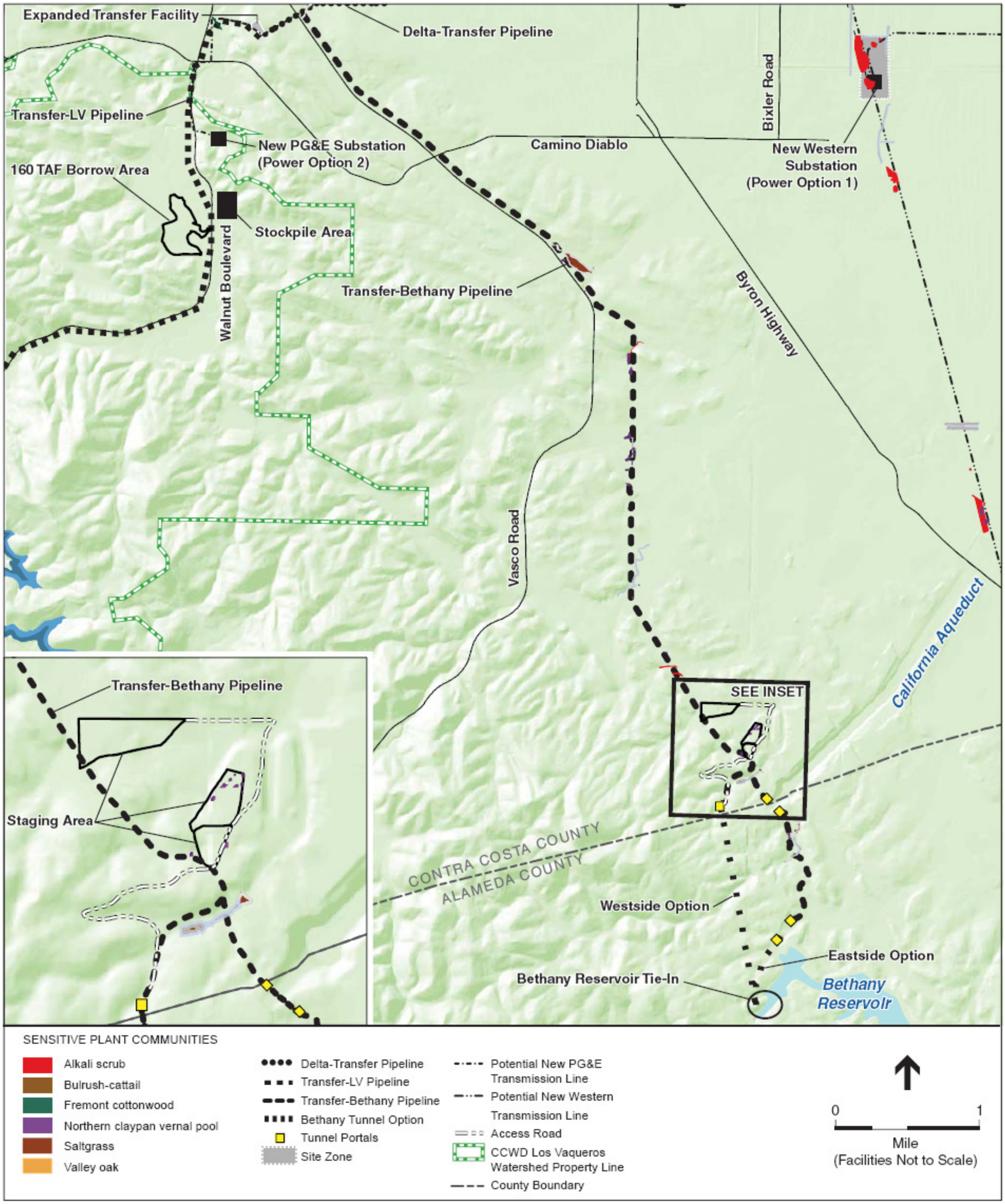


Figure 27. Potential Direct Impacts to Sensitive Plant Communities in Vicinity of the Transfer-Bethany Pipeline and Western Transmission Line
Source: Reclamation and CCWD 2009

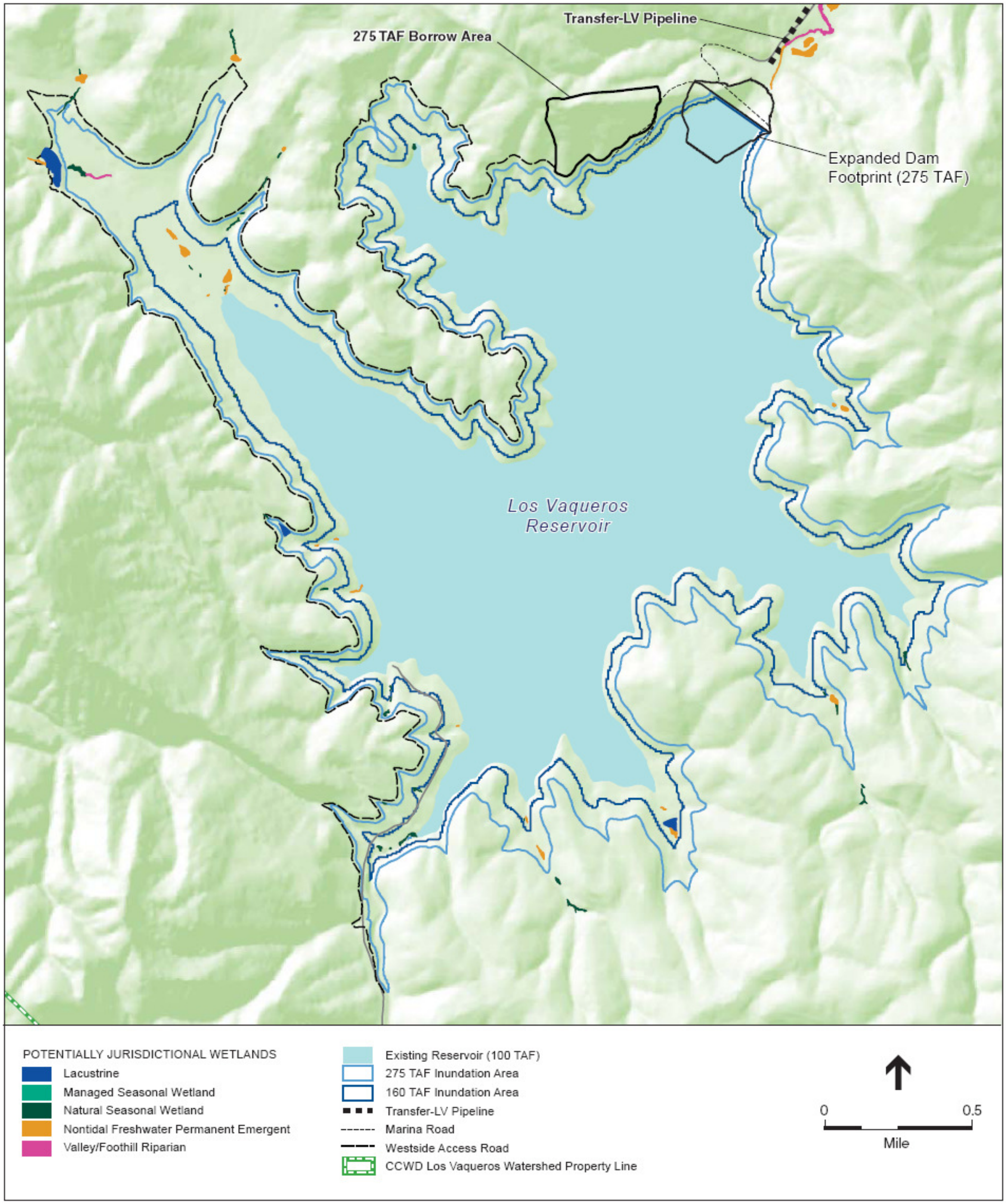


Figure 28. Potentially Jurisdictional Wetlands in the Vicinity of the Los Vaqueros Reservoir
Source: Reclamation and CCWD 2009

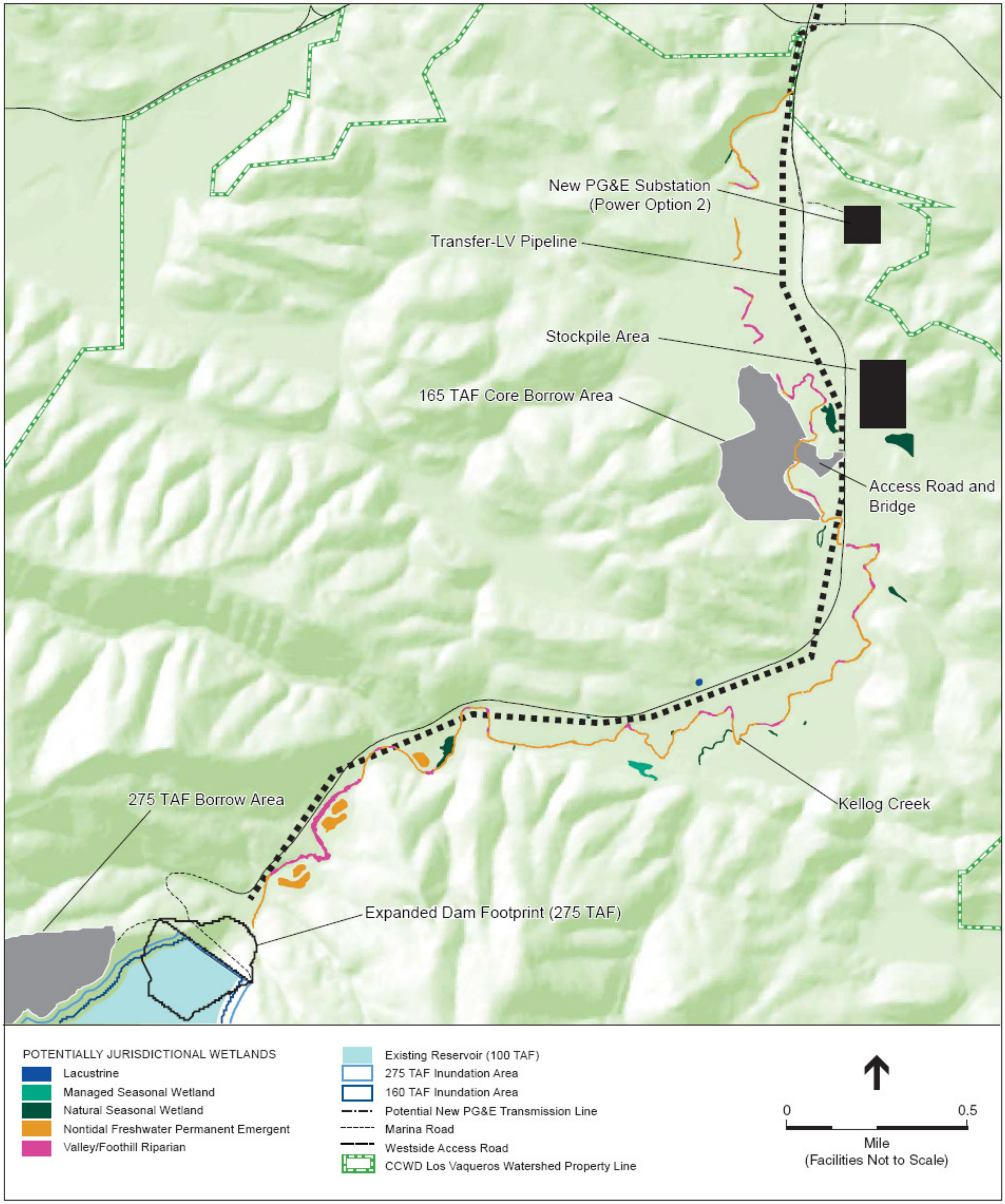
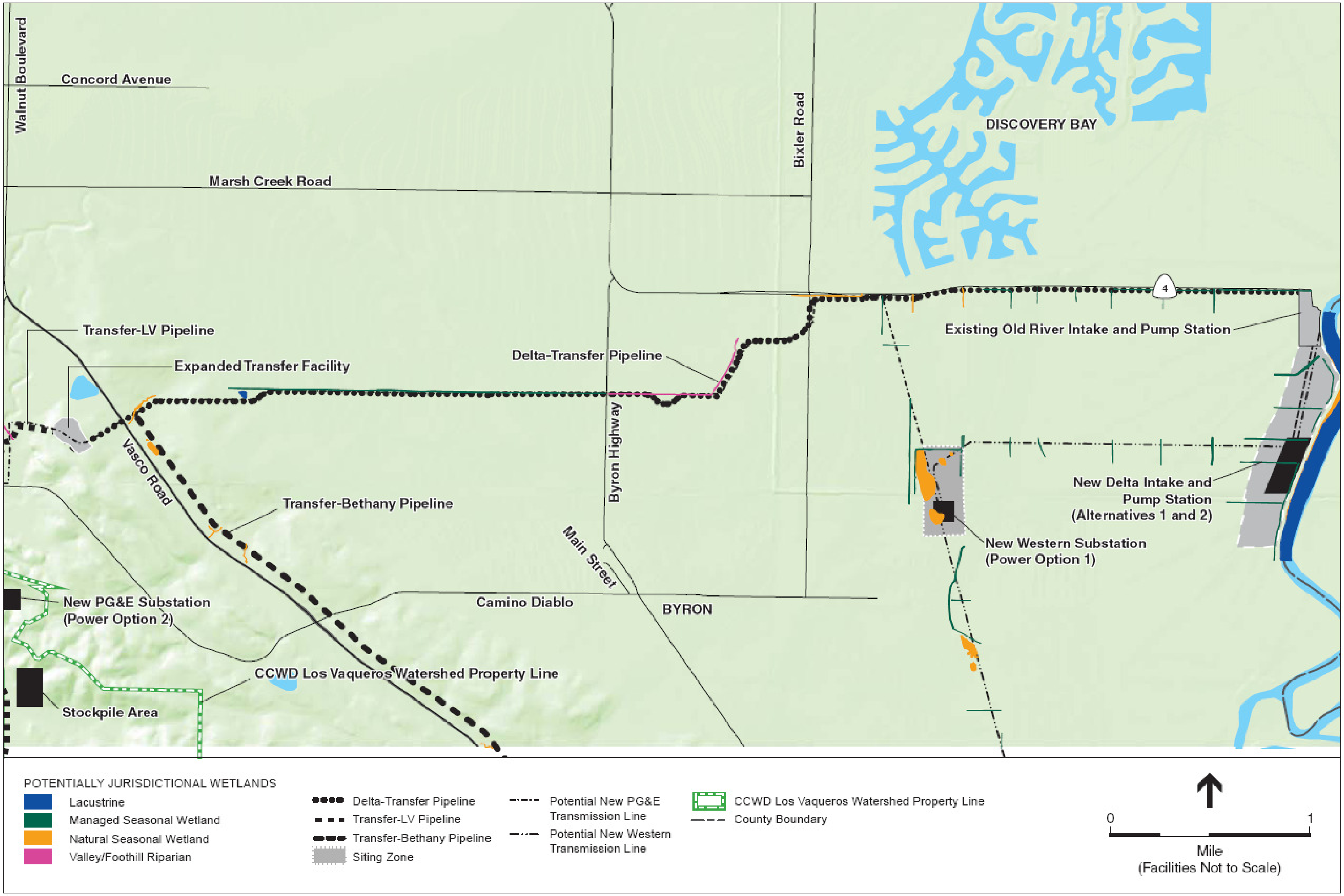


Figure 29. Potentially Jurisdictional Wetlands in the Vicinity of Other In-Watershed Facilities

Source: Reclamation and CCWD 2009



*Old River is mislabeled as Lacustrine, Old River should be labeled as Tidal Riverine or Tidal Perennial Aquatic

Figure 30. Potentially Jurisdictional Wetlands in the Vicinity of the Delta Intake and Pump Station Facilities and Along the Delta-Transfer Pipeline
Source: Reclamation and CCWD 2009

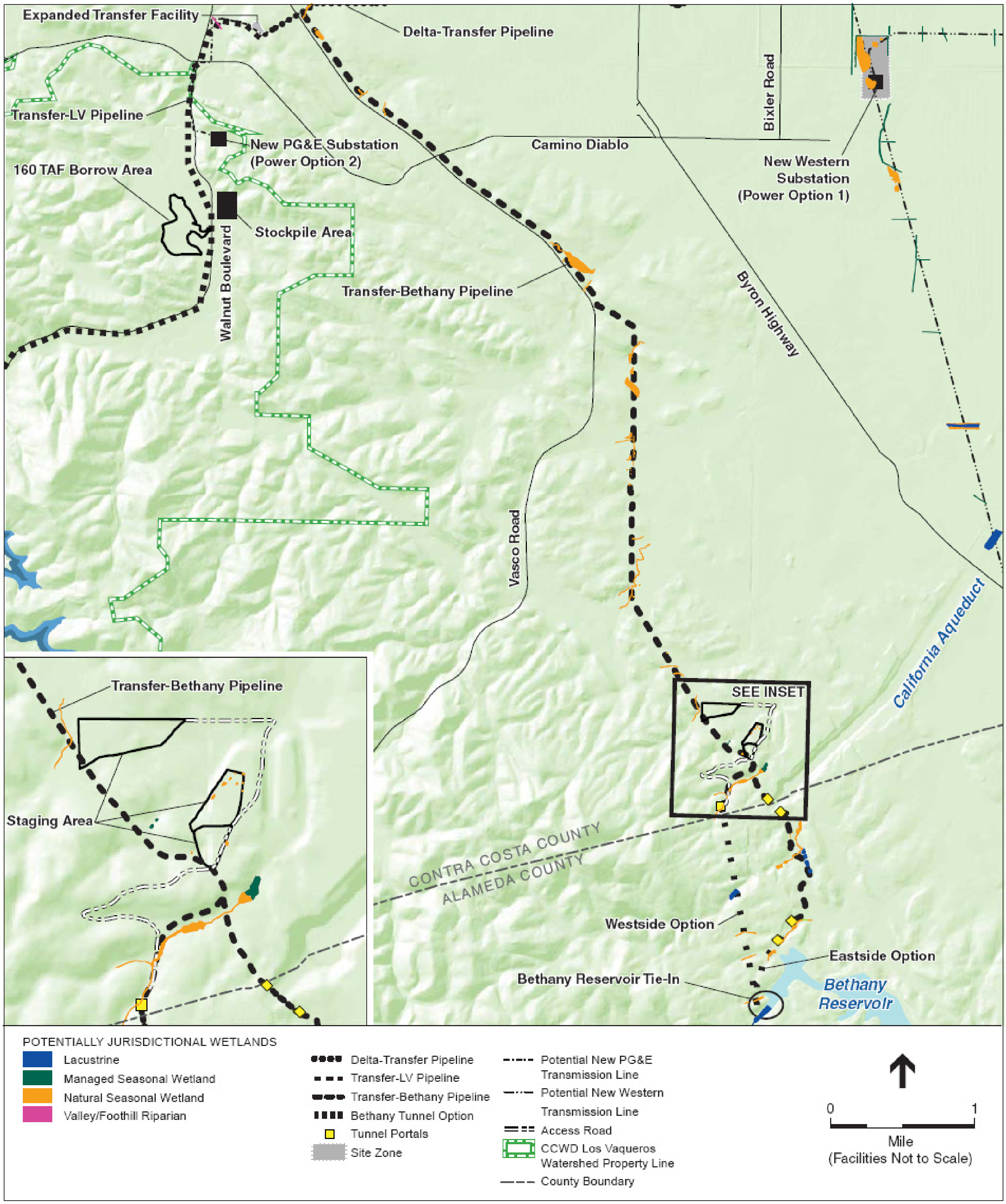


Figure 31. Potentially Jurisdictional Wetlands in the Vicinity of the Transfer-Bethany Pipeline and Western Transmission Line
Source: Reclamation and CCWD 2009

snags, thus creating new roosting habitat. Beneficial effects may include increased foraging opportunities due to a larger reservoir as well as increased shoreline length. This increase could result in more bald eagles using the site for overwintering or initiating nesting in the watershed.

In the long-term, reservoir expansion is expected to increase open water habitat for migratory waterfowl, grebes, cormorants, terns, osprey, bald eagle, and other bird species.

The Transfer-LV Pipeline alignment traverses Kellogg Creek at six locations, of which five are within the watershed (see Figures 26-31). The character of Kellogg Creek varies between crossing sites, with two sites supporting ephemeral flows and four sites supporting perennial water. Of the two locations with ephemeral conditions, one is between the Transfer Station Facility and Walnut Boulevard and the other is in the watershed, north of CCWD's administrative office. These locations are generally unvegetated (or indistinct from surrounding upland non-native grassland), but are steeply incised. The four crossing locations with perennial conditions in the watershed support some willow scrub and scattered oaks, but portions of the banks are unvegetated except for non-native annual grasses and ruderal species. Open trench construction would be utilized at all crossing locations (Reclamation and CCWD 2009). These impacts would not occur with Alternatives 3 and 4.

Installation of the pipeline would result in temporary impacts to 0.67 acre of wetland features (including riparian habitat); Reclamation and CCWD expect no permanent impacts to potentially jurisdictional features. The Transfer-LV Pipeline intersection with Kellogg Creek, west of the Transfer Facility, could temporarily affect about 0.11 acre of Fremont cottonwood habitat and 0.10 acre of valley oak habitat, which would be restored after project implementation. These impacts would not occur with Alternatives 3 and 4.

Within the Delta-Transfer Pipeline corridor, up to 1.63 acres of valley oak riparian vegetation along Kellogg Creek could be temporarily disturbed during grading and trenching to install the pipeline, and restored after project completion. The existing easement is south of the creek, but some disturbance could occur if the construction corridor is constrained by other sensitive habitat features. These impacts would not occur with Alternatives 3 and 4.

Under Power Option 2: Western and PG&E, Kellogg Creek is the only identified jurisdictional wetland in the PG&E study area. Powerlines would traverse the creek at two locations and poles would be sited outside of the creek corridor. These impacts would not occur with Alternatives 3 and 4.

Species Impacts
Valley/foothill riparian habitat in the project area supports special-status wildlife species that may be affected by the proposed project. These include California red-legged frog, California tiger salamander, valley elderberry longhorn beetle, yellow warbler, yellow-breasted chat, Cooper's hawk, sharp-shinned hawk, and western pond turtle, among others. Project construction has the potential to directly affect these species by permanently or temporarily altering or inundating riparian habitat, which provides, cover, foraging, breeding, wintering, and dispersal habitat.

Valley/Foothill Woodland and Forest (includes Blue Oak Series, Mixed Oak Series, Interior Live Oak Series, Coast Live Oak Series, Valley Oak Series (Non-Riparian), and California Bay Series)
Oak habitat covers 3,010 acres, or 18 percent of the watershed, and is the second most common habitat type within the watershed. Alternatives 1 – 3 would impact a total of 315.6 acres of valley/foothill woodland and forest habitat. The proposed project would cause the direct and permanent loss of 287 acres of oak woodlands. Permanent impacts include 114.3 acres of blue oak woodland and forest and 9.02 acres of blue oak mitigation lands, 31.6 acres of valley oak woodland and forest, and 132.1 acres of valley oak mitigation lands. Temporary in-watershed impacts from construction would affect up to 28.6 acres of valley/foothill woodland and forest habitat.

About 68.61 acres of blue oak habitat would be affected by inundation, and another 5.73 acres would be temporarily and 18.79 acres permanently affected by construction of the other in-watershed facilities.

About 29.15 acres of valley oak habitat would be inundated and 0.95 acre could be affected by construction of the westside access road and other in-watershed facilities.

Prior onsite mitigation commitments for terrestrial oak woodland habitat would be impacted by grading, dewatering, trenching, and other construction activities related to dam modification and/or permanently flooded due to reservoir expansion to 275 TAF. Permanent habitat losses would include the inundation of 125 acres of mitigation (*i.e.*, planted) valley oak savannah, 3.03 acres of valley oak woodland, and 9.02 acres of blue oak woodland. Additionally, about 4.1 acres of mitigation valley oak savannah would be permanently lost to construction of the dam and associated Inlet/Outlet Pipelines.

Indirect impacts to oak woodlands near the inundation area may result from an increase in wave action and soil moisture content. These impacts may eventually weaken oaks surrounding the inundation area by reducing the amount of oxygen available to roots and also by increasing soil erosion, which may eventually cause death. California oak species vary in tolerance to flooding, with blue oak considered the least tolerant and valley oak the most tolerant (Jacobs *et al*. 1997). Increases in soil moisture content can reduce soil aeration and oxygen diffusion to roots. Low soil oxygen, or hypoxia, inhibits root growth and diminishes tree vigor. Moreover, hypoxia stress may predispose a plant to disease and insect pests; particularly root rots (Jacobs *et al*. 1997). The effects to oak trees surrounding the enlarged inundation area should be evaluated after the enlarged reservoir has operated for 2 to 3 years.

Species Impacts
Based on surveys, one special-status plant species was identified in oak woodland habitat and may be affected by the proposed project. Brewer's dwarf-flax could be directly affected by reservoir inundation and by relocation of the westside access road (see Figure 24 above).

Oak woodland and forest habitat in the project area supports special-status wildlife species that may be affected by the proposed project. These species include bald eagle, golden eagle, white-tailed kite, long-eared owl, oak titmouse, and bats, among others. Project construction has the potential to directly affect these species by permanently or temporarily altering or inundating valley/foothill woodland and forest habitat which provides, cover, foraging, breeding, wintering, aestivation, and dispersal habitat.

A golden eagle nest site is 16 feet from the shoulder of the proposed westside access road. Aside from potential construction effects, this road would also be used for recreational purposes (and subject to seasonal closures if golden eagle nesting is identified nearby. Impacts include potential disturbance of this nest site from westside access road use. Human disturbance during construction and operation of the reservoir could result in nest abandonment or nest failure as parent eagles are disturbed or are unable to return to the nest to care for eggs or young.

Upland Cropland (Cropland)
Cropland habitat occurs in and near portions of the Transfer-LV Pipeline, Delta-Transfer Pipeline, Transfer-Bethany Pipeline, Delta Intake and Pump Station, and Power Options 1 and 2. Acres of impact to this habitat type were not included in the Draft EIS/EIR.

Permanent habitat impacts would be limited along pipeline alignments because the pipeline areas would be restored after construction. Permanent upland disturbances would be associated with small access vaults (about 100 square feet or 0.002 acre) and would be placed about every 1,000 feet along pipelines. Valve structures (roughly 10-foot square) would also be permanently placed every few hundred feet along pipeline routes, with less than an acre of anticipated habitat loss. Permanent habitat impacts due to access vault, blow-off valve, and vent installations along the pipeline alignments would equal less than 0.5 acre total. Other than these features, the pipelines are not expected to have permanent habitat impacts.

Under Power Option 1: Western Only, the proposed powerline alignment would traverse primarily agricultural areas in use for crops, irrigated pasturelands, and grazed annual grasslands.

As with Option 1, under Power Option 2: Western and PG&E, the proposed powerline alignment would traverse primarily agricultural areas in use for crops, irrigated pasturelands, and grazed annual grasslands.

Species Impacts
Impacts to this habitat type may impact the following species: voles, mice, bats, mourning doves, pheasants, California horned lark, and several blackbird species. Impacts may also include a reduction in foraging opportunities for raptor species such as Swainson's hawk, red-tailed hawk, northern harrier, western burrowing owl, and white-tailed kite. Western pond turtles that use agricultural irrigation channels and associated upland cropland may also be affected.

Lacustrine (Open Water)
Excluding the reservoir, the proposed project would result in 1.25 acres of permanent impacts to lacustrine habitat (4 pond features).

De-watering the reservoir would result in the loss of 1,500 acres of lacustrine habitat, but the size of the inundation area would increase to 2,500 acres of lacustrine habitat after construction; a net increase of 1,000 acres. Draining the reservoir, completing dam construction, and re-filling the reservoir is expected to take between 3-4 years.

Species Impacts
Los Vaqueros Reservoir is used as a stopover for many water-dependent species of waterfowl and shorebirds on the Pacific Flyway. The Mt. Diablo Audubon Society documented 72,212 birds among 165 different species of birds in their 2006 Christmas bird count. Of these, 53 species are at least partially dependent upon freshwater marsh or open-water habitat provided by the reservoir. Waterfowl species that frequent the reservoir include the Canada goose, wood duck, gadwall, American wigeon, mallard, northern shoveler, northern pintail, green-winged teal, canvasback, redhead, ring-necked duck, greater scaup, lesser scaup, bufflehead, common goldeneye, hooded merganser, common merganser, and ruddy duck. Other birds noted in association with the reservoir include grebes, sandpipers, pelicans, cormorants, egrets, herons, and gulls.

Birds use the reservoir throughout the year. The 3-year or longer absence of open-water and freshwater marsh habitat at the reservoir during dam construction would temporarily eliminate foraging and stop-over habitat on the Pacific Flyway that has been available to migrating waterfowl since 1998. Elimination of open-water areas would temporarily eliminate foraging opportunities and force migrants to use other nearby aquatic locations. During dam construction, water-dependent migratory birds are expected to use other nearby reservoirs and water bodies as foraging and stop-over locations.

Palustrine (Nontidal Freshwater Permanent Emergent [includes Bulrush-Cattail Series and Spikerush Series])
The reservoir expansion and construction of other facilities both in and outside of the watershed have the potential to result in losses to the nontidal freshwater permanent emergent plant community (see Figures 28-31). Total impacts to nontidal freshwater permanent emergent habitat would be 3.41 acres. These include 2.76 acres of permanent impacts, and less than 0.65 acre of temporary impacts. About 1.57 acres of permanent impacts to prior mitigation commitments are also included in these impacts.

Seventeen features would be affected by reservoir inundation and in-watershed construction activities. About 2.5 acres of cattail-bulrush habitat would be permanently affected by dam construction and an additional 0.04 acre of nontidal freshwater permanent emergent habitat would be permanently affected by other in-watershed activities.

About 1.57 acres of the prior onsite mitigation commitments for freshwater emergent wetland habitat would be permanently inundated by reservoir expansion, as follows: (1) the spring mitigation site, which has one 0.15-acre emergent marsh; (2) the Clear Lake mitigation site, which has four emergent marsh features totaling 1.24 acres; and (3) the Canyon mitigation site, which has one 0.18-acre emergent marsh.

During construction the reservoir would be drained and flows to Kellogg Creek would be bypassed around the dam at a flow rate of about 5 cubic feet per second. The downstream reach of Kellogg Creek would receive bypassed flows during the construction period and would also continue to receive flows from the lower watershed during this period.

The Transfer-LV Pipeline intersection with Kellogg Creek, west of the Transfer Facility, could temporarily affect about 0.24 acre of bulrush-cattail habitat, which would be restored after project implementation.

About 0.23 acre of bulrush-cattail habitat could be temporarily affected along the Transfer- Bethany Pipeline crossings of Brushy Creek and other unnamed drainages along the corridor. These areas would be restored after the project is completed.

The new Delta Intake and Pump Station facility footprint would temporarily impact 0.08 acre of emergent wetland habitat within engineered irrigation canals and ditches within agricultural portions of the project area. This facility would also permanently impact about 0.22 acre of bulrush-cattail habitat.

Under Power Option 1: Western Only, agricultural irrigation ditches and small seasonal wetlands are present throughout the Western powerline alignment. Several portions of the powerline alignment support wetlands (including bulrush-cattail) that would be spanned by powerlines. These areas are north and east of the Western substation siting zone. Due to flexibility in facilities siting, the Western substation location would be sited within the study area to minimize impacts to sensitive plant communities. It is expected that sensitive plant communities would be avoided by project design,

largely by spanning wetland habitats with powerlines. Less than 0.1 acre of temporary impacts to bulrush-cattail habitat would occur by implementing Power Option 1.

As with Option 1, under Power Option 2: Western and PG&E, agricultural irrigation ditches and small seasonal wetlands are present throughout the Western powerline alignment and would be spanned (including bulrush-cattail series). Because no sensitive plant communities were found in the area of the proposed PG&E substation, no impacts are expected to occur to sensitive plant communities. Less than 0.1 acre of temporary impacts to bulrush-cattail habitat would occur by implementing Power Option 2.

If both construction and restoration are not completed within a year for the temporary impacts described above, the Service would consider these impacts as permanent.

Species Impacts
Nontidal freshwater permanent emergent habitat in the project area supports special-status wildlife species that may be affected by the proposed project. These species include California red-legged frog, California tiger salamander, western pond turtle, tricolored blackbird, and bats, among others. Project construction has the potential to directly affect these species by permanently or temporarily altering, de-watering, or inundating nontidal freshwater permanent emergent habitat, which provides, cover, foraging, breeding, and dispersal habitat.

Palustrine (Natural Seasonal Wetland [includes Northern Claypan Vernal Pool, Bush Seepweed Series, and Saltgrass Series])
Construction and operation of Alternatives 1 and 2 would result in a total of 9.52 acres of impacts to natural seasonal wetland habitat (this does not include potential impacts to vernal pools down-gradient of the Transfer-Bethany Pipeline because they were not quantified). This includes 2.71 acres of permanent impacts and 6.81 acres of temporary impacts to this habitat type.

A number of ponds constructed as mitigation for the existing Los Vaqueros Reservoir would be impacted by construction of the proposed project. In the Inlet/Outlet Pipelines area, construction activities would last for 2 years. Five alkali marsh ponds in this area, each of which supports California red-legged frog breeding, would be subject to long-term (i.e., greater than 1 year) dewatering during construction, as Los Vaqueros Reservoir will be unavailable as a water source during this period. An additional six marsh ponds, a number of which support California tiger salamander and California red-legged frog breeding, would be inundated by the enlarged reservoir.

About 0.08 acre of saltgrass series (alkali marsh) habitat would be permanently impacted in the 275-TAF inundation zone in stock ponds and stream channels north and east of the reservoir. About 0.38 acre of bush seepweed habitat would also be temporarily affected by construction of in-watershed facilities.

A single rock outcrop within in the watershed containing a number of unique vernal pools and known as the Kellogg Creek vernal pool complex is about 0.20 mile east and upslope from the proposed 275-TAF waterline. This location would not be directly affected by the reservoir inundation or proposed in-watershed facilities.

The proposed Eastside trail would provide public hiking access to shoreline areas. Trail construction and public access would not occur within 500 feet of the Kellogg Creek vernal pool complex; therefore, direct impacts are not anticipated from trail construction or lawful use of trails. However, use of lands within 200 feet of the complex, which was the threshold established under the Service's 1995 BO, provides the possibility for trespass and permanent damage to the Kellogg Creek vernal pool complex. The Kellogg Creek vernal pool complex could be subject to indirect disturbance as a result of recreational users on trails and in the vicinity accessing the area resulting in habitat degradation.

A limited amount of saltgrass series habitat (0.22 acre) in the watershed could be temporarily affected (see Figure 23 above) by trenching and grading activities associated with Transfer-LV Pipeline construction. After construction, disturbed areas would be restored to pre-project conditions.

The Delta-Transfer Pipeline alignment traverses eight drainages. Of these, four are small, maintained irrigation channels that do not support emergent vegetation, the other four are blue-line drainages[4]. Of these, two are large, maintained, unvegetated drainage ditches near Discovery Bay where the alignment parallels State Route 4. These features are about 15 feet wide, with an initial anticipated impact of 0.07 acre each. The other two features are alkali wetlands, one from the above-described area and the other just east of Vasco Road. The first of these features is a deep, trapezoidal channel that supports iodine bush, saltgrass, and a few willows. This feature measures about 40 feet across at the top of the bank and 15 feet at ordinary high water. The anticipated impact to wetlands at this site would be about 0.07 acre. The second feature, the blue-line drainage near Vasco Road, supports a broad alkali swale dominated by saltgrass and saltbush that varies in width from an estimated 10 feet to 40 feet. The total anticipated impact to this feature is 2.97 acres.

After pipeline installation, the drainage features would be restored on site. No access vaults would be installed within jurisdictional drainages that occur along the pipeline corridor. Installation of the pipeline would result in the temporary impacts of 3.18 acres; no permanent impacts to these features are anticipated.

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[4] A *blue-line* stream is one that flows for most or all of the year and is distinguished on U.S. Geological Survey topographic maps with a solid blue line.

Installation of the Transfer-Bethany Pipeline would result in estimated temporary impacts to 3.03 acres of wetlands. Fifteen potentially jurisdictional drainages are on the Transfer-Bethany Pipeline alignment, including Brushy Creek (at Armstrong Road), six small, ephemeral unnamed drainages tributary to Brushy Creek, and eight unnamed tributaries to various unnamed channels in the Delta. Of these, five unnamed features are characterized as intermittent alkali swales that generally support saltbush, saltgrass, and associated saline-adapted species. These intermittent features vary in width from narrow incised channels to broad alkaline meadows greater than 40 feet wide.

Another five unnamed intermittent drainages are generally unvegetated (or indistinct from surrounding upland non-native grassland), but are incised. Lastly, the alignment crosses Brushy Creek where the drainage crosses Armstrong Road. Brushy Creek is an intermittent stream that is somewhat degraded due to cattle access. Brushy Creek supports some cattails but portions of the banks are unvegetated except for non-native annual grasses and ruderal species. Trenching and grading along the Transfer-Bethany Pipeline crossings of Brushy Creek and other unnamed drainages could temporarily disturb up to 0.22 acre of bush seepweed vegetation. These areas would be restored after the project is completed.

Saltgrass series habitat (0.95 acre) is present within and right next to sections of the Transfer-Bethany Pipeline alignment. Project construction in the vicinity of this habitat could directly affect water quality in these features. Ground-disturbing activities such as trenching and grading, vegetation clearing, and construction materials storage could result in the direct loss of habitat and/or degradation of water quality. Seasonal wetlands would be restored wherever feasible, but it may not always be possible to restore all ponds on site; therefore, impacts could be permanent in some areas.

In addition, surveys identified 0.86 acre of northern claypan vernal pool habitat (16 alkali pools) in the Transfer-Bethany Pipeline study area. It is presumed that this project component would permanently affect up to 0.86 acre of northern claypan vernal pool habitat. These areas would be restored after the project is completed. Even with surface restoration, the installation of the pipeline may affect local vernal pool hydrology in pools outside the alignment by altering surface flows, groundwater flow, or infiltration rates, and reducing the quality or extent of the overall vernal pool complex outside the project alignment. If the hardpan layer is not appropriately restored following construction, the installation of the Transfer-Bethany Pipeline through this area could have a permanent, direct impact on vernal pools within the pipeline construction corridor and could have indirect effects on down-gradient pools through alteration of topography and/or changes to soil infiltration rates in surface soils.

Under Power Option 1: Western Only, agricultural irrigation ditches and small seasonal wetlands are present throughout the Western powerline alignment. Several portions of the powerline alignment support natural seasonal wetlands (bush seepweed and northern claypan vernal pool) that would be spanned by powerlines. These areas are north and east of the Western substation siting zone. Natural seasonal wetland habitat (bush seepweed) was also identified at the proposed Western substation site. Due to flexibility in facilities siting, the Western substation location would be sited within the study area to minimize impacts to sensitive plant communities (Reclamation and CCWD 2009). The Service agrees with this assessment and expects that sensitive plant communities would be avoided by project design, largely by spanning natural seasonal wetland habitats with powerlines.

As with Option 1, under Power Option 2: Western and PG&E, the proposed powerline alignment would span natural seasonal wetlands (bush seepweed and northern claypan vernal pool). Alkali pools are found just north of the Skinner Delta Fish Protective Facility. This area would be avoided by siting poles away from seasonal wetlands and restricting vehicle access in sensitive areas. Wetlands were not found at the PG&E substation site. The Service does not anticipate wetland impacts from the PG&E substation and distribution line.

Species Impacts
Brittlescale and San Joaquin spearscale occur in alkali seasonal wetlands and were identified in and near the proposed project area and may be affected by the proposed project. Critical habitat for Contra Costa goldfields may also be impacted by construction of the proposed project (see Figures 24 and 25 above).

Seasonal wetland habitat in the project area supports special-status wildlife species that may be affected by the proposed project. These include California red-legged frog, California tiger salamander, vernal pool fairy shrimp (and vernal pool fairy shrimp critical habitat), mid-valley fairy shrimp, coast horned lizard, western pond turtle, and shorebirds, among others. Project construction has the potential to directly affect these species by permanently or temporarily altering seasonal wetland habitat, which provides, cover, foraging, breeding, and dispersal habitat.

<u>Tidal Aquatic Habitats and Associated Species</u>
Palustrine (Tidal Freshwater Emergent [includes Bulrush-Cattail Series])
The New Delta Intake and Pump Station would impact nontidal freshwater permanent emergent habitat on the west bank of Old River. The facility footprint would permanently impact a total of 0.22 acre of bulrush-cattail habitat.

Species Impacts
Rose-mallow populations were identified at the site for the new Delta Intake and Pump Station, as well as in nearby areas outside the proposed project area. These populations may be directly or indirectly affected by construction and operation of the proposed project. Nearby populations of delta mudwort and Mason's lilaeopsis may also be affected by pumping operations if the water elevation is drawn down during periods of pumping (see Figure 25).

Tidal freshwater emergent habitat in the project area supports special-status wildlife species that may be affected by the proposed project. These include western pond turtle, short-eared owl, northern harrier, white-tailed kite, tri-colored blackbird, shorebirds, and a variety of fish species, among others. Project construction has the potential to directly affect these species by permanently or temporarily altering tidal freshwater emergent habitat, which provides, cover, foraging, breeding/spawning, and fish migration habitat.

Aquatic habitat at the intake site is characterized as disturbed and degraded. Nevertheless, habitat in the vicinity of the intake location is used by resident fish and macroinvertebrates for spawning, juvenile rearing, migration, foraging, and adult holding. Adult and juvenile Chinook salmon and steelhead use the area as a migratory corridor and juvenile rearing area during downstream migration.

Delta smelt, longfin smelt, and sturgeon are also known to occur in the area. Depending on final site selection, up to about 0.22 acre of emergent wetland and open water habitat may be lost as a result of project implementation.

Tidal Riverine Habitat (Tidal Perennial Aquatic/Riverine)

For the purposes of the impacts analysis concerning in-water construction activities for the new Delta Intake, the Draft EIS/EIR defined the project area to be within Old River, extending about 1,000 feet upstream and downstream of the construction site, as this is the estimated distance over which construction-related effects such as increased turbidity and underwater noise may extend (Reclamation and CCWD 2009).

Potential operational effects of the Los Vaqueros Reservoir Expansion Project, such as entrainment of larval fish and other aquatic resources, may also occur within this project area. For the purposes of analyzing potential operational effects, the project area also includes any other portions of the Delta where hydraulic or hydrodynamic conditions affecting aquatic habitat may be changed such that there could be project-related indirect effects on fish or other aquatic organisms.

The New Delta Intake and Pump Station would result in a total of 0.68 acre permanent and temporary impacts to tidal riverine habitat on the west bank of Old River. The new intake and fish screen would be 182 feet in length and permanently impact about 0.13 acre of tidal riverine habitat (182 feet by 30 feet). New riprap placement would permanently impact 0.05 acre of habitat near the river bottom (M. Moses, CCWD, pers. comm. 2009). Temporary impacts to about 0.5 acre of tidal riverine habitat would result from cofferdam installation, dewatering of the construction area, and from excavation around the expanded fish screen intake.

Most of the in-channel construction activities associated with the new Delta Intake would be conducted in a dewatered cofferdam and would be isolated from Old River. After installation of the cofferdam, the water in the cofferdam enclosure would be treated (as necessary) and discharged back to Old River. The use of a cofferdam would substantially reduce potential construction-related adverse impacts on water quality and fishery habitat by isolating the construction area from adjacent aquatic habitats. A cofferdam would reduce suspended sediment concentrations within the river during site excavation, reduce the risk of chemical spills entering the river, and reduce the potential exposure of fish to underwater sounds during pile driving and foundation support placement.

The area temporarily affected by sedimentation and turbidity caused by installation or removal of the cofferdam is expected to be about 500 feet wide and 500 feet long, varying in size and shape depending on tidal conditions and flow within the Old River channel (Reclamation and CCWD 2009). Construction activities could affect habitat up to 1,000 feet upstream or downstream of the new intake site on Old River. These effects would occur intermittently during the estimated 60-day period at the beginning of construction and during the specified work window, when construction activity could disturb sediments and increase turbidity during construction.

The habitat within Old River at the new Delta intake site is characterized by riprap-stabilized levees and silt and sand substrate. Tules and other emergent vegetation associated with shallow water habitat occur in the general area.

To stabilize local channel banks, riprap would be installed along the existing levee for a distance of up to 500 feet upstream and downstream of the new intake. Assuming that riprap would extend vertically from +8 feet msl (100-year flood elevation) to about -25 feet msl (presumed channel bottom), a combined total of up to 0.74 acre of riprap would be placed along the sides of the intake. Additionally, assuming that the intake sill elevation would be at -12.5 feet msl and the length of the intake would be about 180 feet, a total of up to 0.05 acre of riprap would be placed along the channel bank and bottom below the intake (Reclamation and CCWD 2009). The total area of riprap would be up to 0.79 acre, including 0.05 acre of new riprap impacts (M. Moses, CCWD, pers. comm. 2009). Because much of this riprap would be replacement of existing riprap, which currently lines both levees along Old River, the new riprap would not significantly change aquatic habitat conditions.

Temporary impacts would be eliminated by site restoration and by removal of the cofferdam at the completion of in-channel work for the new Delta Intake and Pump Station.

Species Impacts
The proposed in-water construction activities would occur during the summer and early fall (August 1 through November 30) which is consistent with the seasonal work window identified by the Service, NOAA Fisheries, and CDFG for reducing the potential for significant adverse impacts to sensitive fishery resources within the Delta. Salvage results from the CVP and SWP pumping plants indicate which fish species may be found near the project area during the proposed in-water construction timeframe. See Table 13 below for a list of native fish species

Cofferdam installation using percussion hammers and, to a lesser degree, vibrational hammers create underwater sound pressure levels that may adversely affect fish species. Fish may be injured or killed by the impact sounds generated by percussive pile driving. Limiting pile driving and installation of the cofferdam to the summer and early fall would reduce potential impacts to fish species. Use of an air bubble curtain to deflect and absorb sound pressure and use of lower intensity underwater sounds to repel fish from the immediate construction area before using a high-pressure hammer would also reduce potential impacts to fish species. Any potentially adverse effects associated with suspended sediment during the construction of the cofferdam is expected to be temporary, localized, and limited to the cofferdam installation.

Dewatering of the cofferdam for intake and fish screen construction activities at the new Delta Intake has the potential to strand fish and macroinvertebrates during the dewatering process. As water is lowered from the pool behind the cofferdam, the trapped fish and macroinvertebrates have no opportunity to escape. In order to minimize impacts to fish, two fish rescues would be conducted by CCWD to remove fish from behind the cofferdam and relocate them to suitable habitat in Old River.

Physical structures such as water intakes and diversion facilities may attract various species of fish to the area. A number of predatory fish species, such as striped bass and largemouth bass, are attracted to water intake facilities, where they prey on juvenile fish. Experience and observations of fish predation at other water diversion and intake sites within the Sacramento River and Delta (e.g., Red Bluff

Table 13. Native Fishes of the Sacramento-San Joaquin River Delta potentially occurring in the vicinity of the New Delta Intake and Pump Station during the August 1 – November 30 construction window (based on CVP and SWP Salvage Results from 2004 - 2008)
Source: CDFG 2009a

Common Name	Scientific Name
Chinook salmon (winter, spring, fall, and late fall runs)	*Oncorhynchus tshawytscha*
Central Valley steelhead (rainbow trout)	*Oncorhynchus mykiss*
Sacramento sucker	*Catostomus occidentalis*
Delta smelt	*Hypomesus transpacificus*
longfin smelt	*Spirinchus thaleichthys*
prickly sculpin	*Cottus asper*
riffle sculpin	*Cottus gulosus*
starry flounder	*Platichthys stellatus*
Sacramento blackfish	*Orthodon microlepidotus*
Sacramento pikeminnow	*Ptychocheilus grandis*
Sacramento splittail	*Pogonichthys macrolepidotus*
threespine stickleback	*Gasterosteus aculeatus*
tule perch	*Hysterocarpus traskii*
river lamprey	*Lampetra ayresii*
Pacific lamprey	*Lampetra tridentata*
North American green sturgeon	*Acipenser medirostris*
white sturgeon	*Acipenser transmontanus*

Diversion Dam, Clifton Court Forebay, Woodbridge Irrigation District dam) have shown that increased vulnerability of fish such as juvenile chinook salmon and steelhead to predation is typically related to physical structures that create turbulence and disorient fish.

The risk of attracting predatory fish species to the new Delta intake structure, or the potential risk of increased predation mortality for fish migrating through or inhabiting the south Delta, would be minimized by designing the intake and fish screen to avoid areas where predatory fish would congregate (e.g., avoid structural elements of the intake that create turbulence and structures that provide cover and hiding/ambush locations for predators). In addition, the intake and fish screen would not include collection or bypasses/fish return systems that have been found to attract predators and increase the concentrations of prey fish and their vulnerability to predation. The distribution of predatory fish inhabiting the area right next to the intake structure could change as a result of project implementation, but an increase in the overall abundance of predatory fish inhabiting Old River in the vicinity of the new Delta Intake is not expected.

Alternatives 1 and 2 would be expected to shift a portion of the South Bay water agencies' Delta diversions to the expanded Los Vaqueros system, which would provide improved fish screening, a No-Diversion Period, and multiple intake locations to better protect Delta fish. The new Delta Intake structure on Old River would be designed and operated in accordance with CDFG, NOAA Fisheries, and Service criteria to protect delta smelt, juvenile salmon, and other fish species within the Delta. The 30-day No-Diversion Period may also reduce fishery impacts in the month of April by providing water supply to South Bay water agencies from storage in the expanded Los Vaqueros Reservoir, and thereby reduce total Delta diversions during this period.

As part of intake operation, routine maintenance would include fish screen cleaning as well as periodic screen panel removal for inspection, cleaning, and repairs if needed. As part of routine screen maintenance, CCWD would maintain the screen cleaning mechanisms (e.g., replacement brushes) and would curtail diversion operations in the event that the screen cleaners are not operating in accordance with design criteria to avoid adverse impacts (e.g., velocity hot spots that could result in increased vulnerability of fish to impingement on the screen surface) until the screen cleaners have been returned to routine operations.

Screen panels are periodically removed from an intake structure for inspection and repair. Typically panels are removed and inspected annually, or more frequently, in the event of damage to a screen panel. When a screen panel is removed from the intake fish and macroinvertebrates would be vulnerable to entrainment into the water diversion. The CCWD would curtail diversion operations whenever a screen panel was removed from the intake. In the event that a screen panel is replaced by a stop-log or blank panel (solid panel with no screen mesh) the maximum diversion rate would be reduced proportionally to the reduction in screen area to maintain acceptable approach velocities across the remaining screen panels.

The new Delta Intake and/or expanded Old River intake is not anticipated to require maintenance dredging. The existing Old River intake and fish screen have not required any maintenance dredging since their operations were initiated in 1998 (Reclamation and CCWD 2009). While it is possible that a new intake on a different location in Old River could experience different sedimentation conditions, the intake structure would be designed to minimize the likelihood of sediment accumulation. Maintenance dredging in the river channel outside the new Delta Intake structure, if necessary, would not be part of routine maintenance, and would be permitted separately.

In addition to the species listed above, potentially affected species also include: western pond turtle, American peregrine falcon, osprey, California gull, herons, egrets, terns, and cormorants, among others. Additional pumping from the Delta may result in decreased residence time of water in the Delta, resulting in an incremental loss of primary food production (Kimmerer 2004). This would impact macroinvertebrates, fish (Kimmerer 2004), birds, and other species higher in the food chain. Additional pumping in Old River may also incrementally contribute to net reverse flows in Old and Middle rivers during certain times of the year, and incrementally increase fish entrainment and salvage mortality risk at the SWP and CVP export facilities during these times (Service 2008d). On the other hand, net flows in Old and Middle rivers may be incrementally more positive (e.g., flowing slightly more toward to the north) at times of the year when pumping is reduced (M. Moses, CCWD, pers. comm. 2009).

Climate Change

As discussed above, climate change could result in an increase in the frequency or severity of flooding within California. The Kellogg Creek watershed, as well as other minor tributaries to the Los Vaqueros Reservoir, could receive increased flood flows during storm events, and these local storm flows would be collected in the expanded Los Vaqueros Reservoir. While the Los Vaqueros Reservoir is designed to function primarily as a water storage facility, the proposed expansion of the existing reservoir could provide additional capacity to withhold increases in future flood flows within the watershed.

The proposed new Delta Intake and Pump Station would be located in the Delta on the shoreline of Old River. This area would potentially be subject to increased inflow from upstream areas as a result of flooding in the watersheds tributary to the Delta. This area would also be subject to climate-induced sea level rise. These increased flood flows, in combination with sea level rise, could result in increased frequency of high water within the Delta.

Climate change-induced sea level rise is expected to increase salinity levels in the Delta, potentially resulting in degraded freshwater quality at state, Federal, agricultural, and local municipal pumping facilities. To offset increased salinity intrusion, Delta pumping could be curtailed, or upstream reservoir releases could be increased. However, if actions are not taken to offset increased salinity levels, water quality would be degraded as a result of seawater intrusion. This, in turn, would affect habitat quality in the Delta.

Greenhouse Gas Emissions

Project-related air quality impacts would fall into two categories: short-term, construction-related impacts and long-term, operations-related impacts. Short-term construction activities would primarily result in the generation of pollutants from construction equipment, these pollutants include greenhouse gases. Long-term operational emission sources would result in emissions associated with vehicle trips during routine inspection and maintenance of the project components and infrequent testing of emergency generators. In addition, the utilities that generate the electricity necessary to operate the new Delta Intake and Pump Station and the Expanded Transfer Facility would emit pollutants, including greenhouse gases.

All alternatives would require land clearing and grubbing, earthmoving for reservoir expansion, cut and fill operations, trenching, soil compaction, grading, and improvements such as roadway surfaces, structures, and facilities. Construction activities would also result in the emission of pollutants from construction equipment exhaust and construction worker automobile and haul truck trips. Emission levels for construction activities would vary depending on the number and type of equipment, duration of use, operating schedules, and the number of construction workers.

Operation of the reservoir expansion project would result in indirect greenhouse gas emissions due to increased energy use. Compared to future conditions without the project, greenhouse gas emissions would increase for each of the proposed alternatives. These increases could be minimized by implementing various measures including energy recovery at the Transfer Facility and at the Contra Costa Canal, as well as solar and other alternative energy installations. Project construction would result in temporary increases in greenhouse gas emissions associated with transportation of materials, most notably pipeline segments and dam construction materials (although borrow areas within the watershed would provide the majority of the material required for the dam raise), as well as construction equipment operation and worker transportation.

Aside from electricity use, there is the potential for additional greenhouse gas emissions (CO2 and CH4) from the expanded reservoir. There is apparent agreement within the scientific community that reservoirs produce carbon dioxide and methane gases as a result of inundation and decomposition of vegetation, but disagreement on exactly how much of these gases are sequestered in reservoirs versus released into the atmosphere. At present there are no established methodologies or emission factors to quantify emission reductions or increases from reservoirs in different regions.

Long-term operation of each alternative is anticipated to generate traffic volumes similar to the existing traffic within the project area, with the addition of a minimal number of maintenance worker trips and use of recreational facilities at levels similar to current conditions.

Service Mitigation Policy

The Service's Mitigation Policy, as issued in the Federal Register Vol. 46(15): 7656-7663, outlines how the Service works with partners to help mitigate any adverse impacts from land and water development projects on fish, wildlife, and their habitats. The purpose of this policy is to help assure consistent and effective recommendations by outlining policy guidelines for the levels of mitigation needed, as well as the various methods for accomplishing the mitigation. In addition, it allows Federal action agencies and private developers to anticipate Service recommendations and plan for mitigation measures early—thus avoiding delays late in the planning process.

Under the Service's Mitigation Policy, resources are divided into four resource categories to ensure that recommended mitigation is consistent with the fish and wildlife habitat functions and values involved. How a proposed action affects selected (evaluation) species within their corresponding habitats is one element in determining what mitigation the Service will seek for the project. The categories cover a range of habitat functions and values, from those considered to be unique and irreplaceable, to those believed to be much more common and of relatively lesser value to fish and wildlife. Each of the four resource categories has criteria with specific mitigation goals. The criteria are: 1) areas of high value for the evaluation species that are unique and irreplaceable; 2) areas of high value for the evaluation species that are scarce, or are becoming scarce, regionally; 3) areas of high to medium value for the evaluation species that are relatively abundant; and 4) areas with medium to low value for the evaluation species. The respective mitigation goals are: 1) no net loss of existing habitat value; 2) no net loss of in-kind habitat value; 3) no net loss of habitat value, while minimizing loss of in-kind habitat value; and 4) minimize loss of habitat value (see Table 14 below).

The Service reviews a variety of criteria to outline mitigation recommendations and determine the agency's position on a specific project or proposal. The criteria are not mutually exclusive, and are meant to provide a framework for the Service to fulfill its technical assistance role to Federal action agencies and the public. The action agencies are then charged with making the final decision to approve the proposal and require some level of mitigation, if appropriate. In this process, the Service considers whether:

(1) Proposals are ecologically sound;
(2) The least environmentally damaging reasonable alternative is selected;
(3) Every reasonable effort is made to avoid or minimize damage or loss of fish and wildlife resources and uses;
(4) All important recommended means and measures have been adopted with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal; and

(5) For wetlands and shallow water habitats, the proposed activity is clearly water-dependent and there is a demonstrated public need.

Table 14. Summary of Resource Categories, Designation Criteria and Mitigation Planning Goals under the Service Mitigation Policy

Resource Category	Designation Criteria	Mitigation Planning Goal
1	High value for evaluation species and unique and irreplaceable	No loss of existing habitat
2	High value for evaluation species and scarce or becoming scarce	No net loss of in-kind habitat value
3	High to medium value for evaluation species and abundant	No net loss of habitat value while minimizing loss of in-kind habitat value
4	Medium to low value for evaluation species	Minimize loss of habitat value

Discussion

Resource Categories

Ten habitat types were identified in the project study area, which had potential for impacts from the proposed project. These habitats, and their corresponding evaluation species, designated Resource Categories and associated mitigation planning goals are discussed below, and summarized in Table 15.

Table 15. Resource Categories, Evaluation Species, and Mitigation Planning Goals for Habitats Impacted by the proposed Los Vaqueros Reservoir Expansion Project

Cover-Type	Evaluation Species	Resource Category	Mitigation Goal
Grassland			
Perennial Bunchgrass and Alkali Grassland	Burrowing owl, San Joaquin whipsnake, and American badger	2	No net loss of in-kind habitat value.
Non-Native Annual Grassland	Burrowing owl, San Joaquin whipsnake, and American badger	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Upland Scrub	Wrentit, Bell's sage sparrow, and loggerhead shrike	3	No net loss of habitat value while minimizing loss of in-kind habitat value.

Cover-Type	**Evaluation Species**	**Resource Category**	**Mitigation Goal**
Valley/Foothill Riparian	Yellow warbler, yellow-breasted chat, and black-headed grosbeak	2	No net loss of in-kind habitat value.
Valley/Foothill Woodland and Forest	Acorn woodpecker, yellow warbler, and golden eagle	2	No net loss of in-kind habitat value.
Upland Cropland			
Deciduous Orchard	Western red bat and Brewer's blackbird	4	Minimize loss of habitat value.
Dryland Grain Crop	Tricolored blackbird and Swainson's hawk	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Irrigated Row Crop	Raptors	4	Minimize loss of habitat value.
Pasture	Aleutian Canada goose, pheasant, and deer	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Lacustrine	Osprey, wood duck, and long-eared myotis bat	2	No net loss of in-kind habitat value.
Palustrine			
Nontidal Freshwater Permanent Emergent	common yellowthroat, western pond turtle, and yellow-headed blackbird	2	No net loss of in-kind habitat value.
Natural Seasonal Wetland	Curved-foot Hygrotis diving beetle, alkali fairy shrimp, and coast horned lizard	2	No net loss of in-kind habitat value.
Tidal Freshwater Emergent	Muskrat and great blue heron	2	No net loss of in-kind habitat value.
Tidal Riverine	Longfin smelt and Sacramento splittail	2	No net loss of in-kind habitat value.

Grassland (California Annual Grassland Series and Purple Needlegrass Series)
Annual grassland occurs throughout the proposed project area. Annual grassland can provide important habitat for native California species such as the western toad, western rattlesnake, mallard, prairie falcon, western kingbird, San Joaquin kit fox, golden eagle, and the black-tailed jackrabbit. Grassland habitat within the watershed includes high quality native perennial bunchgrass stands and alkali grasslands. Native grassland habitats have become rare in the Central Valley due to competition with non-native species, fire suppression, grazing, and land conversion. A CCWD publication states "Experts felt that these needle-melic-pine bluegrass associations at Los Vaqueros were among the ten best occurrences of this association in the state (Nuzum 2005)." Alkali grasslands also contain specialized plant species that are salt tolerant, such as San Joaquin spearscale and brittlescale.

The evaluation species selected for annual grasslands in the project study area are the burrowing owl, San Joaquin whipsnake (coachwhip), and American badger. We chose the burrowing owl as an evaluation species because: (1) as a predator, they play a key role in community ecology of the study area; (2) they have important human non-consumptive benefits (e.g. bird watching); and (3) the Service's responsibilities for these species protection and management under the Migratory Bird Treaty Act. We chose the San Joaquin whipsnake as an evaluation species because they are an important predator species, and may also be a prey species, for a variety of wildlife species. San Joaquin whipsnake prey species include small mammals, lizards and eggs, snakes (including rattlesnakes), birds and eggs, young turtles, insects, and carrion (CDFG 2008d). Raptors prey on San Joaquin whipsnake, and roadrunners may feed on young snakes (CDFG 2008d). We chose the American badger as an evaluation species because badgers are highly specialized and play an important role in small mammal population ecology (CDFG 2008d). The main portion of the badger diet includes rats, mice, chipmunks, ground squirrels and pocket gophers (CDFG 2008d). Badgers will also eat some reptiles, insects, earthworms, eggs, birds, and carrion (CDFG 2008d).

Native perennial bunchgrass and alkali grassland habitats in the proposed project area were designated as Resource Category 2, based on the open habitat characteristics and foraging areas provided by this habitat for native species, and also for the quantity of native plant species they contain. Our associated mitigation planning goal for these areas is "no net loss of in-kind habitat value."

Non-native annual grassland habitat in the proposed project area was designated as Resource Category 3, based on the foraging, breeding, and dispersal areas provided by this habitat, and also for the quantity of non-native plant species they contain. Our associated mitigation planning goal for these areas is "No net loss of habitat value while minimizing loss of in-kind habitat value."

Upland Scrub Habitat (Common Manzanita Series, California Sagebrush Series, and Chamise Series)
Upland scrub habitat dominates slopes with poor soils found on the western portion of the watershed (Nuzum 2005). Upland scrub habitat can provide important habitat for native California species such as black-tailed deer, Alameda whipsnake, silvery legless lizard, San Joaquin whipsnake, coast horned lizard, foothill yellow-legged frog, western spadefoot toad, greater-western mastiff bat, long-legged myotis bat, and American badger. Special status plant species including Mt. Diablo manzanita, Diablo helianthella, and Brewer's dwarf flax occur in both the northern mixed chaparral and sage scrub community types. The nine populations of Mt. Diablo manzanita in the watershed are the second

largest population in the state (Nuzum 2005). The Diablo helianthella populations (31) and the Brewer's dwarf flax populations (25) are the largest known populations of both of these plants in the state (Nuzum 2005).

The evaluation species selected for the upland scrub cover-type that would be impacted in the proposed project area are wrentit, Bell's sage sparrow, and loggerhead shrike. The wrentit was selected because it is strongly associated with shrubland habitats including chaparral. The species has also been identified by California Partners in Flight (CalPIF) as a focal bird species for the conservation of chaparral habitat. The Bell's sage sparrow was selected because of its association with scrub and chaparral habitats, and also because of its inclusion on the California Department of Fish and Game Watch List. We chose the loggerhead shrike as an evaluation species because: (1) shrikes, as predators, play a key role in community ecology of the study area; (2) they are listed by CDFG as a California Species of Special Concern; and (3) they are listed by the Service as a Bird of Conservation Concern.

The upland scrub cover-type within the proposed project area is designated as Resource Category 3 based on their potential to support a diversity of species and based on their declining range within California. Our associated mitigation planning goal for these areas is "No net loss of habitat value while minimizing loss of in-kind habitat value."

Valley/Foothill Riparian (Fremont Cottonwood Series and Valley Oak Series)
Riparian vegetation grows at the margins of stream courses, ponds, rivers, and reservoirs, and requires permanently or semi-permanently saturated soils. Cottonwood/willow riparian forest, coast live oak riparian forest, and valley oak riparian forest occur within the proposed project area. Riparian habitat supports a variety of wildlife species that feed on seeds, vegetation, insects, and vertebrate prey. Aquatic and terrestrial invertebrates take shelter and forage in riparian habitats. Invertebrates in turn are a food source for amphibians and reptiles, such as California slender salamanders, tiger salamanders, western pond turtle, California toad, red-legged frogs, common garter snakes, western skinks, and ringneck snakes. Insectivorous birds include warblers, northern flickers, woodpeckers, and flycatchers. Small mammals found in riparian habitats include shrews, voles, bats, and mice. Raptors commonly occurring in riparian habitats include great horned owls, long-eared owls, Cooper's hawk, red-tailed hawk, and American kestrel. Where large trees are present, they provide nesting sites for a number of wildlife species, including raptors. Cavity nesting species, such as woodpeckers, bats, tree squirrels, and raccoons, require mature stands of trees. Striped skunks, black-tailed deer, raccoons, gray foxes, and badgers range through the area and use the riparian system for foraging as well as for cover and movement corridors.

The evaluation species selected for the valley/foothill riparian forest cover-type that would be impacted are yellow warbler, yellow-breasted chat, and black-headed grosbeak. Yellow warbler abundance is positively associated with the presence of valley oak in the Central Valley (RHJV 2004). The yellow-breasted chat was selected because of its dependence on riparian habitat for breeding and its status as a CALFED MSCS species. Black-headed grosbeak was selected because the species' abundance and occurrence is positively associated with Fremont cottonwood presence and tree species richness, which are important components of cottonwood riparian forest and mixed riparian forest cover-types (RHJV 2004).

Yellow warbler, yellow-breasted chat, and black-headed grosbeak were identified by RHJV as a focal bird species for the conservation of riparian habitat (RHJV 2004). Yellow warbler also has special status as a CALFED MSCS species. Additionally, the Service has responsibility for the protection and management of these species under the Migratory Bird Treaty Act.

Thus, because of the significance of the habitat to the evaluation species and other riparian obligate species, the Service has designated these areas as Resource Category 2. Our associated mitigation planning goal for these areas is "no net loss of in-kind habitat value."

Valley/Foothill Woodland and Forest (Blue Oak Series, Mixed Oak Series, Interior Live Oak Series, Coast Live Oak Series, and California Bay Series)

Blue oak woodland is the most common woodland community in the proposed project area occurring primarily on south-, west-, and east-facing slopes (Nuzum 2005). Other woodland and savanna areas in the watershed support interior live oak, coast live oak, foothill pine, and non-riparian valley oak species. The valley/foothill woodland and forest cover-type can provide important habitat for native California species such as golden eagle, Lewis' woodpecker, Nuttall's woodpecker, plain titmouse, long-eared owl, orange-crowned warbler, red-tailed hawk, western bluebird, American kestrel, ensatina, Gilbert's skink, ringneck snake, yellow-bellied racer, black-tailed deer, western gray squirrel, American badger, and a variety of bat species. Special status plant species including Brewer's dwarf flax occur in the oak woodland community type.

The evaluation species selected for oak woodland cover-type that would be impacted are acorn woodpecker, yellow warbler, and golden eagle. Acorn woodpeckers utilize oak woodlands for nearly all their life requisites; 50-60 percent of the acorn woodpecker's annual diet consists of acorns. Acorn woodpeckers can also represent impacts to other canopy-dwelling species. Yellow warbler abundance is positively associated with the abundance of valley oak (RHJV 2004). Large trees in canyons and valleys with an open view, such as the Los Vaqueros Watershed, provide valuable nesting habitat for golden eagle pairs. Thus, the Service has selected acorn woodpecker, yellow warbler, and golden eagle because of their dependence on oak woodland habitat; the status of yellow warbler as a CALFED MSCS species; and the status of golden eagle as a California Fully Protected species and status under the Bald and Golden Eagle Protection Act.

Oak woodland communities are threatened statewide due to a variety of factors including woodcutting, conversion of woodland areas to agriculture and urban uses, and the lack of natural reproduction throughout most of the range of valley and blue oaks. Blue oak is especially slow growing and is not regenerating in many parts of its range (Schoenherr 1992).

The Service has designated these areas as Resource Category 2 because of the valley oak component of the oak woodland cover-type and their significance to yellow warbler; due to the declining range of all oak woodland communities within California; and based on their high value to the evaluation species. Our associated mitigation planning goal for these areas is "no net loss of in-kind habitat value."

Upland Cropland (Cropland)

Upland cropland and irrigated pastureland are found in the out-of-watershed project areas. Crops along these corridors include tomatoes, alfalfa, corn, and hay, and orchards of English walnut and persimmon; as well as irrigated pastureland. Croplands on the alignment are closely situated to grassland habitats and freshwater permanent emergent habitat. Thus, many of the wildlife species associated with these habitats also forage in croplands.

Even though upland agriculture is disturbed regularly by discing, mowing, and application of herbicide and/or pesticides, it can still provide value for native species. Upland agriculture can provide habitat for species common to the Central Valley of California such as ring-necked pheasant, red-tailed hawk, Swainson's hawk, California ground squirrel, and California vole.

The evaluation species selected for deciduous orchard cover-type that would be impacted are western red bat and Brewer's blackbird. The western red bat was selected because of its status as a California Species of Special Concern and because the bat species is known to utilize fruit and nut orchards in the Central Valley. Brewer's blackbird was selected to represent migratory birds that forage in the deciduous orchards of the project area and because of the Service's responsibility for the bird's protection and management under the Migratory Bird Treaty Act. California ground squirrel was selected to represent common small mammals that forage in deciduous orchards in the project area.

The evaluation species selected for dryland grain crops cover-type that would be impacted are tricolored blackbird and Swainson's hawk. The tricolored blackbird is a California Species of Special Concern that is known to nest in dryland grain crops in large colonies. Swainson's hawk is a California threatened species that is known to forage in grain crop habitat within the study area and are known to breed in the vicinity of the Delta-Transfer Pipeline alignment. Both bird species are CALFED MSCS species. The Service also has a responsibility for the protection and management of these birds under the Migratory Bird Treaty Act.

Raptors were selected as the evaluation species for impacts to the irrigated row crops cover-type. Raptors guild was selected to represent the special-status raptors that forage for small mammals and amphibians in this habitat type.

The evaluation species selected for pasture cover-type that would be impacted are Aleutian Canada goose, pheasant, and deer. Aleutian Canada goose was selected because of its status as a CALFED MSCS and to represent waterfowl that utilize pastures in the proposed project area for foraging and/or nesting (D. Woolington, Service, pers. comm. 2009). Pheasant was selected to represent game bird species that utilize pastures in the proposed project area for foraging and nesting. Deer was selected to represent game mammal species that forage in this habitat type.

Overall, pasture, grain and hay, idled fields, and other agricultural habitats were designated as Resource Category 4, based on the open space values that they provide in an area of increasing human development, as well as for the foraging habitat provided for a variety of wildlife species. Our associated mitigation planning goal for these areas is "Minimize loss of habitat value."

Lacustrine (Open Water [Greater than 6.6 feet deep])

In addition to 25 species of fish and a host of invertebrate species and several emergent and submergent plant species, the reservoir is utilized by at least 26 species of waterfowl in the fall and winter (Nuzum 2005). It is also used for foraging by bald eagles throughout the year, as observed by CCWD staff and as observed by Service staff during a March, 2008 site visit. Ospreys, terns, grebes, mergansers, cormorants, herons, and pelicans fish the reservoir throughout the year and gulls use the reservoir throughout the year for resting. At times during the migratory season, the reservoir is utilized for resting by tens of thousands of migratory waterfowl (Nuzum 2005).

Lacustrine ponds within the proposed project area provide habitat for a variety of wildlife species. Wildlife that extensively use the ponds include special-status species such as California red-legged frog, California tiger salamander, and western pond turtle. Various waterfowl species include the mallard and cinnamon teal, which breed in the area; and greater yellowlegs and killdeer, which forage at the ponds and nest in nearby open gravel areas or roadways (Nuzum 2005). Black phoebes and swallows feed on insects flying above the water and garter snakes, striped skunks, and raccoons prey on amphibian larvae and aquatic insects. Ponds also provide a source of drinking water for deer, coyotes, foxes, and many other wildlife species (Nuzum 2005).

The evaluation species selected for lacustrine cover-type that would be impacted within Los Vaqueros Reservoir are osprey, wood duck, and long-eared myotis bat. Osprey was selected because of its status as a CALFED MSCS species and for its close association with lacustrine and woodland habitats. Wood duck was selected because of its Federal status as a Game Bird Below Desired Condition, and because of the breeding and foraging habitat provided for this species within the watershed. Long-eared myotis bat was selected because of its status as a Priority Species with the Western Bat Working Group, and because of the foraging habitat provided by lacustrine, woodland, and scrub cover types in the proposed project area.

Based on the high value of this habitat to many sensitive wildlife and game species, the Service designates the lacustrine cover-type within the Project area as Resource Category 2. Our associated mitigation planning goal for these areas is “no net loss of in-kind habitat value.”

Palustrine (Nontidal Freshwater Permanent Emergent/Freshwater Marsh [Bulrush-Cattail Series and Spikerush Series])

Insectivorous birds, waterfowl, amphibians, reptiles, mammals, and many other wildlife species use emergent wetland cover-types for nesting, foraging, and cover. The nontidal freshwater permanent emergent cover-type is found throughout the proposed project area.

The evaluation species selected for nontidal freshwater permanent emergent cover-type that would be impacted are common yellowthroat, western pond turtle, and yellow-headed blackbird. The presence of sedges and native grasses, as well as emergent wetlands and associated uplands, have a positive influence on the abundance of common yellowthroat (RHJV 2004). Additionally, the Service has responsibility for the protection and management of this bird species under the Migratory Bird Treaty Act. Western pond turtle was selected due to its dependence on creek and emergent wetland habitat throughout the proposed project area and its status as a CALFED MSCS species. Yellow-headed blackbird was selected because of its status as a California Species of Special Concern and because of its strong association with fresh emergent wetlands with dense vegetation.

Because of the increasing rarity of nontidal freshwater permanent emergent cover and its significance to the evaluation species, the Service has designated these areas as Resource Category 2. Our associated mitigation planning goal for these areas is “no net loss of in-kind habitat value.”

Palustrine (Natural Seasonal Wetland [Northern Claypan Vernal Pool, Bush Seepweed Series, and Saltgrass Series])
The proposed project area contains unique wetland habitat types that support a wide array of species. Habitats on the northeastern and eastern edge of the watershed are characterized to a large extent by alkaline soils and atypical species compared to the balance of the watershed (Nuzum 2005).

The watershed has 100 ponds with many that support special-status species. In addition, the watershed has very unusual vernal pools within rock outcrop areas associated with cliff faces (Nuzum 2005). Alkali marshes occur along pond margins, creeks, springs, seeps, and drainages in the project area. Marshes provide important habitat for tri-colored blackbirds, shorebirds, hawks, owls, muskrats, and raccoons. Alkali meadows provide habitat when flooded for a large variety of waterfowl species and shorebirds; when dry they provide good quality habitat for upland bird species such as western meadowlark, loggerhead shrike, and numerous small mammals. Vernal pools support a number of branchiopod and water beetle species, which provide prey for a variety of bird species. Vernal pools also support breeding, foraging, and dispersing amphibian species; as well as providing drinking water to other wildlife species (Nuzum 2005).

Alkali seep/marsh habitat within the watershed support vegetation such as alkali bulrush, salt grass, wire rush, frankenia, and saltbush (Nuzum 2005).

Alkali meadows are characterized by a turf of herbaceous perennial halophytic species with nearly barren, salt-encrusted scalds interspersed throughout (scalds are areas where salt has come to the surface, leaving a bare crusting area where few or no plant species can grow due to high salinity). Herbaceous vegetation adapted to the extremely alkaline soil of seasonal alkali meadow habitat includes saltgrass, frankenia, poverty weed, seep-weed, saltbush, large-flowered sand spurrey, and wire rush (Nuzum 2005).

Valley sink scrub is dominated by a patchy shrub overstory of iodine bush and seep-weed. The understory consists of a patchwork of barren, salt-encrusted scalds and alkali meadow vegetation. The remaining valley sink scrub communities are extremely rare compared to historical extent and are found in the southern San Joaquin Valley and in or near the Kellogg Creek watershed. Two special status plant species, San Joaquin spearscale and brittlescale, occupy areas within this community (Nuzum 2005).

Northern claypan vernal pool vegetation is divided into plant species that ring the pool margin and plant species within the pool basin. Typical margin species include hair grass, yellow carpet, brass buttons, and toad rush. Common dominants of the pool basin include coyote thistle, mousetails, goldfields, popcorn flower, tricolored monkey flower, and lythrum (Nuzum 2005).

It is unlikely that losses of alkali wetlands could be fully mitigated. Their unique soil chemistries and water regimes are virtually impossible to reproduce. These habitat types are threatened throughout the Central Valley due to agricultural, livestock grazing, and urban land use impacts (Service 1993a).

The evaluation species selected for these habitat types are curved-foot Hygrotis diving beetle, alkali fairy shrimp, and coast horned lizard. We chose curved-foot Hygrotus diving beetle because it is a predator species and plays an important role in alkali wetland ecology, and because they are a prey species for a variety of wildlife species. We chose alkali fairy shrimp to represent branchiopods that occur in alkali vernal pools and because they are a prey species for a variety of wildlife species, including other fairy shrimp species (Brown and Carpelan 1971). We chose the coast horned lizard as an evaluation species because of their status as a California Species of Special Concern and because their association with valley sink scrub and alkali flat habitats.

The Service has placed these wetland resources in Resource Category 2 due to their rarity, the high value they have for wildlife, and the experimental nature of any potential mitigation. Our associated mitigation planning goal for these areas is "no net loss of in-kind habitat value."

Palustrine (Tidal Freshwater Emergent [Bulrush-Cattail Series])
Tidal freshwater emergent habitat occurs along the shoreline of Old River. This cover-type can provide important habitat for many native species such as rose mallow, Mason's lilaeopsis, northern river otter, western pond turtle, wading birds, insectivorous birds, and a variety of fish species.

The evaluation species selected for this habitat type are muskrat and great blue heron. We chose muskrat as an evaluation species because they depend on bulrush, cattail, and other emergent vegetation for food, in addition to eating prey species found in emergent vegetation. We chose great blue heron as an evaluation species because: (1) they have important human non-consumptive benefits (e.g. bird watching); (2) and the Service's responsibilities for this species protection and management under the Migratory Bird Treaty Act.

The freshwater marsh habitat occurring in the proposed project area has been designated Resource Category 2, based on the importance of this habitat to native species. Our associated mitigation planning goal for these areas is "no net loss of in-kind habitat value."

Tidal Riverine Habitat (Tidal Perennial Aquatic/Riverine)
Tidal riverine habitat occurs in Old River and can provide important habitat for native species like Sacramento splittail, longfin smelt, and threespine stickleback.

The evaluation species selected for tidal riverine habitat that would be impacted in Old River are longfin smelt and Sacramento splittail. Both fish species are highly dependent on the Delta for their survival. The CALFED Final EIR/EIS and CALFED ROD (CALFED 2000a, b) state that CALFED actions must "recover both species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature." Longfin smelt has declined to 3 percent of its historic levels; its abundance has been at record lows for the past 4 years (CDFG 2009b, c).

Based on the dependence of longfin smelt, Sacramento splittail, and other estuarine species on tidal riverine habitat within the Delta, the Service has designated these areas as Resource Category 2. Our associated mitigation planning goal for these areas is "no net loss of in-kind habitat value."

<u>Impacts Discussion</u>
The four action alternatives described below could provide a combination of environmental water management, water supply reliability, and drinking water quality improvements, depending on the alternative selected and the final project participants (refer to the "Project Description" section above for a description of these features). In the Draft EIS/EIR, Alternative 1 was considered the Proposed

Project for purposes of CEQA and as the Proposed Action for purposes of NEPA. Alternative 1 includes the largest reservoir expansion and greatest extent of associated facilities considered in the Draft EIS/EIR and is designed to meet both of the primary project objectives. Based on conversations with CCWD and Reclamation since the development and publication of the Draft EIS/EIR, Alternative 4 has now been identified as the environmentally superior alternative/environmentally preferable alternative pursuant to CEQA. Alternative 4 represents the smallest reservoir expansion with the fewest new or expanded facilities. Regardless of the alternative selected, the expanded reservoir system would create a new level of flexibility to respond to Delta conditions that change from season to season and year to year.

Summary and Comparison of Alternatives 1, 2, 3, and 4:

Alternatives 1 and 2 include the same facilities; the only difference between these two alternatives is the operational emphasis (see Table 16 below and Figure 2 in the "Project Setting" section above). Alternatives 1 and 2 include the largest reservoir and facilities expansion (to 275 TAF); including the South Bay Connection (Transfer-Bethany Pipeline) to serve the three South Bay water agencies (ACWD, SCVWD and Zone 7). Alternative 1 includes equal operational emphasis on both environmental water management and water supply reliability. The operation emphasis under Alternative 2 focuses on environmental water management, though this alternative would result in some increases in water supply reliability for Bay Area water agencies. Under Alternative 2, only CCWD would receive water supply reliability in dry years, and South Bay water agencies would not receive additional water supplies to restore lost water supplies under current export pumping restrictions.

Alternatives 3 and 4 have no South Bay Connection, and differ as to the size of the expanded reservoir (a 275 TAF versus a 160 TAF reservoir, respectively) and expanded facilities; Alternative 3 and 4 also differ in operational emphasis (see Table 16 and Figures 32 and 33 below). Alternative 4 represents the smallest reservoir expansion with the fewest new or expanded facilities, and emphasizes water supply reliability rather than environmental water management emphasized under Alternative 3.

The analyses indicate that Alternatives 1, 2 and 4 are expected to reduce impacts to fish as compared to the No Action/No Project Alternative by changing the timing of water diversions, improving flow conditions during certain times of the year and during drought years (M. Moses, CCWD, pers. comm. 2009), and improving temperature, or other aquatic characteristics that contribute to a reduction of impacts to aquatic ecosystems and native fish and wildlife. However, in order to improve flow conditions during drought years and during critical periods for fish, more pumping would shift to wet years and times of the year that are less critical to sensitive fish species, which could incrementally worsen flow conditions during these time periods (M. Moses, CCWD, pers. comm. 2009).

Alternatives 1 and 2. Should CCWD reach agreement with Reclamation and DWR regarding a coordinated pumping agreement, Alternatives 1 and 2 could shift a portion of the Delta supply diversion location and timing for the three South Bay water agencies from the SWP and CVP export pumps to the expanded Los Vaqueros system. If operated in coordination with the SWP and CVP systems, the expanded Los Vaqueros system's screened intakes and reservoir would be expected to provide improved flexibility for fish protection, environmental water supplies, and Bay Area water supply reliability. A reduction of impacts to fish may result from improved fish screening, application of a no-diversion period during critical times for fish, multiple intake locations to avoid fish, and added flexibility in timing the pumping curtailment at SWP and CVP Delta export facilities to provide greater impact reductions for fish.

Alternatives 1 and 2 vary the use of the expanded storage between environmental water management and supply and water supply reliability. Water supply reliability would be provided by restoring some Delta supplies lost due to current regulatory restrictions on SWP and CVP export pumping (this could result in pumping more water than is currently possible given regulatory restrictions), storing water in wet years for use in dry years, and increasing available storage for emergencies. Alternative 2 would use the expanded reservoir to provide dedicated storage for environmental water supplies, which could be used for Central Valley wildlife refuge water supply; in-stream flows; additional SWP/CVP Delta export pumping curtailment; or other environmental purposes. For example, water from the expanded Los Vaqueros Reservoir system could be transferred downstream to San Luis Reservoir where it would be available for delivery to San Joaquin Valley wildlife refuges. It could also be used directly or by exchange to reduce Delta diversions during fish sensitive periods; to reduce direct take at other diversions; or to provide river flows for fishery purposes. Alternatives 1 and 2 would also provide improvements in the water quality delivered to three South Bay water agencies.

<u>Alternatives 3 and 4</u>. Alternatives 3 and 4 are expected to provide improved fish protection, environmental water supply, and water supply reliability benefits without the South Bay Connection. Since Alternatives 3 and 4 would not include the South Bay Connection, CVP and SWP supplies would not be delivered to South Bay water agencies through the expanded Los Vaqueros Reservoir system. Water supplies could be delivered through existing interties or by exchange, but these methods are not likely to be as flexible compared with the South Bay Connection. See Figures 32 and 33.

Table 16. Reservoir Expansion Alternatives with Key Distinguishing Characteristics
Source: Reclamation and CCWD 2009

Project Characteristic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Expanded Reservoir Storage Capacity	275 TAF	275 TAF	275 TAF	160 TAF
Operational Emphasis	Environmental Water Management & Water Supply Reliability	Environmental Water Management	Environmental Water Management	Water Supply Reliability
New South Bay Connection?	Yes, 470 cfs	Yes, 470 cfs	No	No
Intake Facilities	Construct new 170 cfs intake on Old River	Construct new 170 cfs intake on Old River	Expand existing intake facility on Old River by 70 cfs	No changes to existing intake facility
Pipeline Capacity from Intake to Expanded Reservoir	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 570 cfs	No changes to existing pipeline capacity
Expanded Transfer Facility?	Yes	Yes	Yes	No, only minor upgrades are needed
Additional Power Supply Needed?	Yes	Yes	Yes	No

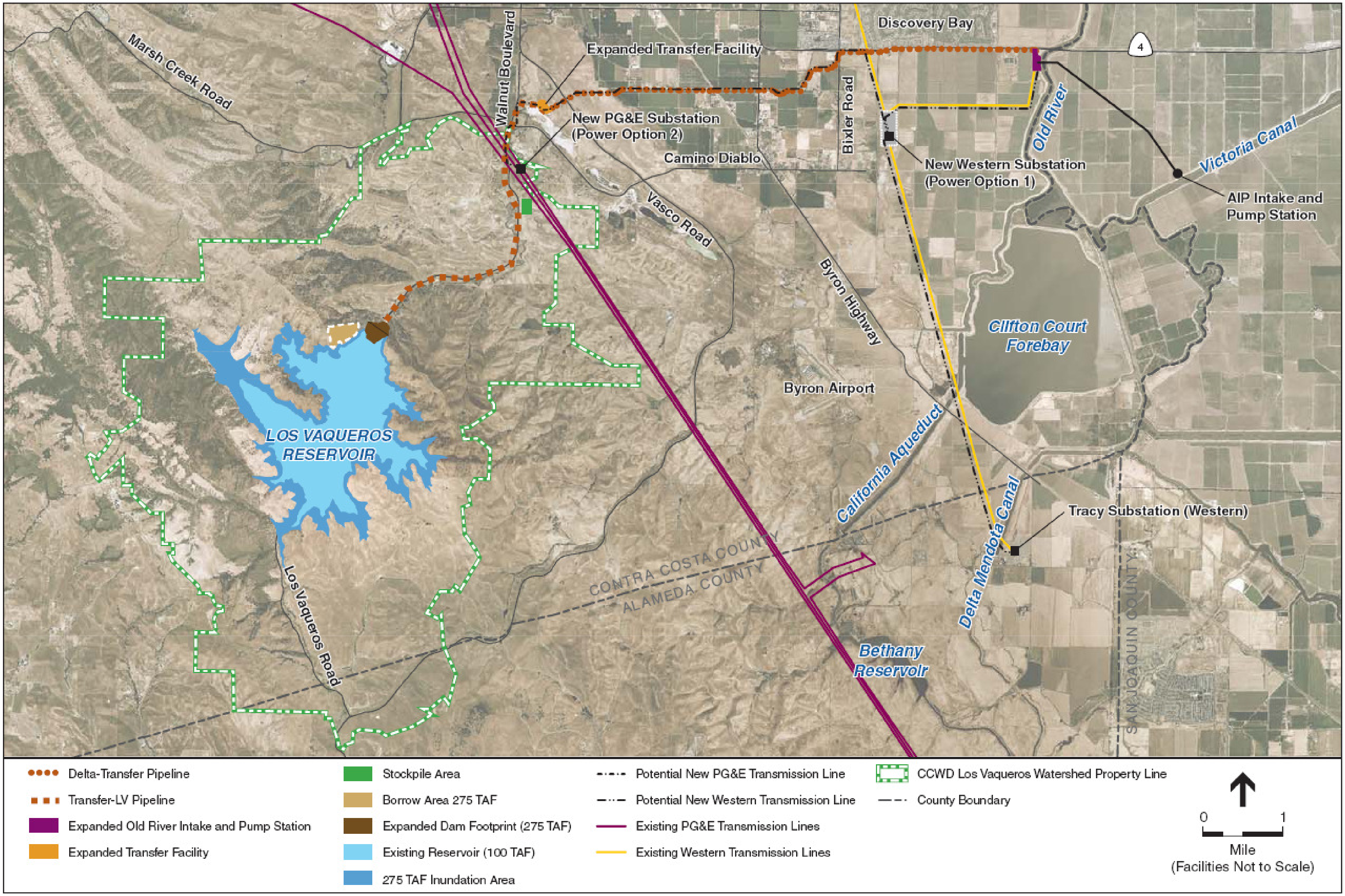

Figure 32. Proposed Facilities – Alternative 3
Source: Reclamation and CCWD 2009

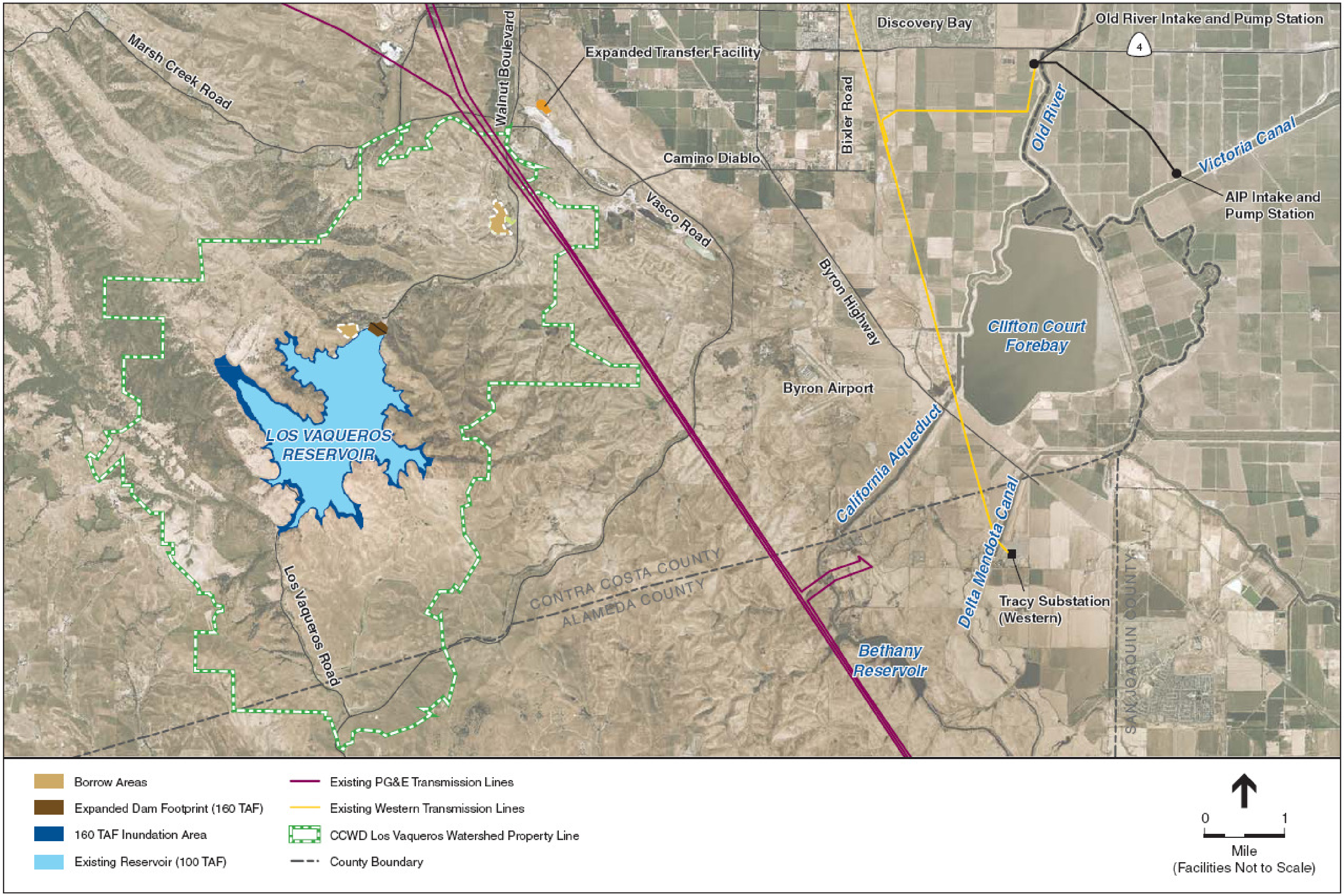

Figure 33. Proposed Facilities – Alternative 4
Source: Reclamation and CCWD 2009

Similar to Alternative 2, Alternative 3 could dedicate environmental water supply storage in the expanded reservoir. This could be accomplished through coordinated operations with and instead draw from the stored Los Vaqueros Reservoir supplies to serve its customers. The water stored upstream of the Delta in CVP reservoirs that had been reserved for delivery to Reclamation's CVP system. For example, when Reclamation has a need to retain cold water stored in upstream reservoirs, CCWD could refrain from pumping its CVP supply from the Delta CCWD could then be reallocated for environmental purposes, including cold water releases to support salmon spawning; pulse flow releases to support salmon migration; or water for wildlife refuges or other environmental purposes. The CVP water supply foregone by CCWD in this manner could also be conveyed through the Delta by existing export facilities for environmental purposes south of the Delta.

Under Alternatives 3 and 4, the additional storage would increase the amount of water available in dry years to CCWD, reducing the need to purchase supplemental dry-year supplies. Increased stored water supplies would also be available in emergencies for delivery to Bay Area water agencies through existing interties or by exchange.

Alternatives 3 and 4 would also provide water quality improvements to CCWD.

General Impacts of Alternatives 1, 2, 3, and 4
While the project alternatives are intended to reduce impacts to fish in the Delta and improve Bay Area water supply reliability and drinking water quality, as described above, these alternatives also would result in temporary and permanent impacts to the environment. The environmental impacts associated with the project alternatives can be generally categorized as follows: project construction; facility siting / footprint; project operations; and climate change.

Construction
Most environmental impacts identified for the project alternatives would be associated with project construction; these impacts would occur for up to 3 years and would cease once project construction is completed. Construction impacts include effects associated with transport of construction materials and equipment and carrying out construction activities such as excavation, grading, foundation development, paving, and building of structures. Construction activities generate impacts such as noise, dust, habitat disruption, temporary effects on agricultural activities, construction traffic and access disruption, increased erosion, increased potential for hazardous materials spills (such as fuel or paint), and related water quality issues.

<u>Construction Impacts to Birds</u>. Each of the proposed alternatives would cause some degree of temporary habitat disturbance or permanent habitat loss within or near nesting habitat for birds that are protected under the Federal Migratory Bird Treaty Act and the Bald and Golden Eagle Act. Bird species that nest or could nest in the project vicinity includes the following: Cooper's hawk, sharp-shinned hawk, red-tailed hawk, red-shouldered hawk, white-tailed kite, osprey, northern harrier, golden eagle, prairie falcon, and other raptors, as well as Bell's sage sparrow, oak titmouse, yellow warbler, Pacific-slope flycatcher, California horned lark, yellow-breasted chat, loggerhead shrike, Allen's hummingbird, Bewick's wren, California thrasher, tricolored

blackbird, and a variety of waterfowl and shorebirds. These and other more common bird species may forage and nest in riparian, woodland, scrub, wetland, and/or grassland habitats throughout the project area.

Construction activities associated with the project (including grading and removal of trees, shrubs, and other potential nesting habitat during the breeding season) could result in direct mortality of nesting birds. Impacts from construction noise, vibrations, and increased human presence could disturb adult birds, causing nest abandonment, death of young, or loss of reproductive potential at active nests near project sites. Such project impacts could occur at all facilities associated with the project.

Generally, more intensive construction activities can impact breeding birds within a larger sphere of influence. This is particularly true for pile driving, jack-hammering, and blasting activities, which may have a short duration, but can be loud and potentially disruptive to local nesting birds. Noise or vibration impacts on nesting golden eagles and other raptors could occur during blasting or jack-hammering activities in the 275-TAF borrow area and at the dam construction site.

Construction disturbances to native habitats that may support nesting birds along pipeline and power alignments would be temporary with few permanent habitat losses. Project construction and reservoir inundation would result in the permanent removal of grassland, scrub, woodland, wetland, and riparian habitats that could support breeding birds.

Alternatives 1, 2, and 3 include the construction of new powerlines by either PG&E or Western that will connect new or upgraded facilities to existing power supplies. Poles and powerlines pose a danger to raptors as a result of electrocution and collision hazards, and are a recognized source of raptor mortality. Powerline electrocution is the result of two interacting factors: raptor behavior and pole design. Raptors are opportunistically attracted to powerlines because they provide perch sites for hunting, resting, feeding, for territorial defense, or as nesting structures. Many standard designs of electrical industry hardware place conductors and ground-wires close enough together that raptors can touch them simultaneously with their wings or other body parts, causing electrocution. Raptors and other birds may also collide with powerlines, which can be difficult for birds to detect for various reasons such as inclement weather conditions. Western typically uses standard hardware that minimizes the potential for bird electrocutions and collisions.

Project alternatives would incorporate relatively low-height, high-intensity lighting during construction, and low-height, low intensity lighting at onsite buildings and facilities after construction. After construction, project lighting would be consistent with existing lighting at the dam and other facilities, which have not been demonstrated to pose a significant impact to flying birds, including shorebirds, waterfowl, passerines, and raptors that occur locally. Consistent with existing lighting in the watershed, light sources would be shielded and directed downward to reduce the amount of light and ambient glare. As a result, outdoor lighting for the project alternatives is not expected to result in a substantial impact to wildlife or pose an increased strike hazard to migratory or other flying birds. After construction, shorebirds, waterfowl, passerines, and raptors are expected to use habitats in the project area to the same degree as before the project.

Construction Impacts to Bats. Breeding and non-breeding bats could roost in many of the large sycamore or oak trees that occur in the watershed as well as in trees or structures near pipeline alignments. Crevices in Los Vaqueros Dam, buildings, and other structures in the watershed could also provide roosting habitat for special-status bats. Focused surveys have not been conducted to document the distribution or types of special-status bats that could be in the study area.

Although the loss of individual bats in a non-breeding roost may not be considered significant, the loss of an active maternity roost, even of relatively common species such as the California myotis, would be significant. Based on their known range and available habitat in the watershed and along pipeline alignments, bat species that could be affected by the project include the pallid bat, Townsend's big-eared bat, greater western mastiff bat, small-footed myotis bat, long-eared myotis bat, fringed myotis bat, long-legged myotis bat, and Yuma myotis bat.

Some reservoir facilities would require nighttime lighting, both during and after construction. Consistent with existing lighting in the watershed, light sources would be relatively low-height, shielded, and directed downward to reduce the amount of light and ambient glare. However, nighttime lighting may have a negative impact on the behavior of nocturnal wildlife species and their prey, such as bats and flying insects. The impact on bats could be further minimized using low pressure sodium lamps instead of mercury, metal halide, or high-pressure sodium lamps (Fure 2006 and Bat Conservation Trust, Undated). If mercury lamps are used, they could be fitted with UV filters (Fure 2006). Limiting the times lighting is on in order to provide some dark periods would also minimize lighting impacts (Fure 2006 and Bat Conservation Trust, Undated). Additionally, roads in important bat foraging areas could contain unlit stretches in order to avoid isolating bat colonies (Fure 2006 and Bat Conservation Trust, Undated).

Facility Siting / Footprint

Facility siting or footprint effects are the permanent effects that result from locating a facility on a specific site and removing or altering what was on the site previously. Most of the footprint effects would be associated with expansion of the reservoir, which would result in adverse effects on biological resources. These types of impacts include conversion of farmland to non-agricultural uses, and effects on biological resources and habitats, as well as the potential for increased exposure to hazards. In some cases, the Draft EIS/EIR identified these types of impacts as substantial for the project alternatives. In most cases the Draft EIS/EIR provides feasible mitigation measures to reduce these effects.

Reservoir and Dam. Under Alternatives 1, 2 and 3 the reservoir would be expanded from 100 TAF to 275 TAF, which would increase the area of reservoir inundation by approximately 1,000 acres; from 1,500 acres to 2,500 acres. Under Alternative 4, reservoir expansion from 100 TAF to 160 TAF would inundate an additional 400 acres; increasing the area of inundation from 1,500 acres to 1,900 acres. The expanded reservoir would inundate existing habitat for biological resources, including various sensitive plant and animal species; inundation primarily would affect grassland habitat but also oak woodland, riparian, scrub, and wetland habitats, including existing mitigation/compensation areas.

The Draft EIS/EIR states that the effects of reservoir expansion on biological resources would be mitigated through implementation of a habitat compensation and enhancement program that would preserve, restore and enhance habitats of the type affected. However, one effect of reservoir expansion that the Draft EIS/EIR considered significant and unavoidable, despite habitat mitigation is the inundation of an area of grassland along the west side of the reservoir that contains CDFG conservation easements for San Joaquin kit fox, and is considered to be a potential movement corridor. The Service concurs with this assessment. This movement corridor connects to Round Valley Regional Preserve, which is part of the East Bay Regional Park District. Loss of this corridor could potentially isolate Round Valley Regional Preserve, which provides habitat for San Joaquin kit fox (Reclamation and CCWD 2009; East Bay Regional Park District 2008; CDFG 2008a).

The loss of habitat and prey due to the increase in inundation area could reduce prey availability and affect one or more pairs of golden eagles. Of particular concern is the pair of golden eagles which occupy the territory referred to by CCWD as Los Vaqueros. Based on information provided by CCWD, the Los Vaqueros territory occupies about 3,377 acres which makes this territory one of the larger territories in the watershed. It should be noted that almost half of this area is covered with deep water (Los Vaqueros Reservoir) which has little value as foraging habitat for golden eagles. The Los Vaqueros pair will lose about 168 acres of foraging habitat as a result of Alternative 4. This represents about 10 percent of the pairs actual foraging habitat. Due to the high density of breeding golden eagles within this area, if this pair is displaced it is unlikely they would move to another area without displacing another pair of eagles.

<u>Recreational Facilities</u>. Relocation of existing recreation facilities and the addition of new recreation facilities proposed under all alternatives would result in additional effects on habitats within the watershed (see Figure 17 in the “Project Description” section above and see Figure 34 below). Reclamation’s and CCWD’s 2009 Draft EIS/EIR states that these effects would be reduced through the habitat mitigation program. However, it is the Service’s opinion that habitat impacts should be avoided when possible, and the addition of the proposed Eastside trail would create habitat impacts that could otherwise be avoided (Alternatives 1-4).

<u>Pipelines</u>. Construction of new pipelines under Alternatives 1-3 would result in impacts to biological resources, with potentially substantial impacts under Alternatives 1 and 2. Pipelines would be buried and the surface area restored. However, even with surface restoration, installation of the Transfer-Bethany Pipeline may permanently and directly impact 0.86 acre of northern claypan vernal pools; and may affect local vernal pool hydrology in pools outside the alignment by altering surface flows, groundwater flows, or infiltration rates, and reducing the quality or extent of the overall vernal pool complex outside the project alignment (discussed in the “Future Conditions with Project” section above).

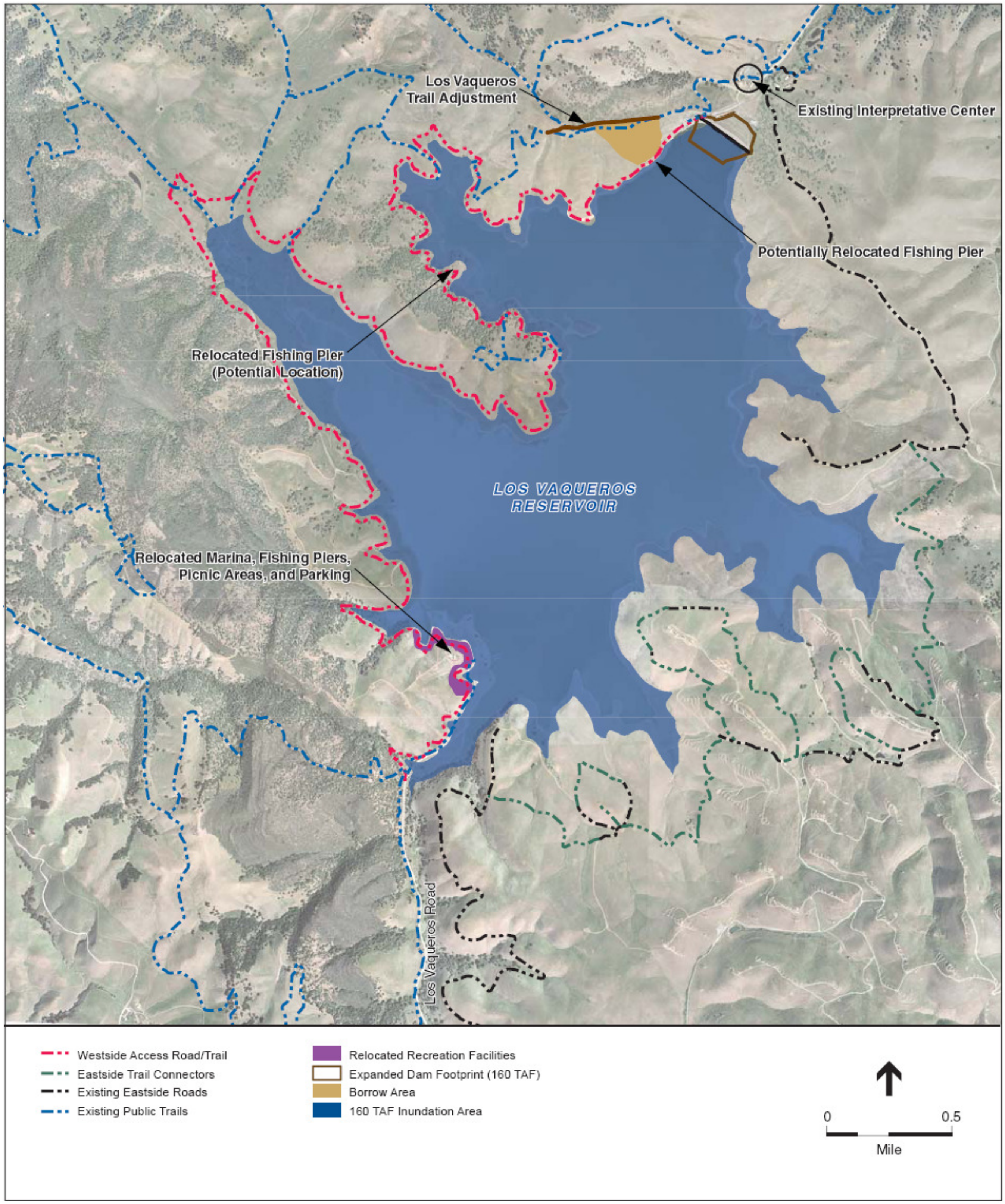

Figure 34. Proposed Recreation Facilities – 160 TAF Reservoir Expansion, Alternative 4
Source: Reclamation and CCWD 2009

If the Transfer-Bethany Pipeline is constructed, it appears that westside Bethany Reservoir connection would have fewer impacts to habitat than the eastside Bethany Reservoir connection would, as described in the Draft EIS/EIR. The westside option would be 0.4 mile shorter than the eastside option, and the majority of the westside option would be constructed by tunneling. The eastside option would alternate between trenching and tunneling, which may result in greater impacts to habitat. A comparison of potential impacts under both these options would help determine which option has relatively fewer habitat impacts. At this time the Service does not have the information needed to compare these two options.

<u>Borrow Areas.</u> Under Alternative 4, extracting material from the proposed primary and secondary core borrow areas for dam expansion could result in a permanent effect on the character of the surrounding area in the lower Kellogg Valley. These borrow area are in close proximity to nesting sites utilized by golden eagles occupying the Camino Diablo and the Vasco territories. Activity at the borrow areas could result in disturbance to nesting eagles resulting in a failure or the adults to or abandonment of the nest and loss of eggs or young.

<u>Power Options</u>. Under Alternatives 1-3, either Power Option 1 or Power Option 2 would be constructed in order to provide additional power to support expanded operations. The environmental impacts described under each power option appear to be very similar. Though, the siting zone identified for the proposed Western substation under Power Option 1 includes the sensitive alkali scrub vegetative series, while the location for the proposed PG&E substation under Power Option 2 appears to be located further away from sensitive wetlands and vegetation. Even though the proposed Western substation would be located outside of sensitive wetland areas, the additional impermeable surfaces may increase surface run-off and alter the hydrology of any adjacent wetlands. This may result in indirect-effects to these alkali scrub wetlands.

Project Operations
Project operation effects relate primarily to the proposed diversion of water from the Delta for delivery to the potential project participants: the South Bay water agencies and CCWD. It also includes recreation and environmental resource management.

<u>Water Diversion Operations</u>. Each of the proposed alternatives are intended to reduce impacts to Delta fishery resources, even though the amount of water diverted from the Delta would increase under all four alternatives. However, under Alternative 3, additional water would be diverted through the expanded Los Vaqueros Reservoir system and, unlike conditions under Alternatives 1 and 2, this water diversion would not be offset by a commensurate reduction in Delta water diversion from the CVP and SWP Delta export pumps. Consequently, additional fish could be adversely affected by the increased Delta diversion. In contrast, Alternatives 1 and 2 may potentially reduce impacts to Delta fishery resources during times of the year most critical to sensitive fish species. Use of fish screens for diversion of water for South Bay water agencies would be expected to reduce impacts to Delta fishery resources; impacts may be reduced further by managing pumping reduction timing and delivering water to South Bay water agencies from reservoir storage.

Reclamation and DWR have not yet agreed to reduce CVP and SWP Delta exports under Alternatives 1 and 2. If an agreement cannot be reached, Alternatives 1 and 2 would not provide the expected benefits to Delta fishery resources.

A component of Alternatives 2 and 3 includes dedicated storage for environmental water supply, which could be used to benefit fish and wildlife in a variety of ways (described under the "Summary and Comparison of Alternatives 1, 2, 3, and 4" heading above). These water supplies could be stored and used at a time when they are needed most. The expanded reservoir and additional infrastructure required to divert, store, and deliver these environmental water supplies would negatively affect a wide array of fish, wildlife, plants, and unique habitats, as described in the "Future Conditions with Project" section above. Without an environmental cost/benefit analysis, it is difficult to determine whether the environmental benefits equal or out-weight the environmental costs. As described in the Draft EIS/EIR, it appears that the potential environmental benefits do not justify the impacts associated with implementing Alternatives 2 and 3.

Climate Change

Reclamation's and CCWD's 2009 Draft EIS/EIR examines the potential for the project alternatives to increase greenhouse gas emissions, which in turn would contribute to global climate change effects. Recent literature indicates the effects of climate change on sea level rise, storm event magnitude, drought, and salinity intrusion could be larger than anticipated in Reclamation's and CCWD's 2009 Draft EIS/EIR (discussed in detail in the "Future Conditions Without Project" and "Future Conditions with Project" sections above).

Project construction and operation would result in increased greenhouse gas emissions. Construction emissions would be relatively short-term, ceasing after 3 years upon project completion. Greenhouse gas emissions associated with project operation would result primarily from the purchase and use of additional electrical energy to support water diversion and delivery pumping through the expanded Los Vaqueros Reservoir system. Under Alternatives 1 and 2, the increase in water diversion and delivery pumping proposed under the project would be partially offset by reductions in water pumping elsewhere, specifically through the CVP and SWP Delta water export systems. The project alternatives include the following features designed to minimize energy consumption and greenhouse gas emissions: on-site borrow areas to supply dam construction materials; local acquisition of construction materials; efficient pumping facilities; incorporation of solar panels in the roof of the Marina Complex and new interpretive center; in-system energy recovery in the Transfer-Bethany Pipeline; and use of CCWD's low emission, fuel efficient vehicle fleet.

Governor Schwarzenegger's Executive Order S-13-08 and CALFED Independent Science Board recommendations (Mount 2007) encourage considering a range of sea level rise scenarios for the life of the project in order to assess project vulnerability; and also encourage reducing expected risks and increasing resiliency to sea level rise. These sources also suggest using sea level rise estimates in conjunction with appropriate local information regarding local uplift and subsidence, coastal erosion rates, predicted higher high water levels, storm surge data, and storm wave data.

One projected effect of climate change is increased salinity intrusion. If salinity intrusion becomes more of an issue, diverting additional water from Old River may not provide the desired flexibility for obtaining high quality water. Increased diversions on Old River may contribute to reverse flows on Old and Middle Rivers (OMR), which may draw saline water toward intakes located on OMR. Locating additional or expanded intakes on OMR may warrant further consideration, and comparing proposed operations with projected climate change scenarios may assist with alternative elimination and selection.

Maintaining landscape connectivity is important for ensuring the long-term viability of fish, wildlife, and plant species. In order to prepare for the potential shift of species ranges in response to climate change, it is important to maintain existing habitat-connectivity between protected lands managed by Federal, state, local, and private entities.

Bald and Golden Eagle Protection Act (Eagle Act)

The Eagle Act prohibits take of bald eagles and golden eagles and provides a statutory definition of "take," which includes activities that "disturb" eagles. Bald eagles and golden eagles are also protected under the Migratory Bird Treaty Act (16 U.S.C. 703–712). To provide a consistent framework in which to implement the Eagle Act after bald eagle delisting, on June 5, 2007, the Service clarified its regulations implementing the Bald and Golden Eagle Protection Act (72 FR 31131). The modifications to implementing regulations for the Eagle Act established a regulatory definition of "disturb," a term specifically prohibited as "take" by the Eagle Act. As per the regulatory definition, disturb means: *to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, injury to an eagle; a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.*

As stated, the regulatory definition of "disturb" also applies to golden eagles. Also on June 5, 2007, the Service issued a Notice of Availability of the National Bald Eagle Management Guidelines (72 FR 31156). These guidelines provide a roadmap to avoid violating the Eagle Act while conducting activities near eagles. For example, the guidelines recommend buffers around nests to screen nesting eagles from noise and visual distractions caused by human activities.

The Service expects that two pairs of golden eagles will be disturbed during construction to an extent that they may fail to nest or produce young. Since construction is expected to take place over a period of 18 to 24 months, two nesting seasons will be affected. This will result in a potential loss of up to eight golden eagles that will not be produced as a result of this action. In addition to the loss of production from these two pairs, a third pair of golden eagles may fail to reproduce due to a restricted foraging area. This reduced foraging area will likely affect the ability of this pair to support themselves and maintain a nesting territory once the reservoir is filled to capacity.

Due to the enlarged reservoir providing more shoreline and hunting opportunities for bald eagles, the enlarged reservoir may support a nesting pair of bald eagles once the reservoir is restocked with fish.

Summary of Impacts
All action alternatives (Alternatives 1, 2, 3, and 4) would result in the following impacts:

- Loss of grassland area, including CDFG conservation easements, along the west side of the reservoir that is a potential movement corridor for the endangered San Joaquin kit fox, as well as potential isolation of Round Valley Regional Preserve, which provides habitat for a local San Joaquin kit fox population (Reclamation and CCWD 2009; East Bay Regional Park District 2008).

- Loss of California tiger salamander and California red-legged frog breeding habitat and upland aestivation habitat in the expanded reservoir inundation areas. These losses would occur within proposed critical habitat for California red-legged frog. There would also be additional impacts to dispersal and upland aestivation habitat in the out-of-watershed project areas under Alternatives 1, 2, and 3.

Alternatives 1 and 2 may result in the following impacts:

- Potential permanent alteration of vernal pool habitat along the Transfer-Bethany Pipeline alignment, and potential permanent alteration of all vernal pools down-gradient of the Transfer-Bethany Pipeline alignment. The long-term effects of this impact will depend on the success of restoring the claypan after pipeline construction.

Alternative 3 would result in the following additional impacts:

- Increased adverse impact of Delta fishery resources due to increased water diversion from the Delta. This is both a direct project impact and a cumulative effect of the project.

Mitigation measures have been included as part of the project action to reduce the direct and cumulative impacts, however, the proposed mitigation measures may not eliminate the effects of the proposed action entirely.

<u>Habitat Evaluation Procedures and Compensation</u>
The Service completed a draft Habitat Evaluation Procedures (HEP) report in September 2006 based on Los Vaqueros Reservoir Expansion Project alternatives at the time. Because mitigation sites were not known until the Services biological opinion was completed in February 2011 the HEP was not completed. Habitat values from the current draft HEP report were only used to estimate compensation ratios for the proposed project.

The purpose of a HEP is to quantify the function and value of any habitat lost versus the function and value of proposed mitigation sites, which would be used to replace the habitat that is lost due to the proposed action. The HEP analysis takes into consideration habitat value that is gained on mitigation lands over time through habitat enhancement or restoration measures. Thus, there are more opportunities for habitat restoration or enhancement on lands that initially have lower quality habitat. If higher quality lands are acquired as mitigation, there is less opportunity for improving upon the initial habitat value. Therefore, assuming that lower quality habitat can be successfully restored, the mitigation ratios for acquiring lower quality habitat would be lower than for acquiring higher quality habitat.

A HEP application is based on the assumption that habitat for selected wildlife species or communities can be described by a model which produces a Habitat Suitability Index (HSI). The HSI, a value from 0.0 to 1.0, is assumed to relate directly to the carrying capacity of the habitat being evaluated. A value of 0.0 means the evaluated habitat has no carrying capacity for the selected species; while a value of 1.0 means the evaluated habitat has the highest possible carrying capacity for the selected species.

The draft HEP report calculated baseline Habitat Suitability Index (HSI) values for the following cover-types within the proposed project area: 1) oak woodland; 2) chaparral; 3) riparian; 4) wetland; and 5) grassland. The calculated baseline HSI values are shown in Table 17 below.

Table 17. Calculated Habitat Suitability Index Values for Habits Found within the Los Vaqueros Reservoir Expansion Project Boundary[5]
Source: Service *in lit.* 2006

Cover-Type	HSI Values within Kellogg Creek Watershed	HSI Values outside of Kellogg Creek Watershed
Oak Woodland	0.92	0.70
Grassland	1.00	1.00
Wetland	0.56	--
Chaparral	0.79	--
Riparian	0.71	--

The CALFED MSCS (in CALFED 2000a) recommends the following mitigation ratios for impacts to these habitat-types:

- Valley/Foothill Woodland and Forest – 2:1 to 5:1 (includes non-riparian oak woodland and savanna habitats); restore or enhance in-kind habitat
- Valley/Foothill Riparian – 2:1 to 5:1; restore or enhance in-kind habitat
- Grassland – 1:1 to 3:1; restore or enhance in-kind habitat
- Natural Seasonal Wetland – 2:1 to 5:1; restore or enhance in-kind habitat
- Upland Scrub – 2:1 to 5:1; restore or enhance in-kind habitat
- Tidal Perennial Aquatic– 2:1 to 5:1; restore or enhance in-kind habitat
- Tidal Freshwater Emergent – 2:1 to 5:1; restore or enhance in-kind habitat
- Nontidal Freshwater Permanent Emergent – 1:1 to 3:1; restore or enhance in-kind habitat
- Upland Cropland – 1:1 to 3:1; restore or enhance suitable natural foraging habitat

These mitigation ratios do not preclude the Service from requiring additional compensation for impacts to federally-listed species and their habitats. Required compensation under FESA,

[5] These values are from the Service's September 2006 draft HEP report for the Los Vaqueros Expansion Project. HSI values for habitats outside the Kellogg Creek watershed are incomplete. Values still need to be determined for wetland (vernal pools), riparian, tidal freshwater emergent, and tidal perennial aquatic habitats in project areas outside the Kellogg Creek watershed.

CESA, the Clean Water Act, and the Rivers and Harbors Act could potentially fulfill a portion or all of the Service's recommended mitigation under the Fish and Wildlife Coordination Act.

The Service recommends that for mitigation planning purposes mitigation ratios should based upon the calculated HSI's in the draft HEP, as well as upon the suggested range of CALFED MSCS mitigation ratios. Higher HSI values correspond to higher mitigation ratios within the CALFED MSCS mitigation ranges. Conversely, lower HSI values correspond to lower mitigation ratios within the CALFED MSCS mitigation ranges. For cover-types that have not undergone HEP, the Service has assumed a HSI value of 1.0. The recommended ratios apply to non-mitigation/non-conservation areas. For impacts to existing mitigation/conservation areas, the Service recommends a minimum of doubling the recommended ratios for each cover-type. This is based on the temporal loss of habitat from constructing the original reservoir (such as for slow-growing blue oaks), as well on the loss of lands which are meant to be protected in perpetuity. Based upon these criteria, the Service recommends the following mitigation ratios for habitats within the proposed project area (see Tables 18 and 19).

Table 18. Recommended Mitigation for Cover-Types within the Los Vaqueros Reservoir Expansion Project Boundary under Alternative 1 (applies to non-mitigation/non-conservation areas)

NCCP Habitat-Type (HEP Cover Type in Parentheses) or Unique Habitat Type	Recommended Mitigation Ratio for Impacts within Kellogg Creek Watershed	Recommended Mitigation Ratio for Impacts outside of Kellogg Creek Watershed	Mitigation Type
Valley/Foothill Woodland and Forest (Oak Woodland)	5:1	4:1	Restore or enhance in-kind habitat
Grassland (Grassland)	3:1	3:1	Restore or enhance in-kind habitat
Natural Seasonal Wetland (Wetland, excluding vernal pool and alkaline wetland)	4:1	5:1	Restore or enhance in-kind habitat
Nontidal Freshwater Permanent Emergent (Wetland)	2:1	3:1	Restore or enhance in-kind habitat
Upland Scrub (Chaparral)	5:1	--	Restore or enhance in-kind habitat
Valley/Foothill Riparian (Riparian)	4:1	5:1	Restore or enhance in-kind habitat
Vernal Pool	--	5:1	Restore or enhance in-kind habitat
Alkaline Wetland	5:1	5:1	Restore or enhance in-kind habitat
Tidal Perennial Aquatic	--	5:1	Restore or enhance in-kind habitat
Tidal Freshwater Emergent	--	5:1	Restore or enhance in-kind habitat
Upland Cropland	--	3:1	Restore or enhance suitable natural foraging habitat

Table 19. Recommended Mitigation for Cover-Types within the Los Vaqueros Reservoir Expansion Project Boundary under Alternative 1 (applies to mitigation/conservation areas)

NCCP Habitat Type (HEP Cover Type in Parentheses) or Unique Habitat Type	Recommended Mitigation Ratio for Impacts to Existing Mitigation/Conservation Areas within Kellogg Creek Watershed	Mitigation Type
Valley/Foothill Woodland and Forest (Oak Woodland)	10:1	Restore or enhance in-kind habitat
Grassland (Grassland)	6:1	Restore or enhance in-kind habitat
Natural Seasonal Wetland (Wetland, excluding vernal pool and alkaline wetland)	8:1	Restore or enhance in-kind habitat
Nontidal Freshwater Permanent Emergent (Wetland)	4:1	Restore or enhance in-kind habitat
Upland Scrub (Chaparral)	10:1	Restore or enhance in-kind habitat
Valley/Foothill Riparian (Riparian)	8:1	Restore or enhance in-kind habitat
Alkaline Wetland	10:1	Restore or enhance in-kind habitat

Conclusion

Alternatives 1 and 2 would have the most extensive terrestrial impacts, including permanent and temporary impacts to existing conservation easements, existing mitigation areas, critical habitat for federally-listed species, proposed critical habitat for federally-listed species, and potential impacts to sensitive fish, wildlife, and plant species. These two alternatives have the greatest potential for incurring long-term adverse impacts. Operations under these alternatives would also result in increased diversions as compared to the No Project/No Action alternative. This may incrementally affect aquatic habitat characteristics in the Delta, and contribute to conditions that negatively impact sensitive species in the Delta.

Alternative 3 would have fewer terrestrial impacts by avoiding pipeline construction in critical habitat for vernal pool species, and also by placing an additional fish screen in the existing Old River Intake and Pump Station. However, implementing this alternative would still result in impacts to grassland habitat within the Los Vaqueros watershed, as well as substantial impacts to other habitats within the watershed. Operations under this alternative would also result in the greatest impacts to Delta fishery resources and aquatic habitat within the Delta.

Alternative 4 would have the fewest terrestrial impacts of all the proposed action alternatives. It would have the smallest reservoir footprint, the fewest facilities, and would not impact terrestrial habitats in the out-of-watershed study area. However, implementing this alternative would still result in impacts to grassland habitat within the Los Vaqueros watershed, in addition to impacts to other habitats within the watershed. It also appears that operations under this alternative would result in relatively small impacts to Delta fishery resources as compared to the No Project/No Action alternative.

Overall we believe that Alternative 4 would result in the fewest negative environmental impacts of the proposed action alternatives.

Recommendations

The following recommendations constitute what the Service believes, from a fish and wildlife resource protection and conservation perspective and consistent with our Mitigation Policy, to be the best recommendations for the project, based on information presently available. Our preferred choice for mitigation of adverse impacts is to avoid them altogether. If the project proceeds as described under Alternatives 1 through 4 in the February 2009 Draft EIS/EIR (Reclamation and CCWD 2009), and as described in direct and electronic discussions between CCWD, Reclamation and the Service, we recommend Reclamation and CCWD implement the mitigation measures identified in the Draft EIS/EIR, as well as complete the following:

General Recommendations

The following recommendations are specific to the implementation of Alternative 4, (i.e. CCWD's preferred alternative). Should Reclamation elect to pursue Alternative 1, 2, or 3, at a later date, this FWCA report and the recommendations contained herein will need to be revisited or modified to reflect the impacts associated with a modified alternative or project.

The Service recommends Reclamation:

1. Prior to project construction, develop and implement, in cooperation with the Service, NOAA Fisheries, CDFG, and project partners, a compensatory mitigation and monitoring plan for all aquatic and terrestrial habitats adversely affected by the project. The document should identify compensation areas, designate re-vegetation areas, list the species to be planted, include a table of existing and expected future habitat acreage, and include a time line for implementation. The document should also describe elements to be monitored that would indicate success or failure, for example, floristic composition and vegetation cover. The mitigation and monitoring plan should include remedial measures if successful re-vegetation is not achieved. The mitigation and monitoring plan should be coordinated with the ASIP and BO(s).

2. Use the draft HEP report to assess mitigation needs for Alternative 4: extrapolate as needed from similar areas evaluated in the HEP to cover project areas within the watershed that have not been evaluated. Follow the recommendations in the draft HEP report for compensating for the loss of habitat value. Of particular concern is the loss and compensation for oak woodlands. Existing documents provided by CCWD identify that oak plantings and reforestation would occur "if feasible" (CCWD, Mitigation Monitoring and Reporting Program 2010). The Service believes that oak woodland restoration is feasible provided an appropriate site is selected for reforestation.

3. Implement all measures identified in the Service's biological opinion (File # 81420-2009-F-0201-1)(see Appendix D).

4. Work with CCWD and the Service to revise the Los Vaqueros Reservoir Expansion Project, Golden Eagle Protection Plan to include measures recommended in this report to protect and monitor eagles within the watershed.

Habitats

The Service recommends Reclamation:

1 Reduce the size of the project footprint and minimize impacts from recreational facility construction and use by not constructing the Eastside trail.

2. Evaluate the effects of the increased inundation area on oak tree health and survival surrounding the enlarged reservoir. This evaluation should be conducted after the enlarged reservoir has operated for 3 years and compensatory mitigation should be provided for any negative impacts.

3. During construction maintain the same quantity and timing of flows in Kellogg Creek immediately downstream of the dam as provided before de-watering and construction begins. If the flow quantity, duration, or timing is expected to change as a result of construction, then evaluate the potential impacts to the habitats and wildlife associated with lower Kellogg Creek.

4. Ensure all ponds presently receiving supplemental water continue to receive supplemental water both during and following construction. Avoid dewatering the ponds immediately downstream of the existing dam. If this is not possible, maintain water levels in as many of the ponds as possible.

5. To the extent possible any mitigation actions, which create aquatic features such as ponds or pools, should be hydrologically sustainable and not dependent upon the addition of supplemental water.

6. Develop a habitat management plan to control invasive species and a more variable age vegetative age structure within the chaparral habitat communities. Discourage non-fire-adapted invasive plants. Leave any snags standing for wildlife use.

Fish and Wildlife Resources

The Service recommends Reclamation:

1. Prevent wildlife species from moving into construction areas after wildlife surveys and relocation measures are implemented by installing suitable exclusion fencing. Silt fencing may not be adequate for excluding wildlife species such as snakes and frogs.

2. Avoid and minimize impacts to western pond turtle nesting habitat by:

a. Clearly mark and maintain an adequate buffer around aquatic sites known to harbor western pond turtles. The estimated distance beyond which available upland habitat for western pond turtle breeding begins to diminish substantially is 750 feet.

b. Conduct surveys for western pond turtle nests during the breeding season and clearly mark their location so that they can be avoided.

c. Provide corridors broad enough not to impede either the movement of adult females to and from the nesting location nor the movement of hatchlings from the nest to the aquatic site should be flagged and/or fenced in a manner to allow turtle movement and to ensure that nests will not be trampled during incubation.

3. In areas where the above is not feasible, minimize impacts to northwestern pond turtle by doing the following:

a. Have a qualified biologist conduct surveys for pond turtle nests, juveniles, and adults prior to and during construction activities in suitable upland nesting and aquatic habitat (upland areas within 1,640 feet of canals, ditches, emergent wetlands, and other permanent/semi-permanent aquatic habitat).

b. Relocate pond turtle nests, juveniles, and adults to suitable habitat away from construction areas; maintain corridors that are broad enough not to impede the movement of adult females to and from the nesting location or the movement of hatchlings from the nest to the aquatic site.

4. Compensate for impacts to western pond turtle by enhancing, restoring, and protecting aquatic and adjacent upland nesting habitat for western pond turtle.

a. Provide suitable upland nesting habitat (*e.g.*, unshaded slopes), plentiful basking sites (*e.g.*, floating snags), and shallow water with dense emergent and subemergent vegetation for juveniles. Install artificial basking substrate and add woody debris to ponds that otherwise lack suitable basking sites to enhance habitat for northwestern pond turtles. In addition to improving habitat for western pond turtle, the woody debris and basking platforms can provide a means for monitoring the turtles and can attract nonnative species of emydid turtles for subsequent removal.

b. Created ponds should be sited away from busy roads to reduce the likelihood of mortality during periods when frogs, turtles, and salamanders move between ponds and uplands. Ponds should be created so that they can be drained if necessary to control bullfrogs and other invasive (exotic) animals.

5. Continue to monitor nesting golden eagles within the watershed. The Service recommends that CCWD conduct satellite telemetry studies on the golden eagles occupying the Los Vaqueros territory. Telemetry should be placed on this pair 12 months prior to refilling the reservoir. Should the territory be found to no longer support a nesting pair of golden eagles, the Service recommends that CCWD purchase property

which supports an active golden eagle territory within Contra Costa County. An alternative to a direct purchase would be for CCWD to contribute funds which would be in turn used to purchase and preserve an active eagle territory within Contra Costa County

In addition CCWD should ensure that activities such as recreation avoid disturbing nesting golden eagles by:

a. Continuing to seasonally close and reroute recreation trails that pass within 0.5 mile of nesting golden eagle sites, with the exception of the Eastside trail which we recommend should be closed during the golden eagle nesting season (February 1 through June 30).

b. Continuing to suspend watershed operations in the vicinity of active golden eagle nests.

6. To minimize disturbance and to protect eagles during construction of the expanded reservoir, the Service recommends implementation of the following measures:

   a. Conduct construction outside of eagle breeding season in accordance with the Service's 2007 National Bald Eagle Management Guidelines (Service 2007c).

   b. The Service suggests implementing a minimum 0.5 mile buffer zone around active eagle nests for the proposed construction activities (Service 2007c).

   c. If golden or bald eagles begin nesting within the buffer zone after construction has begun, implement the same avoidance and minimization measures implemented for active eagle nests found before ground-breaking; implementing a 0.5 mile buffer zone rather than a 500-foot buffer zone (Mitigation measure 4.6.9a; see Appendix C).

   d. Avoid blasting and other activities that produce extremely loud noises within 0.5 mile of active eagle nests, unless greater tolerance to the activity (or similar activity) has been demonstrated by eagles in the nesting area.

   e. To the extent possible, provide visual and audio buffers for raptor nests and roost locations in close proximity to trails, roads, marinas, construction sites, and other areas where human activities may cause disturbance. In addition to the spatial buffers, use native vegetation and natural topography to buffer the sights and sounds of human activities (Richardson and Miller 1997).

7. Implement noise-reducing procedures for construction equipment, not only for nesting raptors, but also for other wildlife species that may be sensitive to noise and vibrations.

8. Increase the buffer size around active raptor nests and/or reduce construction noise levels if birds exhibit signs of disturbance due to noise [Mitigation Measure 4.6.12c states

"During blasting or jack-hammering, a noise level of no greater than 85 decibels (measured at the nest) will be used as general guidance for raptor nests that are established after construction"].

9. Monitor avian nesting in the project area after construction begins. If a bird protected under the MBTA begins nesting near the project site after construction has begun, every effort should be made to prevent nest abandonment. This includes: creating a buffer zone around active nests until young have fledged, monitoring bird reactions to construction activities, and halting activities if construction appears to have a negative effect on nesting birds. Under the Migratory Bird Treaty Act (MBTA), to cause the abandonment of an active nest would be classified as take, and is unlawful.

10. Compensate for loss of nesting habitat by erecting nest boxes for cavity-nesting species such as kestrels, owls, bluebirds, swallows, chickadees, wrens, and others.

11. Comply with Executive Order 13186 by ensuring "that agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts such as Partners-in-Flight, U.S. National Shorebird Plan, North American Waterfowl Management Plan, North American Colonial Waterbird Plan, and other planning efforts, as well as guidance from other sources" (66 FR 3853). Consider the recommendations as applicable to the selected alternative in the bird conservation plans developed by California Partners in Flight, Central Valley Joint Venture, and Riparian Habitat Joint Venture for restoring and managing wetland, riparian, grassland, oak woodland, and chaparral habitat for migratory birds (*e.g.*, Central Valley Joint Venture 2006; Riparian Habitat Joint Venture 2004; California Partners in Flight 2000, 2002, 2004).

12. Minimize the impacts of light pollution on bats by following the measures proposed in the February 2009 Draft EIS/EIR (Reclamation and CCWD 2009) and below (Fure 2006 and Bat Conservation Trust, Undated):

    a. Maintain the brightness as low as possible (less than 2000 lumens [150 watts] are generally needed for security lights).

    b. Direct the lighting to where it is needed to avoid light spillage; minimize upward lighting to avoid light pollution; limit the height of lighting columns to 26 feet; use plantings to screen out light.

    c. Enhance bat roosting habitat by installing bat boxes away from artificial light sources.

    d. Minimize the impacts of the project on bat foraging by restricting the use of insecticides.

13. Compensate for the loss of bat roosting and foraging habitat by enhancing, restoring, and protecting suitable habitat for bat species near Los Vaqueros Reservoir and along Old River by doing the following:

a. Collaborate with the California Bat Conservation Fund.

b. Create and/or enhance bat habitat by constructing bat boxes. Restrict public access to bat roosting areas.

14. Avoid burying American badgers during grading by surveying for badgers before they retreat into their burrows to escape the summer heat.

Plants

The Service recommends Reclamation:

1. Compare the rare plant survey methods used for the proposed project with the guidelines described in the revised July 2002, *General Rare Plant Survey Guidelines* included in Appendix B. If the survey methods used for the proposed project are not consistent with the attached guidelines, please follow the guidelines and conduct the rare plant surveys again.

2. Compensate for impacts to upland cover-types by reseeding or replanting all disturbed upland habitat with native vegetation. Reseed or replant just prior to the rainy season to enhance germination and plant establishment. Develop and implement weed abatement and revegetation monitoring programs that include success criteria.

3. All reseeding including hydroseeding, should be free on non-native species and should be comprised of California native plants.

Climate Change

The Service recommends Reclamation:

1. Consider a range of sea level rise scenarios for the life of the project in order to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise. Sea level rise estimates should also be used in conjunction with appropriate local information regarding local subsidence, predicted higher high water levels, storm surge and storm wave data.

2. Prepare for the potential shift of species ranges in response to climate change by maintaining and enhancing existing habitats between protected lands managed by Federal, state, local, and private entities. The Service supports the concept of landscape connectivity as a means of improving the long-term viability of fish, wildlife, and plant species.

3. Consistent with IPCC (2007c) adaptation strategies/mitigation recommendations work toward making the proposed project carbon neutral. Potential strategies/mitigation recommendations include acquiring land and: 1) restoring or creating emergent marshlands/wetlands as a buffer against sea level rise and flooding, as well as for carbon sequestration (Kusler 1999, Trulio *et al.* 2007); and 2) reforesting former woodland and forest habitats in order to increase biomass productivity and carbon sequestration.

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Appendix A

Conservation Measures for CALFED Multi-Species Conservation Strategy Species and Habitats in the Los Vaqueros Reservoir Expansion Investigation

The following species lists were compiled based on the information found in the following sources: the U.S. Bureau of Reclamation and Contra Costa Water District's August 2008 *Los Vaqueros Reservoir Expansion Project Administrative Draft Environmental Impact Statement/Environmental Impact Report*, prepared by ESA (Reclamation and CCWD 2008); the *Multi-Species Conservation Strategy, Final Programmatic EIS/EIR Technical Appendix*, July 2000 (Appendix D, Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures, and Appendix E, Multi-Species Conservation Strategy Prescriptions and Conservation Measures for Evaluated Species, in CALFED 2000a); California Department of Fish and Game's (CDFG) *Life History Accounts and Range Maps - California Wildlife Habitat Relationships System* (CDFG 2008a); CDFG's November 2008 update of *Rarefind, California Department of Fish and Game Natural Diversity Database* (CDFG 2008b); CDFG's February 2008 list of *Special Animals* (CDFG 2008c); U. S. Geological Survey's *North American Breeding Bird Survey*, 1966-2007 Analysis, Livermore Route 14203 (Sauer, J. R., J. E. Hines, and J. Fallon 2008); the National Audubon Society's *Christmas Bird Count Historical Results*, East Contra Costa County Count Circle, Count Years: 98-108 (National Audubon Society 2008); and the California Native Plant Society's *Inventory of Rare and Endangered Plants* (CNPS 2008).

Table 1. CALFED MSCS Avian Species with potential to occur in the Los Vaqueros Reservoir Expansion project area.

Common Name	Scientific Name	MSCS Goal[1]	Status[2]	NCCP Habitats[3]
Birds				
Aleutian Canada goose	*Branta canadensis leucopareia*	m	FD	L, SE, TFE, NFPE, MSW, UC, SFA, TPA
American peregrine falcon	*Falco peregrinus anatum*	m	CE, CFP, FD, BCC	L, NFPE, TPA, SE, TFE, NSM, MSW
Bald eagle	*Haliaeetus leucocephalus*	m	CE, BGE, CFP	L, TPA, VRA, MRA, MW, VFR, MR, MSW, SFA
Black-crowned night heron (rookery)	*Nycticorax nycticorax*	m	----	NFPE, VFR, MR
California gull	*Larus californicus*	m	WL	L, SE, TFE, NFPE, NSW, MSW, UC, SFA, TPA
California yellow warbler	*Dendroica petechia brewsteri*	r	CSC	VFR, MR
Cooper's hawk	*Accipiter cooperii*	m	CWL	VFR, MR, VFW, MW
Double-crested cormorant (Rookery)	*Phalacrocorax auritus*	m	CWL	VFR, MR
Golden eagle	*Aquila chrysaetos*	m	CWL, CFP, BGE	VFR, GR, US, VFW
Grasshopper sparrow	*Ammodramus savannarum*	m	CSC, BCC	GR, TFE
Great blue heron (rookery)	*Ardea herodias*	m	----	VFR, MR
Great egret (rookery)	*Ardea alba*	m	----	VFR, MR
Greater sandhill crane	*Grus canadensis tabida*	r	CT, CFP	NFPE, NSW, MSW, GR, UC, SFA
Long-billed curlew	*Numenius americanus*	m	CWL, BCC, USBCWL	UC, SFA, TPA, SE, TFE, NFPE, NSW, MSW, GR
Long-eared owl	*Asio otus*	m	CSC	MR, VFR, VFW
Mountain plover	*Charadrius montanus*	m	CSC, BCC,	GR, UC

Common Name	Scientific Name	MSCS Goal[1]	Status[2]	NCCP Habitats[3]
			USBCWL	
Northern harrier	*Circus cyaneus*	m	CSC, BCC	UC, SFA, SE, TFE, NFPE, NSW, MSW, GR
Osprey	*Pandion haliaetus*	m	WL	MR, VFR, VFW, MW, L, VRA, MRA, TPA
Short-eared owl	*Asio flammeus*	m	CSC, USBCWL, WL	SE, TFE, NFPE, NSW, MSW, GR, SFA
Snowy egret (rookery)	*Egretta thula*	m	USBCWL	NFPE, VFR, MR
Swainson's hawk	*Buteo swainsoni*	r	CT,BCC, USBCWL	NSW, MSW, VFR, GR, US, VFW, SFA, UC
Tricolored blackbird	*Agelaius tricolor*	m	CSC, BCC, USBCWL	NFPE, NSW, MSW, GR, UC, SFA
Western burrowing owl	*Athene cunicularia hypugea*	m	CSC, BCC	GR, UC
White-tailed kite	*Elanus leucurus*	m	CFP	NSW, MSW, UC, SFA, NFPE, VFR, GR, SE, TFE
Yellow-breasted chat	*Icteria virens*	m	CSC	VFR, MR

KEY on pages 4-5

Table 2. CALFED MSCS Non-Avian Species with potential to occur in the Los Vaqueros Reservoir Expansion project area.

Common Name	Scientific Name	MSCS Goal[1]	Status[2]	NCCP Habitats[3]
Fish				
Central Valley fall-/late fall-run Chinook salmon	*Oncorhyncus tshawytscha*	R	FSC, CSC	AN, TPA, VRA, MRA, SE, TFE
Central Valley spring-run Chinook salmon	*Oncorhyncus tshawytscha*	R	FT, CT	AN, TPA, VRA, MRA, SE, TFE
Central Valley steelhead	*Oncorhyncus mykiss*	R	FT	AN, TPA, VRA, MRA, SE, TFE
Delta smelt	*Hypomesus transpacificus*	R	FT, CT, AFST	ES, TPA, SE, TFE
Hardhead	*Mylopharodon conocephalus*	m	CSC	VRA, MRA
Longfin smelt	*Spirinchus thaleichthys*	R	CSC, AFST	ES, TPA, SE, TFE
North American green sturgeon	*Acispenser medirostris*	R	FT, CSC, AFSE	AN, TPA, VRA, SE, TFE
Sacramento River winter-run Chinook salmon	*Oncorhyncus tshawytscha*	R	FE,CE	AN, TPA, VRA, MRA, SE, TFE
Sacramento splittail	*Pogonichthys macrolepidotus*	R	FD, CSC	ES, TPA, SE, TFE, VRA
Amphibians and Reptiles				
Alameda whipsnake	*Masticophis lateralis euryxanthus*	m	FT, CT	VFR, GR, US, VFW
California red-legged frog	*Rana aurora draytonii*	m	FT, CSC	NFPE, NSW, MSW, VFR, MR, GR, VRA, MRA, L
California tiger salamander	*Ambystoma californiense*	m	FT, CSC	L, NSW, GR, VFR
Foothill yellow-legged frog	*Rana boylii*	m	CSC	VRA, MRA, VFR, MR
San Joaquin whipsnake	*Masticophis flagellum ruddocki*	m	CSC	GR, IDS, US
Western pond turtle	*Actinemys marmorata*	m	CSC	VRA, MRA, L, NFPE, MSW, VFR

Common Name	Scientific Name	MSCS Goal[1]	Status[2]	NCCP Habitats[3]
Western spadefoot toad	*Spea hammondii*	m	CSC	NSW, GR
Mammals				
Greater western mastiff-bat	*Eumops perotis californicus*	m	CSC, WBH	VFR, MR, GR, US, VFW, MW
Ringtail	*Bassariscus astutus*	m	CFP	VFR, MR, US, VFW, MW
San Joaquin kit fox	*Vulpes macrotis mutica*	m	FE, CT	GR, UC
Invertebrates				
Longhorn fairy shrimp	*Branchinecta longiantenna*	m	FE	NSW
Midvalley fairy shrimp	*Branchinecta mesovallensis*	m	---	NSW
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	R	FT	VFR, MR
Vernal pool fairy shrimp	*Branchinecta lynchi*	m	FT	NSW
Plants				
Alkali milk-vetch	*Astragalus tener* var. *tener*	r	List 1B.2	NSW
Big tarplant	*Blepharizonia plumose* ssp. *plumosa*	m	List 1B.1	GR
Brewer's western flax (same as Brewer's dwarf flax)	*Hesperolinon breweri*	m	List 1B.2	GR, US, VFW
Brittlescale	*Atriplex depressa*	m	List 1B.2	GR, NSW
Congdon's tarplant	*Hemizonia parryi* ssp. *congdonii*	m	List 1B.2	GR
Contra Costa goldfields	*Lasthenia conjugens*	m*	FE, List 1B.1	NSW
Contra Costa manzanita	*Arctostaphylos manzanita* ssp.*laevigata*	m*	List 1B.2	US
Diamond-petaled California poppy	*Eschscholzia rhombipetala*	m*	List 1B.1	GR
Delta mudwort	*Limosella subulata*	r	List 2.1	TFE
Diablo helianthella	*Helianthella castanea*	m	List 1B.2	GR
Heartscale	*Atriplex cordulata*	m	List 1B.2	NSW, GR
Large-flowered fiddleneck	*Amsinckia grandiflora*	m*	FE, CE, List 1B.1	GR
Mason's lilaeopsis	*Lilaeopsis masonii*	R	CR, List 1B.1	TFE
Mt. Diablo fairy-lantern	*Calochortus pulchellus*	m	List 1B.2	GR, US, VFW
Mt. Diablo manzanita	*Arctostaphylos auriculata*	m	List 1B.3	US, VFW
Recurved larkspur	*Delphinium recurvatum*	m	List 1B.2	NSW, GR, VFW
Rose-mallow	*Hibiscus lasiocarpus*	m	2.2	TFE, NFPE
San Joaquin spearscale	*Atriplex joaquiniana*	m	List 1B.2	GR, NSW

[1]MSCS Goal:
R = CALFED MSCS Recovery goal species. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.
r = CALFED MSCS Contribute to recovery goal species. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.
m = CALFED MSCS Maintain goal species. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species.
* = CALFED actions are prohibited from causing direct mortality to large-flowered fiddleneck, Contra Costa manzanita, diamond-petaled California poppy, Contra Costa goldfields (Table 4-5 in the MSCS section of CALFED 2000a)

[2]Status Definitions:
AFSE = American Fisheries Society – Endangered
AFST = American Fisheries Society – Threatened
AFSV = American Fisheries Society – Vulnerable
BCC = Birds of Conservation Concern
BGE = Bald and Golden Eagle Protection Act
CE = California Endangered
CFP = California Fully Protected Species
CR = California Rare
CWL = CDFG Watch List
FC = Federal Candidate Species
FD = Federally Delisted
FE = Federal Endangered
FPD = Proposed for Federal Delisting
FSC = Federal Species of Concern
FT = Federal Threatened
PF = Petitioned for Federal Listing

CSC = California Species of Special Concern
CT = California Threatened
USBCWL = United States Bird Conservation Watch List (the Partners in Flight Watch List, the United States Shorebird Conservation Plan Watch List, and the Waterbird Conservation for the Americas Watch List)
List 1B.1 = Seriously endangered in California. Rare, threatened, or endangered elsewhere (California Native Plant Society [CNPS]).
List 1B.2 = Fairly endangered in California. Rare, threatened, or endangered elsewhere (CNPS).
List 2.1 = Seriously endangered in California. Rare, threatened, or endangered in California, but more common elsewhere (CNPS).
List 2.2 = Fairly endangered in California. Rare, threatened, or endangered in California, but more common elsewhere (CNPS).
List 4.3 = Not very endangered in California. Limited distribution worldwide (CNPS).
WBH = Western Bat Working Group High Priority Species
WBMH = Western Bat Working Group Medium-High Priority Species
WBM = Western Bat Working Group Medium Priority Species
WBLM = Western Bat Working Group Low-Medium Priority Species
WL = Audubon Watch List

[3] NCCP Habitats
AN = Anadromous Fish Group
ES = Estuarine Fish Group
GR = Grassland
IDS = Inland Dune Scrub
L = Lacustrine
MR = Montane Riparian Habitat
MSW = Managed Seasonal Wetland
MW = Montane Woodland
NFPE = Nontidal Freshwater Permanent Emergent Habitat
NSW = Natural Seasonal Wetland
SE = Saline Emergent
SFA = Seasonally Flooded Agricultural Land (rice)
TFE = Tidal Freshwater Emergent
TPA = Tidal Perennial Aquatic
UC = Upland Crop
US = Upland Scrub
VFR = Valley Foothill/Riparian Habitat
VFW = Valley/Foothill Woodland and Forest
VRA = Valley Riverine Aquatic

CONSERVATION MEASURES FOR MULTI-SPECIES CONSERVATION STRATEGY HABITATS RECOMMENDED BY CALFED

The following conservation measures are identified in the Multi-Species Conservation Strategy, Final Programmatic EIS/EIR Technical Appendix July 2000 (Appendix D, Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures, in CALFED 2000a).

Tidal Perennial Aquatic Habitat

Potentially affected MSCS species include: American peregrine falcon, bald eagle, Aleutian Canada goose, Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, delta smelt, delta smelt critical habitat, Sacramento River winter-run chinook salmon ESU, Sacramento splittail, Central Valley fall-/latefall-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU, California gull, long-billed curlew, osprey, longfin smelt, green sturgeon.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Design restorations and use construction methods that would minimize the release of sediment as a direct result of construction activities or subsequent erosion.
2. Avoid or minimize construction activities during periods evaluated species are present and could be affected by the actions.
3. To the extent consistent with CALFED objectives, design levee improvements to incorporate restoration of shallow aquatic tidal habitat.

4. Restore or enhance 2-5 acres of additional in-kind habitat for every acre of affected habitat near where impacts on habitat are incurred.
5. To the extent consistent with achieving CALFED objectives, design conveyance facilities to incorporate restoration of shallow aquatic tidal habitat.
6. To the extent consistent with achieving CALFED objectives, design and operate conveyance facilities to avoid entrapping or entraining evaluated species.

Lacustrine Habitat
Potentially affected MSCS species include: American peregrine falcon, bald eagle, Aleutian Canada goose, California gull, osprey, California red-legged frog, California tiger salamander, and western pond turtle.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Avoid or minimize disturbance to existing high value habitat.
2. Avoid or minimize construction activities during the breeding period of evaluated species that are present in existing habitat that could be affected by the actions.
3. Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
4. Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
5. Avoid or minimize implementing transfers of water from sources that support high value lacustrine habitats.

Tidal Freshwater Emergent Habitat
Potentially affected MSCS species include: short-eared owl, California gull, northern harrier, grasshopper sparrow, long-billed curlew, American peregrine falcon, white-tailed kite, Aleutian Canada goose, Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, delta smelt, delta smelt critical habitat, Sacramento River winter-run chinook salmon ESU, Sacramento splittail, Central Valley fall-/late-fall-run Chinook salmon, Central Valley spring-run chinook salmon ESU, longfin smelt, green sturgeon, delta mudwort, Mason's lilaeopsis, and rose-mallow.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Avoid or minimize disturbance to existing tidal freshwater emergent wetland habitat.
2. Restore or enhance 2-5 acres of additional in-kind habitat for every acre of affected tidal freshwater emergent wetland habitat. This compensation should be implemented before the impact occurs and near the impact location.
3. To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of tidal freshwater emergent wetland vegetation following project construction.

4. Avoid or minimize construction activities during the breeding period of evaluated species that are present in existing habitat and that could be affected by these actions.
5. Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
6. Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
7. To the extent consistent with achieving CALFED objectives, operate barriers and other instream structures affecting tidal movement in a manner that will not adversely affect the hydrology supporting populations of evaluated plant species.
8. To the extent practicable, before restoring habitat in areas that support emergent vegetation, initially restore habitat in locations that do not support tidal emergent vegetation. This will ensure that there is no net loss of habitat over the period that restoration is implemented.
9. To the extent consistent with achieving CALFED objectives, select Delta islands that support little or no emergent vegetation along adjacent channels for use as storage facilities.

Nontidal Freshwater Permanent Emergent Habitat

Potentially affected MSCS species include: American peregrine falcon, Aleutian Canada goose, white-tailed kite, short-eared owl, California gull, northern harrier, tricolored blackbird, long-billed curlew, greater sandhill crane, black-crowned night heron (rookery), snowy egret (rookery), California red-legged frog, western pond turtle, and rose-mallow.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Avoid or minimize disturbance to existing habitat.
2. Before implementing actions that could result in the loss or degradation of habitat, restore or enhance l-3 acres of additional in-kind habitat for every acre of existing habitat affected by restoration near where impacts would occur.
3. Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.
4. Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
5. Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
6. Avoid or minimize implementing transfers of water from sources that support emergent wetland vegetation.
7. To the extent practicable, trap and relocate to suitable nearby habitat evaluated wildlife species that would be unlikely to escape from inundation of new or enlarged storage reservoirs.
8. Provide sufficient outflow from storage reservoirs to support the long-term maintenance of wetland vegetation downstream of storage reservoirs.

9. Minimize effects of construction-related runoff into nearby wetlands through use of siltation control barriers, detention basins, or other appropriate methods.

Natural Seasonal Wetland Habitat

Potentially affected MSCS Species include: American peregrine falcon, greater sandhill crane, white-tailed kite, tricolored blackbird, short-eared owl, Swainson's hawk, California gull, long-billed curlew, northern harrier, California red-legged frog, California tiger salamander, western spadefoot toad, longhorn fairy shrimp, mid-valley fairy shrimp, vernal pool fairy shrimp, alkali milk-vetch, heartscale, brittlescale, recurved larkspur, and Contra Costa goldfields.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Avoid or minimize disturbance to existing natural seasonal wetland habitat.
2. Restore or enhance 2-5 acres of additional in-kind habitat for every acre of affected natural seasonal wetland habitat. This compensation should be implemented before the impact occurs and near the impact location.
3. To the extent consistent with achieving CALFED objectives, include project design features that allow for onsite reestablishment and long-term maintenance of natural seasonal wetland vegetation following project construction.
4. Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.
5. Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
6. Establish and protect additional populations of evaluated plant species in suitable nearby natural seasonal wetland habitat before implementing construction activities that could affect existing populations or individuals.
7. Minimize potential effects of construction-related runoff into nearby wetlands through use of siltation control barriers, detention basins, or other appropriate methods.
8. Manage recreational uses of new storage reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas.
9. To the extent practicable, trap and relocate evaluated wildlife species that would be unlikely to escape from storage inundation areas to suitable nearby habitat.

Valley Foothill/Riparian Habitat

Potentially affected MSCS Species include: greater western mastiff-bat, ringtail, bald eagle, Alameda whipsnake, white-tailed kite, golden eagle, Swainson's hawk, California yellow warbler, long-eared owl, Cooper's hawk, osprey, double-crested cormorant (rookery), black-crowned night heron (rookery), great blue heron (rookery), great egret (rookery), and snowy egret (rookery), western pond turtle, foothill yellow-legged frog, Sacramento splittail, California red-legged frog, and valley elderberry longhorn beetle,.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Avoid or minimize disturbance to existing habitat.
2. Restore or enhance 2-5 acres of additional in-kind habitat for every acre of affected habitat near where impacts are incurred before implementing actions that could result in the loss or degradation of habitat.
3. To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of riparian vegetation following project construction.
4. Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.
5. Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
6. Establish and protect additional populations of evaluated plant species in suitable nearby habitat areas before implementing construction activities that could affect existing populations or individuals.
7. To the extent practicable, remove or exclude evaluated amphibian and reptile species from construction corridors before construction is initiated.
8. Avoid or minimize implementing transfers of water from sources that support riparian vegetation.
9. To the extent consistent with CALFED objectives, operate barriers in a manner that will not adversely affect the hydrology supporting riparian vegetation upstream of barriers.
10. Trap and relocate evaluated wildlife species that would be unlikely to escape from storage reservoir inundation areas to suitable nearby habitat areas.
11. Provide sufficient outflow from storage reservoirs sufficient to support the long-term maintenance of existing riparian vegetation downstream of storage reservoirs.
12. Manage recreational uses at new storage reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas.

Grassland Habitat
Potentially affected MSCS species include: San Joaquin kit fox, greater western mastiff-bat, grasshopper sparrow, western burrowing owl, tricolored blackbird, short-eared owl, long-billed curlew, northern harrier, Alameda whipsnake, California tiger salamander, California red-legged frog, western spadefoot toad, greater sandhill crane, white-tailed kite, golden eagle, Swainson's hawk, mountain plover, large-flowered fiddleneck, recurved larkspur, big tarplant, Mt. Diablo fairy-lantern, brittlescale, Congdon's tarplant, Brewer's western flax, diamond-petaled California poppy, Diablo helianthella, heartscale, and San Joaquin spearscale.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Before implementing actions that could result in the loss or degradation of evaluated species, restore or enhance l-3 acres of grassland within the current range of affected species, and near where impacts would occur.
2. Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.

3. Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
4. Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
5. Manage recreational uses to avoid or reduce potential adverse effects on near sensitive plant populations and wildlife use areas.

Upland Scrub Habitat
Potentially affected MSCS species include: ringtail, greater western mastiff-bat, golden eagle, Swainson's hawk, San Joaquin whipsnake, Alameda whipsnake, Mt. Diablo fairy-lantern, Contra Costa manzanita, Mt. Diablo manzanita, and Brewer's western flax.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Avoid or minimize construction activities during the breeding period of evaluated existing habitat that could be affected by these actions.
2. Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
3. Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
4. Before implementing actions that could result in the loss or degradation of evaluated species, restore or enhance 2-5 acres additional in-kind habitat for every acre of existing habitat occupied by evaluated species affected by the actions within the current range of affected species and near where impacts occur.
6. Manage recreational uses associated with new or enlarged reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas.

Valley/Foothill Woodland and Forest Habitat
Affected MSCS species include: Greater western mastiff-bat, ringtail, golden eagle, Swainson's hawk, long-eared owl, Cooper's hawk, osprey, Alameda whipsnake, Mt. Diablo manzanita, Brewer's western flax, Mt. Diablo fairy-lantern, and recurved larkspur.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Avoid or minimize disturbance to existing habitat.
2. Restore or enhance 2-5 acres of additional in-kind habitat for every acre of existing habitat adversely affected by the actions near where impacts would be incurred.
3. Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by the actions.
4. Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.

5. Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
6. Manage recreational uses to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas in the vicinity of new or enlarged storage reservoirs.

Upland Cropland Habitat

Potentially affected MSCS species include: San Joaquin kit fox, Aleutian Canada goose, greater sandhill crane, white-tailed kite, Swainson's hawk, western burrowing owl, mountain plover, tricolored blackbird, California gull, long-billed curlew, northern harrier, and white-faced ibis.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. To the extent practicable, restore aquatic, wetland, riparian, and grassland habitats on agricultural lands that have relatively low forage value (e.g., orchards and vineyards).
2. Restore or enhance l-3 acres of suitable natural foraging habitat near affected lands for every acre of affected habitat regularly used by evaluated species and waterfowl to replace forage values of converted agricultural lands before or when project impacts are incurred.
3. Increase suitable forage availability and/or quantity on l-5 acres of agricultural lands near affected lands for every acre of affected habitat regularly used by evaluated species or waterfowl to replace forage values of converted agricultural lands before or when project impacts are incurred.
4. Avoid or minimize construction activities in habitat when evaluated species are present and could be affected by proposed actions.
5. To the extent consistent with achieving CALFED objectives, design wetlands to include transition habitat to uplands and upland buffer habitat that would support small mammal populations and provide suitable foraging habitat for raptors and other grassland-associated species.
6. To the extent consistent with achieving CALFED objectives, manage restored and enhanced seasonal wetlands to maximize the availability or quantity of suitable forage for waterfowl and sandhill cranes.
7. To the extent consistent with achieving CALFED objectives, design restored and enhanced wetlands and seasonally flooded agricultural habitats to include areas of habitat suitable for small mammals. These areas would serve as refugia during periods when wetlands are flooded and would provide source populations for reoccupation of wetland areas during periods that wetlands are dry.
8. To the extent consistent with achieving CALFED objectives, design and manage restored grasslands to maximize prey abundance and availability for raptors and provide habitat for other grassland-associated species.
9. Avoid or minimize changing cropping practices on upland croplands that provide high forage values for wildlife.
10. To the extent consistent with achieving CALFED objectives, avoid constructing storage and conveyance facilities and associated infrastructure on upland cropland with high wildlife forage habitat value.

Anadromous Fish Group
Potentially affected MSCS species include: Sacramento River winter-run Chinook salmon ESU, Sacramento River winter-run Chinook salmon ESU critical habitat, Central Valley fall-/late-fall-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU critical habitat, Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, and green sturgeon.
<u>Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects</u>

1. Implement measures on an emergency basis during extended droughts to protect water supplies dedicated to meet Delta inflow and outflow criteria deemed essential in maintaining anadromous fish populations. Such measures would be implemented infrequently and would be used only to readjust water supplies to levels expected without this set of CALFED actions. Measures may include additional dedicated surface or ground water stored specifically for this purpose, special options for the purchase of needed additional supplies, or emergency provisions that would reduce other water supply demands. Another measure is initially to implement the actions to the extent feasible to determine potential effects on seasonal and critical-year water supplies and develop a long-term water management plan that includes this and other actions to minimize effects of reallocation in other seasons and critical years.
2. To the extent consistent with CALFED objectives, adjust hydraulics in various channels or construct and operate structures (e.g., the Head of Old River barrier) to ensure fish are not being drawn in greater numbers or proportions toward the pumps. Implement monitoring and testing necessary to design, construct, and operate barriers. Develop and implement procedures and operating criteria for barriers to protect fish. Implement monitoring necessary to detect movement of fish toward the south Delta pumping plants, and implement water management strategies that allow for reduced exports when anadromous fish are at risk. Develop water quality monitoring to detect adverse conditions for anadromous fish. Implement programs to improve water quality through source control, improved drainage management, improved treatment, and dilution.
3. To the extent consistent with CALFED objectives, implement monitoring and testing necessary to define operations of the DCC gates from November through January that achieve benefits to Sacramento basin anadromous fish and avoid potential detriments to anadromous fish from other basins and to other Delta and estuarine fish.
4. Avoid or minimize in-channel construction activities during periods when anadromous fish species are present in high abundance or when life stages are present that are most susceptible to adverse effects associated with implementing actions.
5. Implement proposed restoration actions in areas that (1) have the greatest potential to support high densities of anadromous fish and (2) that will link currently disjunct habitat patches. Avoid or minimize implementing development actions in habitat areas that of anadromous fish, or in locations that would reduce connectivity among habitat patches.
6. To the extent consistent with CALFED objectives, recontour existing flood bypasses, and design and construct new flood bypasses from existing leveed lands in stages using construction design, operating schemes, and procedures developed through pilot studies and project experience that minimize the potential for stranding as waters recede from bypasses. Increased spring inflow could reduce the loss of juvenile anadromous fish to

water diversions by decreasing the proportion of water diverted, and by reducing negative flows in the lower San Joaquin River portion of the Delta. Removing levees and opening leveed lands to tidal action could have transient negative effects due to changes in hydraulics and reduced water quality.

7. To the extent consistent with CALFED objectives, confine additional winter pumping for flooding agricultural lands to times and areas of channels with low densities of anadromous fish.
8. To the extent consistent with CALFED objectives, confine additional winter diversions necessary to manage restored seasonal wetlands to non-dry years when water supplies are sufficient to minimize any effects on downstream transport, export pumping ratios, and foodweb productivity.
9. To the extent consistent with CALFED objectives, place consolidated intakes in areas with minimal numbers of juvenile anadromous fish.
10. Design and construct a new fish-screen system at the entrance to Clifton Court Forebay to alleviate the loss of juvenile anadromous fish to predation in the forebay and to the existing ineffective fish-bypass and collection facility within the forebay.
11. Screen intakes or connect intakes of the Tracy Pumping Plant (Central Valley Project) to the screened Clifton Court Forebay to alleviate loss of fish at the Tracy Fish Protection Facility.
12. Screen all Delta diversions that may entrain juvenile anadromous fish.
13. Restore or enhance 1-3 times the amount of tidal habitat affected by levee upgrades near where impacts are incurred.
14. To the extent consistent with CALFED objectives, include project design features that allow for onsite reestablishment and long-term maintenance of aquatic, wetland, and riparian habitat following project construction.
15. Reductions in unnatural inputs of organic carbon could be replaced with increased natural organic inputs such as from restored tidal wetlands and riparian habitats.
16. Water transfers should be conducted so as not to increase exports during times of the year when anadromous fish are more vulnerable to damage or loss at project facilities or when their habitat may be adversely affected.
17. Construction and operation of new or improved conveyance features in the north and south Delta should be designed to minimize losses of anadromous fishes and to improve migrating, rearing, and feeding habitats.
18. Design and operate proposed new diversions from the Sacramento River to minimize adverse effects on migrating anadromous fish, to avoid blocking upstream migration of fish to the Sacramento River, and to improve habitat conditions for anadromous fish.

Estuarine Fish Group

Affected MSCS species include: delta smelt, delta smelt critical habitat, longfin smelt, and Sacramento splittail.

Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects

1. Implement measures on an emergency basis during extended droughts to protect water supplies dedicated to meet Delta inflow and outfall criteria deemed essential in fish

populations. Such measures would be implemented infrequently and would be used only to readjust water supplies to levels expected without this set of CALFED actions. Measures may include additional dedicated surface or ground water stored specifically for this purpose, special options for the purchase of needed additional supplies, or emergency provisions that would reduce other water supply demands. Another measure is to initially implement the actions to the extent feasible to determine potential effects on seasonal and critical-year water supplies, and develop a long-term water management plan that includes this and other actions to minimize effects of reallocation in other seasons and critical years.

2. To the extent consistent with CALFED objectives, construct and operate in-channel barriers and restrictions to provide sufficient leeway to adjust hydraulics in various channels to ensure fish are not being drawn in greater numbers or proportions toward the pumps or being affected by poor water quality. Implement monitoring and testing necessary to design, construct, and operate barriers and restrictions. Develop and implement procedures and operating criteria for barrier systems to protect fish. Implement monitoring and testing necessary to ensure against excessive movement of fish toward the south-Delta pumping plants.
3. To the extent consistent with CALFED objectives, constrain operation of a barrier at the head of Old River during key periods as necessary to minimize the extent of fish exposure to the south-Delta pumping plants. Implement monitoring and testing necessary to balance the loss of fish from the San Joaquin River, and the west, central, and south Delta.
4. Avoid or minimize in-channel construction activities during periods estuarine fish species would be most susceptible to adverse effects that could be associated with implementing proposed actions.
5. Avoid or minimize implementing proposed actions in occupied habitat areas that could have a substantial adverse effect on the distribution or abundance estuarine fish species.
6. To the extent consistent with CALFED objectives, design and construct overflow basins from existing leveed lands in stages using construction design, operating schemes, and procedures developed through pilot studies and project experience to minimize the potential for stranding as waters recede from overflow areas.
7. To the extent consistent with CALFED objectives, design shallow-water habitat enhancements and restorations to address the habitat needs of native estuarine fish and avoid providing optimal conditions for non-native species.
8. To the extent consistent with CALFED objectives, develop and implement methods that minimize potential adverse effects of changes to hydraulics, water quality, and habitat on estuarine fish species when restoring tidal wetlands from subsided leveed lands.
9. To the extent consistent with CALFED objectives, construct channel islands in sloughs that have relatively poor shallow-water and shaded riverine aquatic (SRA) habitats such that the net gain in these habitats is positive.
10. To the extent practicable, confine additional pumping to times and area to channels with minimal concentrations of fish.
11. Install screens on new diversions to avoid entrainment of juvenile and adult estuarine fish.
12. To the extent consistent with CALFED objectives, confine additional winter diversions necessary to manage restored seasonal habitats to non-dry years when water supplies are

sufficient to minimize any effects on downstream transport, export pumping ratios, and foodweb productivity.

13. To the extent consistent with CALFED objectives, place consolidated intakes in areas that support minimal numbers of native estuarine fish, particularly delta smelt.
14. Design and construct a new fish-screen system at the entrance to Clifton Court Forebay to alleviate the loss of native estuarine fish to predation in the forebay and to the existing fish-bypass and collection facility within the forebay.
15. Screen intakes or connect intakes of the Tracy Pumping Plant (Central Valley Project) to the screened Clifton Court Forebay to alleviate loss of native estuarine fish at the Tracy Fish Protection Facility.
16. Screen all Delta diversions that may entrain native estuarine fish.
17. Restore or enhance 1-3 times the amount of nearshore habitat affected by levee upgrades near where impacts are incurred.
18. Include project design features that allow for onsite reestablishment and long-term maintenance of aquatic, wetland, and riparian habitat following project construction.
19. Increased natural organic inputs, such as from restored tidal wetlands and riparian habitats, could replace reductions in unnatural inputs of organic carbon.
20. Water transfers should be conducted in a manner that avoids increased exports during periods when estuarine fish are more vulnerable to damage or loss at project facilities.
21. Construction and operation of new conveyance features to the south-Delta pumping plants should be designed to minimize losses of estuarine fish.
22. Design and operate proposed new diversions from the Sacramento River to minimize adverse effects on migrating native estuarine fishes, to avoid blocking upstream migration of fish to the Sacramento River, and to improve habitat conditions for native estuarine fish.

SPECIES–SPECIFIC CONSERVATION MEASURES FOR MULTI-SPECIES CONSERVATION STRATEGY SPECIES

The following conservation measures are identified in the Multi-Species Conservation Strategy, Final Programmatic EIS/EIR Technical Appendix July 2000 (Appendix E, Multi-Species Conservation Strategy Prescriptions and Conservation Measures for Evaluated Species, in CALFED 2000a).

“r” Goal MSCS Birds

California Yellow Warbler (*Dendroica petechia brewsteri*)

Maintain and enhance suitable riparian corridor migration habitats and restore suitable breeding habitat within the historical breeding range of these species in the Central Valley.

Conservation Measures that Add Detail to CALFED Actions

1. Coordinate protection and restoration of riparian habitat with other Federal, State, and nonprofit programs (*e.g.*, the Riparian Habitat Joint Venture, the SB1086 program and the Corps’ Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid

conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. To the extent consistent with CALFED objectives, protect existing suitable riparian habitat corridors from future changes in land use or other activities that could result in the loss or degradation of habitat.
3. A portion of restored riparian habitat should be designed to include riparian scrub communities.
4. To the extent practicable, restore riparian habitats in patch sizes sufficient to discourage nest parasitism by brown-headed cowbirds.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Fully mitigate for impacts on existing nesting habitat that may be associated with Watershed Program or other CALFED actions.
2. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable and potentially occupied nesting habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.

Greater Sandhill Crane (*Grus canadensis tabida*)
Achieve recovery objectives identified in the Pacific Flyway Management Plan for the Central Valley population of greater sandhill cranes and Assembly Bill (AB) 1280 legislation that are applicable to the CALFED Problem Area, the Butte Sink, and other species' use areas.

Conservation Measures that Add Detail to CALFED Actions

1. To the extent consistent with CALFED objectives, implement ERP actions in concert with the species recovery strategies identified in AB1280 and the Pacific Flyway Plan.
2. Implementation of proposed ERP actions to enhance agricultural habitats should give priority to improving the abundance and availability of upland agricultural forage (e.g., corn and winter wheat) in the core use area centered around Bract Tract.
3. Implementation of proposed ERP actions to restore wetlands should give priority to restoring and managing wetland habitat within the core use area centered on Bract Tract that would provide suitable roosting habitat.
4. Avoid or minimize recreational uses in the core area centered on Bract Tract that could disrupt crane habitat use patterns from October through March.
5. To the extent consistent with CALFED objectives, at least 10 percent of agricultural lands to be enhanced under the ERP in the Delta and the Butte Sink should be managed to increase forage abundance and availability for cranes. Priority should be given to implementing these habitat improvements within 10 miles of the core habitat centered on Bract Tract.
6. Monitor to determine use of protected, restored, and enhanced habitats by sandhill cranes in core wintering areas.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Avoid or minimize actions near known wintering areas centered around Bract Tract (Staten Island, Taylor Island, Bouldin Island, Canal Ranch, and the area to the east along the Cosumnes River) and in the Butte Sink (from Chico in the north to the Sutter Buttes, and from Sacramento River in the west to Highway 99) that could adversely affect foraging and roosting habitat, and protect these habitat from future changes in land use or other activities that could result in the loss or degradation of habitat.
2. Restore functional habitat use areas (*i.e.,* habitat is used traditionally and consistently for at least 5 years) before any habitat use areas in core area centered on Bract Tract are converted to unsuitable habitat or the degraded as a result of CALFED actions.
3. To the extent practicable, implement ERP restoration of suitable crane habitats (*i.e.*, seasonal wetlands, grasslands, upland croplands, and seasonally flooded agriculture) concurrent with ERP actions that would convert suitable existing habitat to unsuitable habitat (*e.g.*, tidal habitats).

Swainson's Hawk (*Buteo swansonii*)
Protect, enhance, and increase habitat sufficient to support a viable breeding population. The interim prescription is to increase the current estimated population of 1,000 breeding pairs in the Central Valley to 2,000 breeding pairs. This prescription will be modified based on results of a population viability analysis being conducted by the California Department of Fish and Game (CDFG).

Conservation Measures that Add Detail to CALFED Actions

1. Proposed ERP actions designed to restore valley/foothill riparian habitat should initially be implemented in the Delta.
2. To the extent practicable, design restored seasonal wetlands in occupied habitat to provide overwinter refuge for rodents to provide source prey populations during spring and summer.
3. To the extent consistent with CALFED objectives, enhance at least 10% of agricultural lands to be enhanced under the ERP in the Delta, Sacramento River, and San Joaquin River Regions to increase forage abundance and availability within 10 miles of occupied habitat.
4. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that are occupied by the species to maintain or increase their current population levels.
5. To the extent practicable, manage restored or enhanced habitats under the ERP to maintain desirable rodent populations and minimize impacts associated with rodent control.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range

that CALFED actions could affect to determine the presence and distribution of the species.
2. Avoid or minimize actions near locations that support high densities of nesting pairs that could adversely affect high value foraging and nesting habitat.
3. Avoid or minimize actions within 5 miles of active nest sites that could result in disturbance during the breeding period (April-September).
4. To the extent consistent with CALFED objectives, adhere to CDFG Region II mitigation guidelines for avoiding or minimizing impacts of actions on the Swainson's hawk.
5. To the extent practicable, implement ERP restoration or enhancement of suitable Swainson's hawk habitats (*i.e.*, riparian forest and woodland, grassland, and upland croplands) concurrent with ERP actions that would convert suitable existing habitat to unsuitable habitat (*e.g.*, tidal habitats).

<u>"m" Goal MSCS Birds</u>

Aleutian Canada Goose (*Branta canadensis leucopareia*)

1. Enhance or restore l-2 acres of suitable natural or agricultural habitat near affected areas to replace every acre of traditional wintering habitat that is permanently lost or degraded as a result of CALFED actions.
2. To the extent consistent with ERP objectives, direct proposed actions for improving agricultural habitats for wildlife to protecting and improving traditional wintering habitat.

American peregrine falcon (*Falco peregrinus anatum*)

1. Avoid disturbances to active nest sites, including artificial structures (e.g., bridges) associated with implementing CALFED actions during the nesting period (March-August).

Bald Eagle (*Haliaeetus leucocephalus)*

1. Avoid or minimize construction- and recreation-related disturbances that could be associated with implementing CALFED actions within 0.5 mile of active nest sites during the nesting period (February-July).
2. Avoid CALFED actions that could result in the loss of traditional nesting trees or degradation of natural habitat within 0.5 mile of traditional nest trees.
3. To the extent consistent with CALFED objectives, design and manage new storage reservoirs to optimize nesting habitat suitability.

California Gull (*Larus californicus*)

1. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (mid-April through mid-August).
2. Avoid or minimize CALFED actions that could adversely affect the nesting success or size of existing breeding colonies.

Cooper's Hawk (*Accipiter cooperii*)

1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting territories or disturbance to nest sites, conduct surveys in suitable

nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate active nest sites.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions within 0.25 mile of active nest sites during the nesting period (March-August).
3. Avoid or minimize CALFED actions that could result in the loss of traditional nesting trees.
4. Avoid or minimize CALFED actions that could result in the substantial loss or degradation of suitable foraging and nesting habitat in areas that support core nesting populations.
5. Restore or enhance 2-5 acres of suitable nesting habitat near the affected area for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
6. To the extent consistent with ERP objectives, restore valley/foothill riparian habitats adjacent to occupied nesting habitats to create a buffer of natural habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.

Double-Crested Cormorant (Rookery) (*Phalacrocorax auritus*)

1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting habitat or disturbance to nesting colonies, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate nesting colonies.
2. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (February-August).
3. Avoid or minimize CALFED actions that could result in the degradation or loss of nesting structures.
4. To the extent consistent with CALFED objectives, manage existing reservoirs that support breeding populations, and design and manage new storage reservoirs to provide suitable nesting and foraging habitat conditions.

Golden Eagle (*Aquila chrysaetos*)

1. Enhance or restore 1-5 acres of suitable foraging habitat to replace every acre of traditional foraging habitat permanently lost or degraded as a result of CALFED actions.
2. Avoid or minimize construction- and recreation-related disturbances that could be associated with implementing CALFED actions within 0.5 mile of active nest sites during the nesting period (mid-January-August).
3. Avoid or minimize CALFED actions that could result in the degradation or loss of nesting structures.
4. To the extent consistent with ERP objectives, manage restored or enhanced habitats under the ERR to maintain desirable rodent populations and minimize impacts associated with rodent control.

5. To the extent consistent with ERR objectives, restore perennial grasslands adjacent to traditional nest sites to provide foraging and nesting habitat suitable for the natural expansion of populations.

Grasshopper Sparrow (*Ammodramus savannarum*)

1. Before implementing CALFED actions that could result in the loss or degradation of occupied nesting habitat, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate nesting pairs.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions during the nesting period (April-mid-July).
3. To the extent consistent with ERP objectives, design and manage grassland and agricultural habitat restorations and enhancements within the species' range to provide suitable nesting and foraging habitat conditions.

Black-Crowned Night Heron (rookery) (*Nycticorax nycticorax*), Great Blue Heron (rookery) (*Ardea herodias*), Great Egret (rookery) (*Casmerodius albus*), and Snowy Egret (rookery) (*Egretta thula*)

1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting habitat or disturbance to nesting colonies, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate nesting colonies.
2. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (February-August).
3. Avoid or minimize CALFED actions that could result in the degradation or loss of traditional nesting habitat.
4. Restore or enhance l-5 acres of suitable valley/foothill riparian or emergent wetland nesting habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
5. To the extent consistent with ERP objectives, design and manage valley/foothill riparian, wetland, and agricultural habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
6. To the extent consistent with ERP objectives, restore habitats adjacent to nesting colonies to create a buffer of natural habitat. This buffer would protect colonies from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.

Long-Billed Curlew (*Numenius americanus*)

1. Restore or enhance l-2 acres of suitable mudflat, seasonal wetland, grassland, upland cropland, or seasonally flooded agricultural foraging habitat for each acre of traditional foraging habitat that is converted to unsuitable foraging habitat as a result of CALFED actions.
2. To the extent consistent with ERP objectives, design and manage aquatic, wetland, grassland, and agriculture habitat restorations and enhancements to provide suitable foraging habitat.

Long-Eared Owl (*Asio otus*)

1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting territories or disturbance to nest sites, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate active nest sites.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions within 0.25 mile of active nest sites during the nesting period (March-July).
3. Restore or enhance 2-5 acres of suitable nesting habitat for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
4. To the extent consistent with ERP objectives, enhance and restore natural and agricultural habitats adjacent to occupied nesting habitats to create buffer habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.
5. To the extent consistent with ERP objectives, manage restored or enhanced habitats to maintain desirable rodent populations and minimize impacts associated with rodent control.

Mountain Plover (*Charadrius montanus*)

1. To the extent consistent with ERP objectives, manage a portion of agricultural habitats within traditional wintering areas to maintain or enhance foraging habitat conditions.

Northern Harrier (*Circus cyaneus*) and short-eared owl (*Asio flammeus*)

1. Restore or enhance l-2 acres of suitable wetland or grassland nesting habitat for each area of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
2. To the extent consistent with ERP objectives, design and manage wetland, grassland, and agricultural land habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
3. To the extent consistent with ERP objectives, restore wetland and perennial grassland habitats adjacent to occupied nesting habitats to create a buffer zone of natural habitat. This buffer zone would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable foraging habitat and nesting habitat suitable for the natural expansion of populations.
4. To the extent consistent with ERP objectives, manage enhanced agricultural lands to maintain or increase prey populations.
5. Avoid or minimize disturbances that could be associated with implementing CALFED actions near active nest sites during the nesting period (April-August).

Osprey (*Pandion haliaetus*)

1. Before implementing CALFED actions that could result in the loss nesting structures or disturbance to nesting pairs, conduct surveys to determine the presence and distribution of active nest sites along the Sacramento River and other major tributaries to the Bay-Delta.

2. Avoid or minimize disturbances that could be associated with implementing CALFED actions near active nest sites during the nesting period (March-August).
3. Avoid or minimize CALFED actions that could result in the degradation or loss of nesting structures.

Tricolored Blackbird (*Agelaius tricolor*)

1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting habitat or disturbance to nesting colonies, conduct surveys in suitable nesting habitat within portions of the species' range that could be affected by CALFED actions to locate nesting colonies.
2. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (mid-April-July).
3. To the extent consistent with ERP objectives, design and manage wetland and agricultural habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
4. To the extent consistent with ERP objectives, enhance and restore natural and agricultural habitats adjacent to known nesting colonies to create a buffer zone of natural habitat. This buffer zone would protect colonies from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.

Western Burrowing Owl (*Athene cunicularia hypugea*)

1. Restore or enhance l-2 acres of suitable nesting habitat for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
2. To the extent consistent with ERP objectives, design and manage grassland and agricultural land habitat restorations and enhancements to provide suitable foraging habitat conditions.
3. To the extent consistent with ERF' objectives, restore perennial grasslands adjacent to occupied nesting habitats to provide foraging and nesting habitat suitable for the natural expansion of populations.
4. Avoid or minimize disturbances that could be associated with implementing CALFED actions near active nest sites during the nesting period (March-August).
5. To the extent consistent with ERP objectives, manage restored or enhanced habitats to maintain desirable rodent populations and minimize impacts associated with rodent control.

White-Tailed Kite (*Elanus leucurus*)

1. Before implementing CALFED actions that could result in the loss or degradation of occupied nesting habitat or disturbance to nesting pairs, conduct surveys in suitable nesting habitat within the breeding range of the white-tailed kite to locate active nest sites.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions within 0.25 mile of active nest sites during the nesting period (February-September).

3. Avoid or minimize CALFED actions that could result in the loss of traditional nesting trees.
4. Restore or enhance 2-5 acres of suitable nesting habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions. Restored or enhanced compensation habitat should be located in areas that support nesting pairs near valley oak woodlands.
5. To the extent consistent with ERP objectives, enhance and restore natural habitats and agricultural habitats adjacent to occupied nesting habitats to create a buffer zone of natural habitat. This buffer zone would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.
6. To the extent consistent with ERP objectives, manage restored or enhanced habitats under the ERR to maintain desirable rodent populations and minimize impacts associated with rodent control.

Yellow-breasted chat (*Icteria virens*)

1. Before implementing CALFED actions that could result in the loss or degradation of occupied nesting habitat or disturbance to nesting pairs, conduct surveys in suitable nesting habitat within the portions of the species' breeding range that could be affected by CALFED actions to locate nesting pairs.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions during the nesting period (May-August).
3. Restore or enhance 2-5 acres of suitable nesting habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
4. To the extent consistent with ERR objectives, design and manage riparian habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.

<u>"R" Goal MSCS Fish</u>

Central Valley Fall-/Late Fall-Run Chinook Salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU)

The Central Valley fall-/late-fall-run ESU is a candidate species, not a threatened or endangered species, under FESA. The National Marine Fisheries Service (NOAA Fisheries) recovery plan for Central Valley salmonids will therefore not include formal recovery goals for populations in this ESU. The recovery plan for Central Valley salmonids will identify factors of concern and measures to ensure the long-term conservation of the Central Valley fall-/late-fall-run ESU, and recovery actions proposed for listed ESUs will be evaluated to ensure that they do not place nonlisted species at significant risk. CALFED, CDFG, and NOAA Fisheries will work together to identify restoration goals following the "Viable Salmonid Populations" (VSP) framework in a process separate from the NOAA Fisheries recovery planning process. These goals will aim to ensure the long-term viability of Sacramento and San Joaquin fall-run and Sacramento late-fall-run Chinook salmon.

Conservation Measures that Add Detail to CALFED Actions

1. Coordinate protection, enhancement, and restoration of occupied and historical Central Valley fall-/late-fall-run Chinook salmon ESU habitats with other Federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program, CVPIA, and U.S. Army Corps of Engineer's (Corps) Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program (USFWS 1997, 2001) and the recovery plan for the native fishes of the Sacramento-San Joaquin Delta (USFWS 1996).
3. Operate hatcheries such that the maintenance and expansion of natural populations are not threatened by the release of hatchery fish.
4. To the extent consistent with CALFED objectives, manage operations at the Red Bluff Diversion Dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.
5. To the extent consistent with CALFED objectives, manage export flows from the San Joaquin River to improve conditions for upstream migration of adult fish (i.e., attraction flows).
6. To the extent consistent with CALFED objectives, operate physical barriers in the Delta in a manner to assist in achieving recovery goals.
7. Continue research to determine causes for low outmigration survival of fish from the San Joaquin River in the south Delta and identify and implement measures to improve outmigration survival.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley fall-/late-fall-run Chinook salmon listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures" (CALFED 2000a).
2. Operate new or expanded storage, conveyance, and diversion facilities to minimize and compensate for adverse impacts on fall-/late-fall-run Chinook salmon by implementing the following measures:
    a. Provide enhanced flow and water temperature conditions and physical habitat requirements of fall-/late-fall-run Chinook salmon in natal, rearing, and migratory habitat in the Sacramento and San Joaquin Rivers and their meander belts and tributaries.
    b. Minimize adverse hydrodynamic effects in the Delta.
    c. Manage reservoir operations such that the rate and magnitude of flow fluctuations are sufficient to avoid fish stranding and redd dewatering.
3. For all in-channel and near-channel construction activities, implement construction best management practices (BMPs) (such as erosion and sediment control measures) and

conservation measures in the 404 NWP, GPs, and PL84-99 Corps flood relief biological opinions:

   a. Avoid or minimize channel modifications during time periods when fall-/late-fall-run Chinook salmon are vulnerable to the direct and indirect adverse effects of construction activities.
   b. Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity.
   c. Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions.
   d. Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning fall-/late-fall-run Chinook salmon.

4. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical fall-/late-fall-run Chinook salmon spawning and rearing habitat may be considered appropriate compensation:
   a. Remove or modify artificial barriers and diversion structures.
   b. Construct fishways or bypasses to allow unimpeded movement.
5. Water transfers should be conducted during time periods when fall-/late-fall-run Chinook salmon are not vulnerable to entrainment/loss at CVP/SWP export facilities or when upstream and Delta habitat will not be adversely affected.
6. Fish screens shall be installed in accordance with NOAA Fisheries/CDFG fish screening criteria on any new diversions, consolidated diversions or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of fall-/late fall-run Chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure.
7. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in USACE Public Notice No. 5820A Amended.
8. In revising the operation of existing dams or in operating any new dams, avoid impeding passage of fall-/late-fall-run Chinook salmon adults, ensure safe passage of juveniles, and reduce predation on juvenile fall-/late-fall-run Chinook salmon from predatory fish known to congregate below dams.
9. To compensate for increases in CVP/SWP pumping capacity, optimize operation of the DCC from November through mid-June to ensure that juvenile fall-/late-fall-run Chinook salmon remain in the mainstem Sacramento River and successfully outmigrate through the western Delta and San Francisco Bay to the maximum extent consistent with the maintenance of Delta water quality standards.
10. Operation of new barriers:
    a. Manage operations of the Head of Old River barrier in a manner that maximizes benefits to San Joaquin basin Chinook salmon while minimizing adverse

hydrodynamic effects that decrease survival of other salmonids and estuarine fish species.
   b. Manage operations of the flow control barriers in the south Delta to avoid or minimize the adverse effects on migrating fall-/late fall-run Chinook salmon (such as impeding migration and entrapment upstream of the flow control barriers).
11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments:
   a. All materials that are used for construction of in-channel structures must meet applicable State and Federal water quality criteria.
   b. Avoid or minimize the use of such materials that are deleterious to aquatic organisms.
   c. Before implementing CALFED actions that require dredging, dredge materials should be tested to determine the presence of materials deleterious to fall-/late fall-run Chinook salmon. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.
   d. Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats.
12. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).
13. Develop and implement a program to monitor levee rehabilitation and maintenance activities under the CALFED Levee Program to assess cumulative impacts on habitat and evaluate alternatives to traditional flood control and bank stabilization practices. This tracking program should also monitor other Central Valley levee and bank stabilization activities conducted under programs such as the Corps' Comprehensive Study, SB 34 Levee Subventions Program, and the Corps' Nationwide Permit program.
14. Develop a sediment budget that accounts for all sediment sources (fine to coarse), rates of sedimentation, rates of sediment flux through the system, losses or gains from temporary storage reservoirs such as gravel bars or floodplains, and losses by export from the basin:
   a. Develop a coarse sediment management plan, based on the sediment budget that prioritizes gravel requirements relative to existing critical life stage needs (such as flow, temperature, and rearing habitat availability).
   b. Develop sediment control measures that will restore or preserve viable stream communities and freshwater fisheries based on the identification of the main causes or sources of deleterious volumes of anthropogenic inorganic fine sediment input to anadromous rivers and streams.

Central Valley Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*) ESU

The Central Valley spring-run Chinook salmon ESU will be regarded as restored when the ESU meets specific viability criteria to be established in the NOAA Fisheries recovery plan for Central Valley salmonids. Viability of the Central Valley spring-run ESU will be assessed according to the VSP framework developed by NOAA Fisheries (NOAA Fisheries, in review). The framework deals with four population characteristics:

- Abundance: Populations are large enough to resist extinction due to random environmental, demographic and genetic variation.
- Productivity: Populations have enough reproductive capacity to ensure resistance to episodes of poor freshwater or ocean conditions and the ability to rebound rapidly during favorable periods, without the aid of artificial propagation.
- Spatial Distribution: Populations are distributed widely and with sufficient connectivity such that catastrophic events do not deplete all populations and stronger populations can rescue depleted populations.
- Diversity: Populations have enough genetic and life history diversity to enable adaptation to long-term changes in the environment. Populations achieve sufficient expression of historical life history strategies (migration timing, spawning distribution), are not negatively affected by outbreeding depression resulting from straying of domesticated hatchery fish, and are not negatively affected by inbreeding depression due to small population size and inadequate connectivity between populations.

The NOAA Fisheries recovery planning for Central Valley salmonids will proceed in two phases. The first phase will be conducted by a technical recovery team (TRT) that will produce numeric recovery criteria for populations and the ESU following the VSP framework, factors for decline, early actions for recovery, and provide plans for monitoring and evaluation. The TRT will review existing salmonid population recovery goals and management programs being implemented by Federal and State agencies and will coordinate with agency scientists, CALFED staff and Central Valley science/restoration teams such as the Interagency Ecological Program work teams during this first phase. TRT products will be peer-reviewed and made available for public comment.

The second phase will be identification of recovery measures and estimates of cost and time required to achieve recovery. The second phase will involve participation by agency and CALFED staff as well as involvement by a broad range of stakeholders, including local and private entities, with the TRT providing technical guidance on biological issues.

Conservation Measures that Add Detail to CALFED Actions

1. Coordinate protection, enhancement, and restoration of occupied and historical Central Valley spring-run Chinook salmon ESU habitats with other Federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program CVPIA, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program (USFWS 1997, 2001) and the recovery plan for the native fishes of the Sacramento-San Joaquin Delta (USFWS 1996).
3. To the extent consistent with CALFED objectives, operate existing in-channel barriers and any new barriers that may be constructed to avoid changes in Delta channel

hydraulics that increase the numbers of fish or proportions of fish populations drawn toward the pumps or affected by poor water quality.

4. Manage operations at the Red Bluff Diversion Dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley spring-run Chinook salmon listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures" (CALFED 2000a).
2. Operate new or expanded storage, conveyance, and diversion facilities to minimize and compensate for adverse impacts on spring-run Chinook salmon by implementing the following measures:
    a. Provide enhanced flow and water temperature conditions and physical habitat requirements of spring-run Chinook salmon in natal, rearing, and migratory habitat in the Sacramento River and its meander belt and tributaries.
    b. Minimize adverse hydrodynamic effects in the Delta.
    c. Manage reservoir operations such that the rate and magnitude of flow fluctuations are sufficient to avoid fish stranding and redd dewatering.
3. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 Corps flood relief biological opinions:
    a. Avoid or minimize channel modifications during time periods when spring-run Chinook salmon are vulnerable to direct and indirect adverse effects of construction activities.
    b. Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity.
    c. Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions.
    d. Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning spring-run Chinook salmon.
4. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical spring-run Chinook salmon spawning and rearing habitat may be considered appropriate compensation:
    a. Remove or modify artificial barriers and diversion structures.
    b. Construct fishways or bypasses to allow unimpeded movement.
5. Water transfers should be conducted during time periods when spring-run Chinook salmon are not vulnerable to entrainment/loss at CVP/SWP export facilities or when upstream and Delta habitat will not be adversely affected.

6. Fish screens shall be installed in accordance with NOAA Fisheries/CDFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of spring-run Chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure.
7. Fully adhere to all terms and conditions in all applicable CESA and Federal ESA biological opinions and permits for CVP and SWP operations.
8. In revising the operation of existing dams or in operating any new dams, avoid impeding passage of spring-run Chinook salmon adults, ensure safe passage of juveniles, and reduce predation on juvenile spring-run Chinook salmon from predatory fish known to congregate below dams.
9. To compensate for increases in CVP/SWP pumping capacity, optimize operation of the DCC from November through May to ensure that juvenile spring-run Chinook salmon remain in the mainstem Sacramento River and successfully outmigrate through the western Delta and San Francisco Bay to the maximum extent consistent with the maintenance of Delta water quality standards.
10. Operation of new barriers:
    a. Manage operations of the Head of Old River barrier in a manner that maximizes benefits to San Joaquin basin Chinook salmon while minimizing adverse hydrodynamic effects that decrease survival of rearing and migrating juvenile spring-run Chinook salmon and estuarine fish species.
    b. Manage operations of the flow control barriers in the south Delta to avoid or minimize the adverse effects on migrating spring-run Chinook salmon (such as impeding migration and entrapment upstream of the flow control barriers).
11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments:
    a. All materials that are used for construction of in-channel structure must meet applicable State and Federal water quality criteria.
    b. Avoid or minimize the use of such materials that are deleterious to aquatic organisms.
    c. Before implementing CALFED actions that require dredging, dredge materials should be tested to determine the presence of materials deleterious to spring-run Chinook salmon. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.
    d. Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats.
12. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).
13. Develop and implement a program to monitor levee rehabilitation and maintenance activities under the CALFED Levee Program to assess cumulative impacts on habitat and evaluate alternatives to traditional flood control and bank stabilization practices. This tracking program should also monitor other Central Valley levee and bank stabilization

activities conducted under programs such as the Corps' Comprehensive Study, SB 34 Levee Subventions Program, and the Corps' Nationwide Permit program.

14. Develop a sediment budget that accounts for all sediment sources (fine to coarse), rates of sedimentation, rates of sediment flux through the system, losses or gains from temporary storage reservoirs such as gravel bars or floodplains, and losses by export from the basin:
    a. Develop a coarse sediment management plan, based on the sediment budget that prioritizes gravel requirements relative to existing critical life stage needs (such as flow, temperature, and rearing habitat availability).
    b. Develop sediment control measures that will restore or preserve viable stream communities and freshwater fisheries based on the identification of the main causes or sources of deleterious volumes of anthropogenic inorganic fine sediment input to anadromous rivers and streams.

Central Valley Steelhead (*Oncorhynchus mykiss*) ESU

The Central Valley steelhead ESU will be regarded as restored when the ESU meets specific viability criteria to be established in the NOAA Fisheries recovery plan for Central Valley salmonids. Viability of the Central Valley steelhead ESU will be assessed according to the VSP framework developed by NOAA Fisheries (NOAA Fisheries, in review). The framework deals with four population characteristics:

- Abundance: Populations are large enough to resist extinction due to random environmental, demographic and genetic variation.
- Productivity: Populations have enough reproductive capacity to ensure resistance to episodes of poor freshwater or ocean conditions and the ability to rebound rapidly during favorable periods, without the aid of artificial propagation.
- Spatial Distribution: Populations are distributed widely and with sufficient connectivity such that catastrophic events do not deplete all populations and stronger populations can rescue depleted populations.
- Diversity: Populations have enough genetic and life history diversity to enable adaptation to long-term changes in the environment. Populations achieve sufficient expression of historical life history strategies (migration timing, spawning distribution), are not negatively affected by outbreeding depression resulting from straying of domesticated hatchery fish, and are not negatively affected by inbreeding depression due to small population size and inadequate connectivity between populations.

The NOAA Fisheries recovery planning for Central Valley salmonids will proceed in two phases. The first phase will be conducted by a TRT that will produce numeric recovery criteria for populations and the ESU following the VSP framework, factors for decline, early actions for recovery, and provide plans for monitoring and evaluation. The TRT will review existing salmonid population recovery goals and management programs being implemented by Federal and State agencies and will coordinate with agency scientists, CALFED staff and Central Valley science/restoration teams such as the Interagency Ecological Program work teams during this first phase. TRT products will be peer-reviewed and made available for public comment.

The second phase will be identification of recovery measures and estimates of cost and time required to achieve recovery. The second phase will involve participation by agency and

CALFED staff as well as involvement by a broad range of stakeholders, including local and private entities, with the TRT providing technical guidance on biological issues.

Conservation Measures that Add Detail to CALFED Actions

1. Coordinate protection, enhancement, and restoration of occupied and historical Central Valley steelhead ESU habitats with other Federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program CVPIA, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program (USFWS 1997, 2001) and the recovery plan for the native fishes of the Sacramento-San Joaquin Delta (USFWS 1996).
3. Implement management measures and recommended by CDFG (CDFG 1996) that are applicable to CALFED actions and to achieving CALFED objectives.
4. Minimize flow fluctuations to reduce or avoid stranding of juveniles.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley steelhead listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures"(CALFED 2000a).
2. Operate new or expanded storage, conveyance, and diversion facilities to minimize and compensate for adverse impacts on steelhead by implementing the following measures:
   a. Provide enhanced flow and water temperature conditions and physical habitat requirements of steelhead in natal, rearing, and migratory habitat in the Sacramento River and its meander belt and tributaries.
   b. Minimize adverse hydrodynamic effects in the Delta.
   c. Manage reservoir operations such that the rate and magnitude of flow fluctuations are sufficient to avoid fish stranding and redd dewatering.
3. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 Corps flood relief biological opinions:
   a. Avoid or minimize channel modifications during time periods when steelhead are vulnerable to direct and indirect adverse effects of construction activities.
   b. Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity.
   c. Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions.

    d. Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning steelhead.
4. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical steelhead spawning and rearing habitat may be considered appropriate compensation:
    a. Remove or modify artificial barriers and diversion structures.
    b. Construct fishways or bypasses to allow unimpeded movement.
5. Water transfers should be conducted during time periods when spring-run Chinook salmon are not vulnerable to entrainment/loss at CVP/SWP export facilities or when upstream and Delta habitat will not be adversely affected.
6. Fish screens shall be installed in accordance with NOAA Fisheries/CDFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of spring-run Chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure.
7. Fully adhere to all terms and conditions in all applicable CESA and Federal ESA biological opinions and permits for CVP and SWP operations.
8. In revising the operation of existing dams or in operating any new dams, avoid impeding passage of steelhead adults, ensure safe passage of juveniles, and reduce predation on juvenile steelhead from predatory fish known to congregate below dams.
9. To compensate for increases in CVP/SWP pumping capacity, optimize operation of the DCC from January through May to ensure that steelhead smelts remain in the mainstem Sacramento River and successfully outmigrate through the western Delta and San Francisco Bay to the maximum extent consistent with the maintenance of Delta water quality standards.
10. Operation of new barriers:
    a. Manage operations of the Head of Old River barrier in a manner that maximizes benefits to San Joaquin basin Chinook salmon while minimizing adverse hydrodynamic effects that decrease survival of rearing and migrating steelhead and estuarine fish species.
    b. Manage operations of the flow control barriers in the south Delta to avoid or minimize the adverse effects on migrating steelhead (such as impeding migration and entrapment upstream of the flow control barriers).
11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments:
    a. All materials that are used for construction of in-channel structure must meet applicable State and Federal water quality criteria.
    b. Avoid or minimize the use of such materials that are deleterious to aquatic organisms.
    c. Before implementing CALFED actions that require dredging, dredge materials should be tested to determine the presence of materials deleterious to spring-run Chinook salmon. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.

    d. Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats.
12. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).
13. Develop and implement a program to monitor levee rehabilitation and maintenance activities under the CALFED Levee Program to assess cumulative impacts on habitat and evaluate alternatives to traditional flood control and bank stabilization practices. This tracking program should also monitor other Central Valley levee and bank stabilization activities conducted under programs such as the Corps' Comprehensive Study, SB 34 Levee Subventions Program, and the Corps' Nationwide Permit program.
14. Develop a sediment budget that accounts for all sediment sources (fine to coarse), rates of sedimentation, rates of sediment flux through the system, losses or gains from temporary storage reservoirs such as gravel bars or floodplains, and losses by export from the basin:
    a. Develop a coarse sediment management plan based on the sediment budget that prioritizes gravel requirements relative to existing critical life stage needs (such as flow, temperature, and rearing habitat availability).
    b. Develop sediment control measures that will restore or preserve viable stream communities and freshwater fisheries based on the identification of the main causes or sources of deleterious volumes of anthropogenic inorganic fine sediment input to anadromous rivers and streams.

Sacramento River Winter-Run Chinook salmon (*Oncorhynchus tshawytscha*) ESU
The mean annual spawning abundance over any 13 consecutive years will be 10,000 females. The geometric mean of the Cohort Replacement Rate over those same 13 years will be greater than 1.0. Estimates of these criteria will be based on natural production alone and will not include hatchery-produced fish. If the precision for estimating spawning run abundance has a standard error greater than 25%, then the sampling period over which the geometric mean of the Cohort Replacement Rate is estimated will be increased by one additional year for each 10% of additional error over 25% (NOAA Fisheries 1998).

<u>Conservation Measures that Add Detail to CALFED Actions</u>

1. Coordinate protection, enhancement, and restoration of occupied and historical Sacramento River winter-run Chinook salmon ESU habitats with other Federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program CVPIA, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. Implement management measures identified in the proposed recovery plan for the Sacramento River winter-run Chinook salmon ESU (NOAA Fisheries 1997).

3. To the extent consistent with CALFED objectives, manage operations at the Red Bluff Diversion Dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.

<u>Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects</u>

1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Sacramento River winter-run Chinook salmon listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".
2. Operate new or expanded storage, conveyance, and diversion facilities to minimize and compensate for adverse impacts on winter-run Chinook salmon by implementing the following measures:
    a. Provide enhanced flow and water temperature conditions and physical habitat requirements of winter-run Chinook salmon in natal, rearing, and migratory habitat in the Sacramento River and its meander belt and tributaries.
    b. Minimize adverse hydrodynamic effects in the Delta.
    c. Manage reservoir operations such that the rate and magnitude of flow fluctuations are sufficient to avoid fish stranding and redd dewatering.
3. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 Corps flood relief biological opinions:
    a. Avoid or minimize channel modifications during time periods when winter-run Chinook salmon are vulnerable to direct and indirect adverse effects of construction activities.
    b. Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity.
    c. Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions.
    d. Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning winter-run Chinook salmon.
4. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical winter-run Chinook salmon spawning and rearing habitat may be considered appropriate compensation:
    a. Remove or modify artificial barriers and diversion structures.
    b. Construct fishways or bypasses to allow unimpeded movement.
5. Water transfers should be conducted during time periods when winter-run Chinook salmon are not vulnerable to entrainment/loss at CVP/SWP export facilities or when upstream and Delta habitat will not be adversely affected.

6. Fish screens shall be installed in accordance with NOAA Fisheries/CDFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of winter-run Chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure.
7. Fully adhere to all terms and conditions in all applicable CESA and Federal ESA biological opinions and permits for CVP and SWP operations.
8. In revising the operation of existing dams or in operating any new dams, avoid impeding passage of winter-run Chinook salmon adults, ensure safe passage of juveniles, and reduce predation on juvenile winter-run Chinook salmon from predatory fish known to congregate below dams.
9. To compensate for increases in CVP/SWP pumping capacity, optimize operation of the DCC from November through May to ensure that juvenile winter-run Chinook salmon remain in the mainstem Sacramento River and successfully outmigrate through the western Delta and San Francisco Bay to the maximum extent consistent with the maintenance of Delta water quality standards.
10. Operation of new barriers:
    c. Manage operations of the Head of Old River barrier in a manner that maximizes benefits to San Joaquin basin Chinook salmon while minimizing adverse hydrodynamic effects that decrease survival of rearing and migrating juvenile winter-run Chinook salmon and estuarine fish species.
    d. Manage operations of the flow control barriers in the south Delta to avoid or minimize the adverse effects on migrating winter-run Chinook salmon (such as impeding migration and entrapment upstream of the flow control barriers).
11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments:
    a. All materials that are used for construction of in-channel structure must meet applicable State and Federal water quality criteria.
    b. Avoid or minimize the use of such materials that are deleterious to aquatic organisms.
    c. Before implementing CALFED actions that require dredging, dredge materials should be tested to determine the presence of materials deleterious to winter-run Chinook salmon. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.
    d. Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats. All materials that are used for construction of in-channel structures must meet applicable State and Federal water quality criteria.
12. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).
13. Develop and implement a program to monitor levee rehabilitation and maintenance activities under the CALFED Levee Program to assess cumulative impacts on habitat and

evaluate alternatives to traditional flood control and bank stabilization practices. This tracking program should also monitor other Central Valley levee and bank stabilization activities conducted under programs such as the Corps' Comprehensive Study, SB 34 Levee Subventions Program, and the Corps' Nationwide Permit program.

14. Develop a sediment budget that accounts for all sediment sources (fine to coarse), rates of sedimentation, rates of sediment flux through the system, losses or gains from temporary storage reservoirs such as gravel bars or floodplains, and losses by export from the basin:
    a. Develop a coarse sediment management plan, based on the sediment budget that prioritizes gravel requirements relative to existing critical life stage needs (such as flow, temperature, and rearing habitat availability).
    b. Develop sediment control measures that will restore or preserve viable stream communities and freshwater fisheries based on the identification of the main causes or sources of deleterious volumes of anthropogenic inorganic fine sediment input to anadromous rivers and streams.

Delta Smelt (*Hypomesus transpacificus*)
Achieve recovery objectives identified for delta smelt in the recovery plan for the Sacramento/San Joaquin Delta native fishes (USFWS 1996).

<u>Conservation Measures that Add Detail to CALFED Actions</u>

1. Coordinate protection, enhancement, and restoration of occupied delta smelt habitats with other Federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, and USFWS recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. To the extent consistent with CALFED objectives, direct ERP actions toward setting back levees in the south Delta to increase shallow-water habitat.
3. Restore and enhance delta smelt habitat to provide suitable water quality (i.e., low concentrations of pollutants) and substrates for egg attachment (submerged tree roots, branches, rock, and emergent vegetation) to important spawning areas.
4. Expand Interagency Ecological Program (IEP) monitoring efforts in the south Delta for delta smelt.
5. To the extent consistent with CALFED objectives, initiate implementation of USFWS's "Rainbow Report" or similar documentation to provide increased water quality in the south Delta and eliminate or reduce the need for installation of barriers.
6. Monitor to determine if artificial substrates are used by delta smelt for spawning.
7. Protect critical rearing habitat from high salinity (>2 parts per thousand [ppt]) and high concentration of pollutants from February 1 to August 31.
8. Allow delta smelt unrestricted access to suitable spawning habitat and protect these areas from physical disturbance (e.g., heavy equipment operation) and flow disruption from December to July. Maintaining adequate flow and suitable water quality would attract migrating adults in the Sacramento and San Joaquin River channels and their tributaries, including Cache and Montezuma Sloughs and their tributaries.

9. All in-channel modification projects implemented under CALFED should use best management practices to minimize mobilization of sediments that might contain toxins, localize sediment movement, and reduce turbidity.

<u>Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects</u>

1. Implement conservation measures in (a) biological opinions, including the 404 Nationwide Permit (NWP), General Permit (GP), and Public Law (PL) 84-99 Corps flood relief biological opinions, (b) the Central Valley Project Improvement Act (CVPIA) biological assessment, and (c) Diversion Effects on Fish Team (DEFT) reports.
2. To the extent consistent with CALFED objectives, retire agricultural land in the south Delta to minimize the need for barrier installation.
3. Identify and pursue opportunities to provide operational flexibility of the Central Valley Project (CVP) and State Water Project (SWP) to eliminate or reduce the need for installation of barriers in the south Delta.
4. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in Corps Public Notice No. 5820A Amended.
5. Avoid or minimize the use of hard structures (e.g., riprap) to stabilize banks.
6. Avoid or minimize implementing channel modification activities near channel islands, shoals, and shoreline areas with emergent vegetation.
7. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any shallow-water areas ($\leq$ 3m at mean low low water [MLLW]) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).
8. Avoid or minimize dredging or other waterside activities required to implement CALFED actions in shallow-water areas (< 3 meters [m] at MLLW) of the Bay and Delta.
9. Avoid or minimize construction of waterside rock berms and backfill in critical spawning and rearing areas.
10. To the extent consistent with CALFED objectives, protect the Sacramento and San Joaquin Rivers and tributary channels from physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g., water diversion that results in entrainment and in-channel barriers or tidal gates) from February 1 to August 31.
11. Before implementing CALFED actions that require dredging, dredge materials should be tested to determine presence of materials deleterious to delta smelt. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.
12. Avoid or minimize the use of creosote pilings for constructing in-water structures.
13. CALFED actions that have temporary impacts (less than 1 year) on shallow-water habitat within the range of the delta smelt will protect or restore 1 acre of in-kind habitat for each acre of affected habitat.
14. CALFED actions that have long-term (greater than 1 year) impacts on shallow-water habitat shall protect or restore 3 acres of in-kind habitat for each acre of affected habitat.
15. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on delta smelt listed in MSCS Attachment D, "Summary of Potential Beneficial

and Adverse Program Effects and Conservation Measures", Table D-20, "Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".

Green Sturgeon (*Acipenser medirostris*)
Achieve recovery objectives identified for green sturgeon in the recovery plan for the Sacramento/San Joaquin Delta native fishes (USFWS 1996).

<u>Conservation Measures that Add Detail to CALFED Actions</u>

1. Coordinate protection, enhancement, and restoration of occupied and historical green sturgeon habitats with other Federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program CVPIA, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. Provide inflows to the Delta from the Sacramento River greater than 25,000 cubic feet per second during the March-to-May spawning period in at least 2 of every 5 years.
3. Identify and implement measures to eliminate stranding of green sturgeon in the Yolo Bypass or to return stranded fish to the Sacramento River.
4. Conduct research in the MSCS Focus Area to determine green sturgeon habitat requirements, distribution, spawning habitat flow requirements, and factors limiting population abundance.

<u>Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects</u>

1. Coordinate and maximize water supply system operations flexibility consistent with seasonal flow and water temperature needs of the green sturgeon; pursue opportunities to operate new and existing diversions to avoid and minimize adverse effects on green sturgeon, and, to the extent consistent with CALFED objectives, locate diversion points to avoid the primary distribution of green sturgeon.
2. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in Corps Public Notice No. 5820A Amended.
3. For all construction activities, limit construction to windows of minimal species vulnerability and implement best management practices (BMPs), including a stormwater pollution prevention plan, toxic materials control and spill response plan, and vegetation protection plan.
4. CALFED actions that have impacts on shallow water habitat will protect and restore in-kind habitat needed to replace the functional value of each acre of affected habitat, including habitat features that minimize colonization by undesirable non-native species.
5. Avoid or minimize restrictions on the upward movement of green sturgeon to suitable spawning habitat.
6. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on green sturgeon listed in MSCS Attachment D, "Summary of Potential

Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".

Longfin Smelt (*Spirinchus thaleichthys*)

Achieve recovery objectives identified for longfin smelt in the recovery plan for the Sacramento/San Joaquin Delta native fishes (USFWS 1996).

<u>Conservation Measures that Add Detail to CALFED Actions</u>

1. Coordinate protection, enhancement, and restoration of occupied longfin smelt habitats with other Federal, State, and regional programs (*e.g.*, the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, and Service recovery plans) that could affect management of current and historical habitat use areas to avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. Improve January and February flows for the longfin smelt during the second and subsequent years of drought periods.
3. Provide sufficient Delta outflows for the longfin smelt from December through March.
4. Provide suitable water quality and substrates for egg attachment (submerged tree roots, branches, rock, and emergent vegetation) to spawning areas in the Delta and tributaries of northern Suisun Bay.
5. Provide unrestricted access to suitable spawning habitat and protect these areas from physical disturbance (*e.g.*, heavy equipment operation) and flow disruption from December to July. Maintaining adequate flow and suitable water quality would attract migrating adults in the Sacramento and San Joaquin River channels and their tributaries, including Cache and Montezuma Sloughs and their tributaries.
6. Conduct research to determine the relationship between X2 and longfin smelt abundance and distribution.
7. Consistent with CALFED objectives, mobilize organic carbon in the Yolo Bypass to improve food supplies by ensuring flow through the bypass at least every other year.
8. Consistent with CALFED objectives, operate diversions to minimize adverse effects of diversions on longfin smelt during the peak spawning period (January-March).
9. To the extent consistent with CALFED objectives, protect the Sacramento and San Joaquin Rivers and tributary channels from physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g., water diversions that result in entrainment and in-channel barriers or tidal gates) from February 1 to August 31.
10. Protect critical rearing habitat from high salinity (>2 ppt) and high concentration of pollutants from February 1 to August 31.

<u>Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects</u>

1. To the extent consistent with CALFED objectives, channel modification activities should avoid channel islands, shoals, and shoreline areas with emergent vegetation.

2. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).
3. Avoid or minimize dredging or other waterside activities in shallow-water areas (<3 m at MLLW) of the Bay and Delta.
4. Avoid or minimize construction of waterside rock berms and backfill in critical spawning and rearing areas.
5. All in-channel modification projects implemented under CALFED should use best management practices to (1) minimize mobilization of sediments that might contain toxins, (2) localize sediment movement, and (3) reduce turbidity.
6. Before implementing CALFED actions that require dredging, dredge materials should be tested to determine presence of materials deleterious to longfin smelt. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.
7. CALFED actions that have temporary impacts (less than 1 year) on shallow-water habitat within the range of the longfin smelt will protect or restore 1 acre of in-kind habitat for each acre of affected habitat.
8. CALFED actions that have long-term (greater than 1 year) impacts on shallow-water habitat will protect or restore 3 acres of in-kind habitat for each acre of affected habitat.
9. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on longfin smelt listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-20, "Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures"(CALFED 2000a).

Sacramento Splittail (*Pogonichthys macrolepidotus*)
Species recovery objectives will be achieved when two of the following three criteria are met in at least 4 of every 5 years for a 15 year period: (1) the fall midwater trawl survey numbers must be 19 or greater for 7 of 15 years, (2) the Suisun Marsh catch per trawl must be 3.8 or greater and the catch of young-of-year must exceed 3.1 per trawl for 3 of 15 years, and (3) Bay Study otter trawls must be 18 or greater and catch of young-of-year must exceed 14 for 3 out of 15 years.

<u>Conservation Measures that Add Detail to CALFED Actions</u>

1. Coordinate protection, enhancement, and restoration of occupied and historical Sacramento splittail habitats with other Federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program and Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. To the extent consistent with CALFED objectives, remove diversion dams that block splittail access to lower floodplain river spawning areas.
3. Minimize changes in the timing and volume of freshwater flows in the rivers to the Bay-Delta.

4. To the extent consistent with CALFED objectives, direct ERP actions toward setting back levees in the south Delta to increase shallow-water habitat.
5. To the extent consistent with CALFED objectives, reduce the extent of reversed flows in the lower San Joaquin and Delta from February through June.
6. Reduce the loss of splittail at south Delta pumping plants from predation and salvage handling and transport.
7. Reduce the loss of young splittail to entrainment into south-Delta pumping plants.
8. To the extent practicable, reduce the loss of splittail at 1,800 unscreened diversions in the Delta.
9. Reduce losses of adult splittail spawners during their upstream migrations to recreational fishery harvest.
10. To the extent consistent with CALFED objectives, improve Delta water quality, particularly in dry years when pesticide levels and total dissolved solids are high.
11. To the extent consistent with CALFED objectives, reduce the concentration of pollutants in the Colusa Basin drain and other agricultural drains into the Bay-Delta and its watershed.
12. Modify operation of the DCC to minimize the potential to increase exposure of splittail population in the Delta to the south-Delta pumping plants.
13. Modify operation of the barrier at the Head of Old River to minimize the potential for drawing splittail toward the south-Delta pumping plants.
14. To the extent practicable, design and construct overflow basins from existing leveed lands in stages using construction design and operating schemes and procedures developed through pilot studies and project experience. The purpose of this action is to minimize the potential for stranding splittail as waters recede from overflow areas.
15. Design and construct a new intake screen system at the entrance to Clifton Court Forebay that minimizes potential involvement of splittail. Connect intakes of Tracy Pumping Plant to Clifton Court Forebay.
16. Consistent with CALFED objectives, design modifications to south-Delta channels to improve circulation and transport of north-of-Delta water to the south-Delta pumping plants. This action would ensure that habitat supports splittail and that transport of splittail to the south-Delta pumping plants is not increased.
17. To the extent practicable, design seasonal wetlands that have hydrological connectivity with occupied channels to reduce the likelihood of stranding and to provide the structural conditions necessary for spawning.
18. To the extent consistent with CALFED objectives, protect spawning areas by providing suitable water quality (i.e., low concentrations of pollutants) and substrates for egg attachment (e.g., submerged tree roots and branches, and above-water and submersed vegetation).
19. Avoid or minimize adverse effects on rearing habitat of physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g., water diversions, in-channel barriers, or tidal gates).
20. To the extent consistent with CALFED objectives, maintain a low salinity zone in historically occupied habitat of the Bay and Delta from February 1 to August 31.
21. To the extent consistent with CALFED objectives, provide unrestricted access of adults to spawning habitat from December to July by maintaining adequate flow and water quality, and minimizing disturbance and flow disruption.

22. Expand IEP monitoring efforts in the south Delta for Sacramento splittail.
23. To the extent consistent with CALFED objectives, initiate implementation of the USFWS's "Rainbow Report" or similar documentation to provide increased water quality in the south Delta and eliminate or reduce the need for installation of barriers.
24. To the extent consistent with CALFED objectives, reduce the effects on splittail from changes in reservoir operations and ramping rates for flood control.
25. To the extent consistent with CALFED objectives, reduce the loss of freshwater and low-salinity splittail habitat in the Bay-Delta as a result of reductions in Delta inflow and outflow.
26. To the extent consistent with CALFED objectives, increase the frequency of flood bypass flooding in non-wet years to improve splittail spawning and early rearing habitat.
27. To the extent consistent with CALFED objectives, ensure that the Yolo and Sutter Bypasses are flooded during the spawning season at least once every 5 years.
28. To the extent consistent with CALFED objectives, improve the frequency, duration, and extent of bypass flooding in all years.
29. Develop a water management plan to allocate multiyear water supply in reservoirs to protect drought-year supplies and the source of winter-spring Delta inflow and outflow needed to sustain splittail and their habitats.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Consistent with CALFED objectives, limit dredging, diking, and filling of occupied shallow-water habitats.
2. Identify and pursue opportunities to provide operational flexibility of the CVP and SWP to eliminate or reduce the need for installation of barriers in the south Delta.
3. Avoid or minimize the use of hard structures (*i.e.*, riprap) to stabilize banks.
4. Consistent with CALFED objectives, construct and operate barriers in the Delta to minimize the threat to splittail from enhancing transport of water to south-Delta pumping plants.
5. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in USACE Public Notice No. 5820A Amended.
6. Consistent with CALFED objectives, conduct water transfers at times of the year that would not increase exposure of splittail to south-Delta pumping plants.
7. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Sacramento splittail listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-20, "Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures"(CALFED 2000a).

"m" Goal MSCS Fish

Hardhead (*Mylophardon concocephalus*)

There are no CALFED species-specific conservation measures for hardhead. Follow the conservation measures for the MSCS Valley Riverine Aquatic and Montane Riverine Aquatic habitat types.

"m" Goal MSCS Amphibians and Reptiles

Alameda Whipsnake (*Masticophis lateralis euryxanthus*)

1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 2-5 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 2-5 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent practicable, capture individuals from habitat that would be affected by CALFED actions, and relocate them to nearby suitable existing restored, or enhanced habitat.

San Joaquin Whipsnake (*Masticophis flagellum ruddocki*)

1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage l-3 acres of existing occupied habitat for every acre of occupied habitat affected by CALFED actions or (b) enhance or restore l-3 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent practicable, capture individuals from habitat that would be affected by CALFED actions, and relocate them to nearby suitable existing, restored, or enhanced habitat.

California Red-Legged Frog (*Rana aurora draytonii*), California Tiger Salamander (*Ambystoma californiense*), Foothill Yellow-Legged Frog (*Rana boylii*), and Western Spadefoot Toad (*Scaphiopus hammondii*)

1. Avoid CALFED actions that could adversely affect the connectivity of habitat corridors among existing metapopulations.
2. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 1-3 acres of existing occupied habitat for every acre of occupied habitat affected by CALFED actions or (b) enhance or restore l-3 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
3. To the extent practicable, remove or exclude individuals from the affected area to avoid construction-related mortality of individuals or, if habitat will be permanently lost as a result of actions, capture individuals from the affected area and relocate to nearby suitable existing, restored, or enhanced habitat that does not support non-native predator populations.
4. Avoid or minimize CALFED actions that could increase or attract non-native predator populations to occupied habitat.
5. To the extent consistent with ERP objectives, enhance or restore suitable habitats near occupied habitat.

Western Pond Turtle (*Actinemys marmorata*)

1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage l-5 acres of existing occupied habitat for every acre within the same area of

occupied habitat affected by CALFED actions or (b) enhance or restore l-5 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent practicable, capture individuals from habitat that would be affected by CALFED actions, and relocate them to nearby suitable existing, restored, or enhanced habitat.

<u>"m" Goal MSCS Mammals</u>
Greater Western Mastiff-Bat (*Eumops perotis californicus*)

1. Before implementing actions that could result in the loss or degradation of roost habitat, conduct surveys in suitable habitat within the range of the species that could be affected by CALFED actions to locate traditional greater western mastiff-bat roosts.
2. Avoid CALFED actions that could result in the substantial loss or degradation of roosts that support core species populations essential to maintaining the viability and distribution of the species.
3. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that support roost sites to protect roost sites from disturbances that could cause their abandonment and from management actions that could result in the loss or degradation of roosting structures.

Ringtail (*Bassariscus astutus*)

1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 2-5 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 2-5 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent consistent with Ecosystem Restoration Program (ERP) objectives, restore valley/foothill riparian habitats adjacent to occupied habitats to create a buffer of natural habitat. This buffer would protect populations from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable habitat for the natural expansion of populations.

San Joaquin Kit Fox (*Vulpes macrotis mutica*)

1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage l-3 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore l-3 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. Comply with standardized USFWS guidelines when implementing CALFED actions within potentially occupied habitat (U.S. Fish and Wildlife Service 1999a, 1999b).

<u>"R" Goal MSCS Invertebrates</u>
Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

Maintain and restore connectivity among riparian habitats occupied by the valley elderberry longhorn beetle and within its historical range along the Sacramento and San Joaquin Rivers and their major tributaries.

<u>Conservation Measures that Add Detail to CALFED Actions</u>

1. Coordinate protection and restoration of riparian habitats with other Federal and State programs (e.g., USFWS recovery plans, the SB1086 program, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of occupied and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.
2. Within the species' current range, design ERP riparian habitat enhancements and restorations to include suitable riparian edge habitat including elderberry savanna.
3. Initially direct ERP riparian habitat actions toward enhancement and restoration of habitat located near occupied habitat to encourage the natural expansion of the species' range.
4. Include sufficient buffer habitat around suitable restored and enhanced habitat within the species' range to reduce adverse effects associated with pesticide drift.
5. To the extent consistent with CALFED objectives, implement levee maintenance guidelines to protect suitable habitat.
6. To the extent consistent with CALFED objectives, design levees to encourage the establishment and long-term maintenance of suitable habitat.

<u>Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects</u>

1. Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat within the species' range that could be affected by CALFED actions to determine the presence and distribution of the valley elderberry longhorn beetle.
2. Until the valley elderberry longhorn beetle has been recovered, implement the Service's guidelines for mitigating project effects on the valley elderberry longhorn beetle to compensate for CALFED impacts on the species.

<u>"m" Goal MSCS Invertebrates</u>
Longhorn Fairy Shrimp (*Branchinecta longiantenna,*), Mid-Valley Fairy Shrimp (*Branchinecta mesovallensis*), and Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

1. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of the species' populations or that could result in the degradation or loss of habitat within 250 feet of occupied vernal pools.
2. If implementation of CALFED actions could result in relatively minor impacts on these species, implement mitigation actions identified in the Service's programmatic biological opinion for projects that could have small effects on these species (USFWS 1996).

3. To the extent consistent with ERP objectives, enhance or restore suitable habitats to benefit the species in occupied habitat.

<u>"R" Goal MSCS Plants</u>

Mason's Lilaeopsis (*Lilaeopsis masonii*)

Expand suitable and occupied habitat by 100 linear miles and protect at least 90% of the currently occupied habitat, including 90% of high-quality habitat. The high-quality habitat should include occurrences in the North, South, and East Delta and Napa River Ecological Management Units.

<u>Conservation Measures that Add Detail to CALFED Actions</u>

1. Maintain processes that support the dynamic habitat distributed throughout the species' range and associated with existing source populations (species occurs on eroding margins of levees).
2. To the extent practicable, design restoration of tidal habitats to create unvegetated, exposed substrate habitat at tidal margins of tidal freshwater emergent wetlands and riparian habitat.
3. To the extent consistent with CALFED objectives, incorporate sufficient edge habitat to support the species in levee setback and channel island habitat restoration designs.
4. To the extent practicable, maximize sinuosity of restored and created slough channels to increase water-land edge habitat.
5. To the extent consistent with CALFED objectives, maintain and restore habitat and populations throughout the species' geographic ranges and expand habitat and populations to their historical and ecological ranges based on hydrologic, salinity, and other habitat requirements of the species.
6. Consistent with CALFED objectives, incorporate suitable habitat for these species in bank protection designs used in CALFED actions.
7. Monitor status and distribution of the species at 5-year intervals and document expansion of the species into restored habitat for the duration of the program.

<u>Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects</u>

1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. For each linear foot of occupied habitat lost, create 5-10 linear feet, depending on habitat quality, of suitable habitat within 1 year of loss.

<u>"r" Goal MSCS Plants</u>

Delta Mudwort (*Limosella subulata*)

Protect at least 90% of occupied habitat, including 90% of high quality habitat, throughout the range of the species to protect geographic diversity, and expand suitable and occupied habitat by 100 linear miles.

Conservation Measures that Add Detail to CALFED Actions

1. Maintain processes that support the dynamic habitat of Delta mudwort throughout the species range and associated with existing source populations.
2. To the extent consistent with CALFED objectives, create unvegetated, exposed substrate at tidal margins of restored and created tidal freshwater emergent wetland and riparian habitat.
3. To the extent consistent with CALFED objectives, incorporate suitable habitat for these species into levee designs.
4. Incorporate sufficient edge habitat to support the species in levee set back and channel island habitat restoration designs.
5. Maximize sinuosity of restored and created slough channels to increase water-land edge habitat.
6. Maintain and restore habitat and populations throughout the species geographic ranges, and expand the species ranges to the historical and ecological ranges based on hydrological, salinity, and other habitat attributes.
7. Monitor existing populations and their habitat at 5-year intervals.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. For each linear foot of occupied habitat lost, create 5-l 0 linear feet of suitable habitat, of equal or higher habitat quality, within one year of loss.

Alkali Milk-Vetch (*Astragalus tener* var. *tener*)
Protect extant populations, and reintroduce species near extirpated populations.

Conservation Measures that Add Detail to CALFED Actions

1. Protect extant populations, and reintroduce species near extirpated populations.
2. Monitor status and distribution of populations for the duration of CALFED, and design and implement conservation measures if a decline in population size or vigor is observed.

Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. Avoid or minimize CALFED actions that could result in mortality or the loss or degradation of habitat occupied by the species.

<u>“m” Goal MSCS Plants</u>

Big Tarplant (*Blepharizonia plumosa* ssp. *plumosa*)

1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of this species’ populations or that could result in the degradation or loss of high-quality species-occupied natural habitat.
2. If occupied habitat is lost or degraded as a result of CALFED actions, preserve (preferably by acquisition) 6 acres of high-quality occupied habitat and preserve 1 acre of suitable unoccupied habitat for every acre of habitat affected by CALFED.
3. Develop a seedbank from all populations affected by implementation of CALFED actions, and use the collected seed for inoculating unoccupied suitable habitat
4. To the extent consistent with ERP objectives, enhance or restore suitable habitats to benefit these species in occupied habitat.

Brewer’s Western Flax (same as Brewer’s Dwarf Flax) (*Hesperolinon breweri*)

1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of this species’ populations or that could result in the degradation or loss of high-quality species-occupied natural habitat.
2. If occupied habitat is lost or degraded as a result of CALFED actions, preserve (preferably by acquisition) 6 acres of high-quality occupied habitat and preserve 1 acre of suitable unoccupied habitat elsewhere for every acre of unoccupied suitable habitat affected by CALFED. Preserved and restored habitats must be located within a 40-mile radius on the same geomorphic surface as the affected habitat.
3. Develop a seedbank from all populations affected by implementation of CALFED actions, and use the collected seed for inoculating unoccupied suitable habitat.
4. To the extent consistent with ERP objectives, enhance and restore suitable habitats to benefit these species in occupied habitat.

Recurved Larkspur (*Delphinium recurvatum*), Mt. Diablo Fairy-Lantern (*Calochortus* pulchellus), Diablo Helianthella (*Helianthella castanea*), Congdon’s Tarplant (*Hemizonia parryi* ssp. *congdonii*), Brittlescale (*Atriplex depressa*), San Joaquin Spearscale (*Atriplex joaquiniana*), and Heartscale (*Atriplex cordulata*)

1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of these species’ populations or that could result in the degradation or loss of high-quality occupied natural habitat.
2. If occupied habitat is lost or degraded as a result of CALFED actions, restore or create 1 acre of suitable habitat for each acre of affected habitat. Preserved and restored habitats must-be located within a 40-mile radius on the same geomorphic surface as the affected habitat.
3. Develop a seedbank from all populations affected by implementation of CALFED actions, and use the collected seed for inoculating unoccupied suitable habitat.
4. To the extent consistent with ERP objectives, enhance and restore suitable habitats to benefit these species in occupied habitat.

Large-Flowered Fiddleneck (*Amsinkia grandiflora*), Contra Costa Goldfields (*Lasthenia conjugens*), Contra Costa Manzanita (*Arctostaphylos manzanita* ssp. *laevigata*), and Diamond-Petaled California Poppy (*Eschscholzia rhombipetala*)

1. Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat that could be affected by CALFED actions to determine whether species are present.
2. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of populations of these species

Mt. Diablo Manzanita (*Arctostaphylos auriculata*)

1. Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat that could be affected by CALFED actions to determine whether species are present.
2. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of populations of this species.
3. Monitor all sites occupied by these species that are managed under CALFED, especially following management activities; through adaptive management, modify activities as needed to maintain or increase current population levels.

Rose Mallow (*Hibiscus lasiocarpus*)

1. Avoid or minimize adverse effects on the ecological processes that support the dynamic habitat of rose mallow throughout the species' range and associated with existing source populations.
2. Before implementing actions to rehabilitate or restore levees, conduct research to determine the extent and physical and biological qualities of existing habitat and populations.
3. To the extent consistent with ERP objectives, create unvegetated, exposed substrate at tidal margins of restored and created tidal freshwater emergent wetland and riparian habitat.
4. For each linear foot of species-occupied habitat lost or degraded as a result of CALFED actions, create 5-10 linear feet of suitable habitat of equal or higher habitat quality, within 1 year of loss.
5. To the extent consistent with CALFED objectives, incorporate suitable habitat for this species into levee improvement, levee setback, and channel island habitat restoration designs.
6. To the extent consistent with ERP objectives, maximize sinuosity of restored and created slough channels to increase water-land edge habitat.

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Appendix B

General Rare Plant Survey Guidelines

GENERAL RARE PLANT SURVEY GUIDELINES

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All surveys for rare plants should be conducted in accordance with the standardized guidelines issued by the regulatory agencies (U.S. Fish and Wildlife Service 1996, California Department of Fish and Game 2000) and the California Native Plant Society (2001). Some of the requirements specified in the standardized guidelines are that surveys must be conducted during the appropriate season and be floristic in nature. Thus, surveys should not target a single species but should aim to identify any and all rare species and rare plant communities in the area. The guidelines also provide information on selecting a qualified botanist and providing appropriate documentation of surveys. Additional considerations for conducting rare plant surveys are described by Nelson (1987). Permission of the landowner or land-management agency is required for both site access and plant collection. In addition, federal and/or state permits are necessary to collect specimens of plants listed as endangered, threatened, or rare.

The species-specific methods presented below are intended as a supplement to the basic guidelines. They describe the conditions under which the potential for discovering each listed plant species in the survey area will be maximized. Multiple visits to a site may be necessary to ensure that survey conditions have been appropriate for all potentially-occurring rare plant species.

Certain methods are common to all of the following species-specific survey guidelines; similar methods may be employed for species not covered herein. In the southern San Joaquin Valley, many of the listed plants are small and easily obscured by dense vegetation. Thus intensive, systematic surveys are recommended to detect rare plant species in this region. Biologists should walk parallel transects spaced 5 to 10 meters (16 to 33 feet) apart throughout the entire site, regardless of subjective habitat evaluations. Transects may be stratified by topography or plant community for convenience. Field survey crews should include at least one member who has seen the target species growing in its natural habitat. Other team members may be trained using photographs and/or herbarium specimens but should be accompanied in the field by the experienced crew member during all surveys. Project-area surveys are valid only for those species that are evident during the survey period. Prior to conducting surveys in a given year, at least one member of the survey crew should visit known populations of the target species that occur in areas similar in elevation, latitude, vegetation, and topography to the survey area. Such visits will determine whether precipitation has been adequate for germination and growth, as well as confirm current phenology of the target species. Survey reports should document the known locations that were visited, the date of the visit, and the observability and phenology of the target species at that time, plus the date of the survey, the abundance and distribution of all rare species in the survey area, and any other elements required by the agency guidelines. Information on the locations of known populations may be obtained from agency biologists, the California Natural Diversity Data Base, or local chapters of the California Native Plant Society (see below). The current status and abundance of any known populations visited as well as any new populations discovered also should be reported to the California Natural Diversity Data Base.

Surveys can confirm the presence of rare plants on a site, but negative results do not guarantee that rare plant species are absent. However, for practical purposes, surveys that adhere to the attached species-specific guidelines provide reasonable evidence that the specified plant taxa do not occur in the survey area. Surveys that employ methods or timing other than those recommended herein may be used as evidence of the presence (but not absence) of rare plant species.

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Appendix C

Proposed Mitigation Measures from the Los Vaqueros Reservoir Expansion

Reclamation's and CCWD's February 2009 Draft EIS/EIR proposes the following mitigation measures to avoid, minimize, and compensate for impacts associated with construction and operation of Alternative 1 (Proposed Project/Proposed Action):

Delta Fisheries and Aquatic Resources

Impact 4.3.1: In-channel construction activities associated with the proposed new Delta Intake structure would increase short-term localized suspended sediment, turbidity, and possibly contaminant concentrations within Old River, which would increase exposure of various life stages and species of fish to temporarily degraded water quality conditions.

Hazardous Materials Mitigation Measure 4.13.2: In order to prevent accidental release of hazardous materials, CCWD will incorporate specifications into the contract that would 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 any waterways and storm drain inlets; refueling equipment in designated areas; containing contaminants away from any waterways or storm drain inlets; preparing a spill prevention, control, and countermeasure plan; and regularly inspecting construction vehicles for leaks.

Hydrology Mitigation Measure 4.5.1a: The CCWD shall ensure that a Storm Water Pollution Prevention Plan (SWPPP) is prepared in accordance with the requirements of the Regional Water Quality Control Board's (RWQCB) National Pollutant Discharge Elimination System Permit (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 the construction sites through the development of 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:

- 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.

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

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

- 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 must be clearly marked and equipment and vehicles must 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.

- 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 and Brushy Creeks, Bethany Reservoir, the South Bay Aqueduct, and/or other seasonal drainages.

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

Mitigation Measure 4.3.1: To minimize sediment, turbidity, and contaminants in Old River during construction of the new Delta Intake (primarily excavation and cofferdam installation), CCWD or its contractors will obtain and comply with RWQCB Section 401 water quality certification, CDFG streambed alteration agreement, USACE Clean Water Act Section 404 permit, as needed, and adhere to the following requirements:

- Monitor periods of construction activity and coordinate with the contractor to identify periods when localized increases in turbidity may occur.

- Install a silt curtain to reduce the dissipation of suspended sediments during dredging and cofferdam installation.

- Ensure that cofferdam(s) installation occurs during the designated construction window of August 1 through November 30 to avoid the potential risk of adverse impacts on Chinook salmon, steelhead, delta smelt, and other aquatic species, which are more abundant in the area during fall, winter, and spring. This construction window may be shifted through consultation with the Service, NOAA Fisheries, and CDFG if the best available fish survey data indicate that a different construction window for cofferdam installation will avoid or minimize effects on special-status species.

- Minimize substrate disturbance during construction activities.

- Ensure project construction activities will not cause significant turbidity increases in surface waters, as follows:

    1. Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTU), increases will not exceed 1 NTU.

    2. Where natural turbidity is between 5 and 50 NTU, increases will not exceed 20 percent.

3. Where natural turbidity is between 50 and 100 NTU, increase will not exceed 10 NTU.

4. Where natural turbidity is greater than 100 NTU, increases will not exceed 10 percent.

- These limits will be eased during in-water working periods to allow a turbidity increase of 15 NTU over background turbidity as measured in surface waters 300 feet downstream from the working area. In determining compliance with the above limits, appropriate averaging periods may be applied, provided that Delta fisheries and aquatic resources would be fully protected.

- Ensure project construction activities will not cause settleable matter to exceed 0.1 milliliters per liter in surface waters, as measured in surface waters 300 feet downstream from the project.

- In the event that project construction activities create a visible plume in surface waters, initiate monitoring of turbidity levels at the discharge site and 300 feet downstream, taking grab samples for analysis of NTU levels twice per day during the work period while the visible plume persists.

- Notify the RWQCB, CDFG, the Service, and NOAA Fisheries if the above criteria for turbidity are exceeded.

- Notify the RWQCB, CDFG, the Service, and NOAA Fisheries of any spill of petroleum products, oil/grease, or other organic or earthen materials.

- If the required permits from RWQCB, CDFG, the Service or NOAA Fisheries include conditions equivalent to any mitigation measure set forth above, substitute the permit condition for the equivalent mitigation measure.

Impact 4.3.2: Underwater sound-pressure levels generated during cofferdam installation for the new Delta Intake could result in behavioral avoidance or migration delays for special-status fish species.

Measure 4.3.2: As discussed in Mitigation Measure 4.3.1, construction of the cofferdam for the new Delta Intake will be limited to the seasonal period between August 1 and November 30. This measure will also help avoid potential impacts to special-status fish species due to underwater sound pressure levels generated during coffer dam installation. To further reduce and avoid impacts to resident fish present in the south Delta in the immediate vicinity, the cofferdam would be installed using a vibration hammer that minimizes underwater sound pressure levels. If it is determined that a higher intensity percussion hammer would be required for installing the cofferdam, underwater sound pressure level monitoring would be performed by an acoustic expert to document sound pressure levels during cofferdam construction. Limiting construction related underwater sound pressure levels during cofferdam installation to less than 160 dB would reduce potential fishery impacts to a less-than-significant level. If monitoring indicates higher sound pressure levels than 160 dB, in-water construction activity would be suspended and avoidance of potential adverse effects would be achieved by consulting with the Service, NOAA Fisheries, and CDFG to determine and implement the appropriate actions, which would include one or more of the following:

- Surveying Old River at the intake site to determine fish presence before installation, and modifying the work window accordingly;

- Use of an air bubble curtain to deflect and absorb sound pressure;

- Use of lower intensity underwater sounds to repel fish from the immediate construction area before use of a high-pressure hammer;

- Limiting the duration and frequency of high-pressure underwater sound levels during cofferdam installation.

Impact 4.3.3: Dewatering of the cofferdam for the new Delta Intake could result in stranding of fish.

Mitigation Measure 4.3.3: As discussed in Mitigation Measure 4.3.1, construction of the cofferdam for the new Delta Intake will be limited to the seasonal period between August 1 and November 30. This measure will also help avoid potential impacts to special-status fish species due to coffer dam dewatering.

Additionally, CCWD will implement a fish rescue plan acceptable to CDFG, the Service, and NOAA Fisheries. The CCWD shall ensure that a qualified fishery biologist designs and conducts the fish rescue and relocation effort to collect fish (all species) from the area behind the cofferdam. The fish rescue would be implemented during the dewatering of the area behind the cofferdam for the new Delta Intake and would involve capturing and relocating the fish to suitable habitat within Old River. To ensure compliance, a fisheries biologist shall be present onsite during initial dewatering activities.

The CCWD shall monitor progress of installation of the cofferdam and the schedule for dewatering. The CCWD shall coordinate the dewatering schedule with the construction contractor and fishery biologist to allow for the fish rescue to occur before completely closing the cofferdam, and again during dewatering when water is about 2 feet deep at the shallowest point within the cofferdam. The Service, NOAA Fisheries, and CDFG shall be notified at least 48 hours before the fish rescue. Information on the species and sizes of fish collected in the rescue and estimates of survival just before release would be recorded during the time of the fish rescue and provided in a letter report to be submitted within 30 days after the fish rescue to the Service, NOAA Fisheries, and CDFG.

Impact 4.3.4: The new Delta Intake structure and associated fish screens in Old River would physically exclude fish from a small area of existing aquatic habitat and modify existing aquatic habitat.

Biological Resources Mitigation Measure 4.6.2b: Where jurisdictional wetlands and other waters cannot be avoided, to offset temporary and permanent impacts that would occur as a result of the project, restoration and compensatory mitigation shall be provided through the following mechanisms:

- Purchase or dedication of land to provide wetland preservation, restoration or creation. If restoration is available and feasible, then a ratio of at least 2:1 shall be used. If a wetland needs to be created, at least a 3:1 ratio shall be implemented to offset losses. Where practical and feasible, onsite mitigation shall be implemented.

- A wetland mitigation and monitoring plan shall be developed by a qualified biologist in coordination with CDFG, the Service, USACE, and/or RWQCB that details mitigation and monitoring obligations for temporary and permanent impacts to wetlands and other waters as a result of construction activities. The plan shall quantify the total acreage lost; describe mitigation ratios for lost habitat, annual success criteria, mitigation sites, monitoring and reporting requirements, and site specific plans to compensate for wetland losses resulting from the project.

- The mitigation and monitoring plan shall be submitted to the appropriate regulatory agencies for approval.

Impact 4.3.5: The new Delta Intake structure and associated fish screens in Old River would modify hydraulic conditions next to the intake structure, but would not disorient special status fish or attract predatory fish.

Mitigation Measure: none proposed

Impact 4.3.6: Operation of the project alternatives would not result in changes to Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.

Mitigation Measure: none proposed

Impact 4.3.7: Operation of the new screened intake, or changes to diversions at existing intakes, could affect direct entrainment or impingement of fish.

Mitigation Measure: none proposed

Impact 4.3.8: Fish screen maintenance activities would not significantly increase fish entrainment at the new Delta Intake or the expanded Old River Intake.

Mitigation Measure: none proposed

Impact 4.3.9: The project, when combined with other planned project alternatives, or projects under construction in the area, could cumulatively contribute to substantial adverse impacts to Delta fisheries and aquatic resources.

Mitigation for Cumulative Impacts: Implementation of Delta Fisheries and Aquatic Resources Mitigation Measures (Measures 4.3.1, 4.3.2 and 4.3.3), together with Hazardous Materials Mitigation Measure 4.13.2, Hydrology Mitigation Measure 4.5-1a and Biological Resources Mitigation Measure 4.6.2b, will reduce potential impacts to less-than-significant levels. No additional measures are proposed.

Biological Resources

Impact 4.6.1: Project construction would affect the following NCCP habitat types (CDFG sensitive plant communities in parentheses): Natural Seasonal Wetland (i.e., bulrush-cattail series, northern claypan vernal pool, bush seepweed and saltgrass series), Valley/Foothill Riparian (i.e., Fremont cottonwood series and valley oak series), Grassland (i.e., purple needlegrass series) and Valley/Foothill Woodland Forest (i.e., blue oak series).

Mitigation Measure 4.6.1a: Based on the documented distribution of sensitive plant communities, CCWD shall implement avoidance and minimization measures to minimize impacts on sensitive plant communities during project construction. To the extent feasible, project design shall minimize impacts on sensitive plant communities. Exclusion and/or silt fencing shall be installed to buffer avoided areas.

Natural Seasonal Wetland habitat (bush seepweed) shall be avoided within the Western substation study area by siting facilities to avoid to this plant community.

Mitigation Measure 4.6.1b: Where avoidance of sensitive plant communities is not possible, CCWD shall provide compensation through habitat creation, enhancement, and preservation, both within and outside the watershed, for temporary and permanent impacts on the following sensitive plant communities that will be affected by the project:

Natural Seasonal Wetland (Bulrush-cattail Series, Northern Claypan Vernal Pool, Bush Seepweed, and Saltgrass Series)

- The CCWD shall implement Mitigation Measure 4.6.2, presented below, to minimize, and compensate for impacts to sensitive plant communities associated with jurisdictional wetlands and other waters of the United States.

Valley Oak, Blue Oak Woodlands, and Fremont Cottonwood Series

- The CCWD shall develop an oak woodland mitigation and monitoring plan to outline mitigation and monitoring obligations for impacts resulting from increased reservoir levels and construction activities. This plan shall include restoration, enhancement, and/or preservation sites; thresholds of success; monitoring and reporting requirements; site-specific designs for site restoration/enhancement activities; and long-term maintenance activities as set forth in the following bullets.

- Under the oak woodland mitigation and monitoring plan, CCWD shall acquire or dedicate land suitable for blue oak woodland and riparian woodland (valley oak and Fremont cottonwood series) restoration, enhancement, and preservation. If restoration is feasible, then a ratio of at least 2:1 shall be used. If preservation (with enhancement) is used, at least a 3:1 ratio shall be implemented to offset losses.

- Due to the limited availability of suitable mitigation lands in the watershed, CCWD shall purchase blue oak mitigation lands outside of the watershed.

- The CCWD shall coordinate acquisition of woodland mitigation lands with the Service to minimize potential conflicts with regional San Joaquin kit fox planning efforts, which seek to maintain open grasslands movement corridors.

- The CCWD shall submit the mitigation and monitoring plan to the appropriate regulatory agencies for approval.

Purple Needlegrass Grasslands

- The CCWD shall seed disturbed areas within this habitat area with native grass seed collected within or in the vicinity of impacts. Additional seed could be used to supplement seed mixes, but seed shall be from locally collected (within the ecoregion) source material and shall be appropriately selected for site conditions.

- Consistent with MSCS guidance (CALFED, 2000) and coordination with CDFG and the Service, mitigation for loss of this plant community shall be provided by preservation and enhancement of mitigation lands at a minimum of a 2:1 mitigation ratio to compensate for permanent losses.

- The CCWD shall develop and implement a native grassland restoration and enhancement plan to identify potential seed collection sites, quantities of seed required, potential enhancement areas within the Los Vaqueros Watershed, potential enhancement activities, and other measures required to maintain the sustainability of native grassland restoration and enhancement areas.

Impact 4.6.2: Project construction could affect potentially jurisdictional wetlands or waters, and streambeds and banks regulated by CDFG.

Mitigation Measure 4.6.2a: Final project design shall avoid and minimize the fill of wetlands and other waters to the greatest practicable extent. Areas that are avoided shall be subject to best management practices under the NPDES Permit, as described in

Measure 4.5.1. The fill of wetlands at the proposed Western substation site shall be avoided by siting facilities within the study area so as to avoid impacts to such areas.

Mitigation Measure 4.6.2b: Where jurisdictional wetlands and other waters cannot be avoided, to offset temporary and permanent impacts that would occur as a result of the project, restoration and compensatory mitigation shall be provided through the following mechanisms:

- Purchase or dedication of land to provide wetland preservation, restoration or creation. If restoration is available and feasible, then a ratio of at least 2:1 shall be used. If a wetland needs to be created, at least a 3:1 ratio shall be implemented to offset losses. Where practical and feasible, onsite mitigation shall be implemented.

- A wetland mitigation and monitoring plan shall be developed by a qualified biologist in coordination with CDFG, the Service, USACE, and/or RWQCB that details mitigation and monitoring obligations for temporary and permanent impacts to wetlands and other waters as a result of construction activities. The plan shall quantify the total acreage lost, describe mitigation ratios for lost habitat, annual success criteria, mitigation sites, monitoring and reporting requirements, and site specific plans to compensate for wetland losses resulting from the project.

- The mitigation and monitoring plan shall be submitted to the appropriate regulatory agencies for approval.

Impact 4.6.3: Project construction could affect populations of special-status plant species including brittlescale, San Joaquin spearscale, Brewer's dwarf-flax, and rose-mallow.

Mitigation Measure 4.6.3a: Where necessary, CCWD shall complete focused plant surveys on out-of-watershed pipeline alignments and facilities following CDFG's and the Service's special-status plant survey guidelines. Comprehensive special-status plant surveys have been completed, except at a few sites on the Transfer-Bethany Pipeline alignment, within the Western substation siting zone (Power Option 1), within the Western power line alignment associated with Power Option 2 (i.e., within the siting zone for the new Western substation described above), and north of the Skinner Delta Fish Protective Facility (Power Option 2). Surveys shall document the location, extent, and size of Atriplex (brittlescale and heartscale) populations, if present, and shall be used to inform the planned avoidance of rare plant populations whenever possible. The Western substation shall be sited within the Western substation study area so as to avoid and minimize impacts to San Joaquin spearscale.

To the extent feasible, the final project design shall minimize impacts on known special-status plant populations within and next to the construction footprints. The CCWD and its contractors will design facilities to avoid sensitive plant populations whenever feasible, and shall install exclusion fencing and/or silt fencing around sensitive plant populations with as large a buffer as possible to minimize the potential for direct and indirect impacts such as fugitive dust and accidental intrusion into sensitive areas. Dust and erosion control measures are described in Measure 4.5.1.

Mitigation Measure 4.6.3b: Where avoidance is not feasible, CCWD shall compensate for the loss of special-status plants through the following steps:

- A qualified ecologist shall develop and implement a restoration and mitigation plan according to CDFG guidelines and in coordination with CDFG and the Service. At a minimum, the plan shall include collection of reproductive structures from affected plants, a full description of microhabitat conditions necessary for each affected species, seed germination requirements, restoration techniques for temporarily disturbed occurrences, assessments of potential transplant and enhancement sites, success and performance criteria, and monitoring programs, as well as measures to ensure long-term sustainability. The mitigation plan shall apply to portions of the Los Vaqueros Watershed, portions of Transfer-Bethany Pipeline that require vernal pool restoration (i.e., near Byron Airport), and areas that support rose-mallow on the banks of Old River.

- Land that supports known populations of affected special-status plants shall be identified, enhanced, and protected within the watershed or acquired outside of the watershed at a ratio of 1.1:1 and protected in perpetuity with conservation easements.

Impact 4.6.4: Project construction would result in impacts on California red-legged frog and California tiger salamander, including aquatic breeding habitat and upland aestivation habitat for these species.

Mitigation Measure 4.6.4a: CCWD shall implement measures to minimize and avoid take of California red-legged frogs and California tiger salamanders. Before and during construction, the following actions shall minimize impacts on these species:

- The CCWD shall submit the name and credentials of a biologist qualified to act as construction monitor to the Service for approval at least 15 days before construction work begins. General minimum qualifications are a 4-year degree in biological sciences or other appropriate training and/or experience in surveying, identifying, and handling California tiger salamanders and California red-legged frogs.

- A Service-approved biologist shall survey the work sites 2 weeks before the onset of construction. If California tiger salamanders or California red-legged frogs (or their tadpoles or eggs) are found, the approved biologist shall contact the Service to determine whether moving any of these life-stages is appropriate. If the Service approves moving the animals, the approved biologist shall be allowed sufficient time to move frogs and/or salamanders from the work sites before work begins. If these species are not identified, construction can proceed at these sites. The approved biologist shall use professional judgment to determine whether (and if so, when) the California tiger salamanders and/or California red-legged frogs are to be moved. The

Service-approved biologist shall immediately inform the construction manager that work should be halted, if necessary, to avert avoidable take of listed species.

- Areas will be monitored during construction to identify, capture, and relocate sensitive amphibians, if present.

- A detailed California red-legged frog/California tiger salamander relocation plan will be prepared at least 3 weeks before the start of groundbreaking, and submitted to the Service for review. The purpose of the plan is to standardize amphibian relocation methods and relocation sites.

- A Service-approved biologist shall be present at the active work sites until California red-legged frogs and California tiger salamanders have been removed, and habitat disturbance has been completed. Thereafter, the contractor or CCWD shall designate a person to monitor onsite compliance with all minimization measures. A Service-approved biologist shall ensure that this individual receives training consistent with Service requirements.

- The CCWD and its contractors shall initiate all work within potential California red-legged frog aquatic breeding habitat between May 1 and November 1 (i.e., generally identified as the non-breeding season).

- The CCWD and its contractors shall install frog-exclusion fencing (i.e., silt fences) around all construction areas that are within 100 feet of potential California red-legged frog or California tiger salamander aquatic breeding habitat.

- A Service-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the California red-legged frog and California tiger salamander and their habitat, the importance of these species and their habitat, the general measures that are being implemented to conserve the red-legged frog and tiger salamander as they relate to the project, and the boundaries within which the project construction shall occur.

- During work activities, all trash that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. After construction, the contractor shall remove all trash and construction debris from work areas on a daily basis.

- All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 20 meters (65.6 feet) from any riparian habitat or water body.

- Before the onset of work, CCWD shall prepare a storm-water pollution prevention plan and water pollution control plan as described in Measures 4.5.1a and 4.5.1b to allow prompt and effective response to any accidental spills.

- Before construction begins, CCWD shall prepare a plan describing pre-project conditions, restoration, and monitoring success criteria. The CCWD or its contractors shall restore the contours and re-vegetate all areas disturbed by the project with an appropriate assemblage of native vegetation suitable to the area.

- Where needed to maintain California red-legged frog and/or California tiger salamander breeding in existing mitigation wetlands that are presently supplemented with water, but are not directly disrupted by construction, CCWD shall continue to provide supplemental water to these ponds during and after construction according to the existing terms and conditions for these mitigation sites.

Mitigation Measure 4.6.4b: CCWD shall provide compensation for permanent and temporary impacts on California tiger salamander and California red-legged frog aquatic habitat. In accordance with MSCS (CALFED, 2000) objectives, CCWD shall provide compensation for the permanent loss of California red-legged frog and California tiger salamander aquatic habitat at a minimum of a 3:1 ratio. The MSCS does not require compensation for loss of California red-legged frog and California tiger salamander aestivation habitat. To satisfy compensation guidelines, CCWD shall implement the following measures:

- The CCWD shall mitigate for the loss of aquatic breeding sites that will be filled or otherwise directly affected by the project (estimated to be 16 sites at this time; number to be confirmed by pre-construction surveys) as well as mitigate for impacts on associated California red-legged frog upland habitat by providing compensatory habitat.

- The CCWD shall develop and implement a mitigation, monitoring, and management plan, with input from regulatory agencies that shall outline long-term management strategies and performance standards to be attained to compensate for habitat losses resulting from the project. At a minimum, the plan shall include standards for mitigation site selection and construction specifications for mitigation sites, a description of site conditions including aerial maps, an analysis of local amphibian habitat (e.g., is another breeding habitat nearby?), and performance criteria by which site quality can be assessed over time (see below). A monitoring program shall be established to track the development of habitat conditions that are conducive to the establishment of the California red-legged frog and/or California tiger salamander breeding populations. Long-term monitoring (e.g., night surveys and aquatic dip-net surveys) shall be performed on an annual basis to determine if these species are present. The plan shall provide that monitoring be performed to ensure that mitigation ponds that are dependent upon artificial water function as designed.

- Performance criteria shall be used to assess the success of aquatic habitat created for California red-legged frogs and California tiger salamander aquatic habitat. These criteria shall be outlined in the mitigation, monitoring and management plan and shall include:

1. A description of the type of habitat to be created (e.g., permanent marsh consisting of open water and emergent vegetation; semipermanent marsh);

2. The total area, size and number of California red-legged frog and California tiger salamander mitigation ponds to be created based on a comparable loss of breeding sites (e.g., 1:1 replacement ratio) as a result of the project. These ponds shall concurrently satisfy wetland mitigation requirements identified in Measure 4.6.2b;

3. Constructed permanent marsh ponds that are designed to support California red-legged frog breeding shall provide:

    - at least 75% absolute vegetation cover of wetland plant species within shallow water emergent vegetation zones;

    - year-round inundation with depths of at least 1.5 feet in the vegetation zone and 4 feet in open water.

4. Constructed semi-permanent marsh ponds that are designed to support California tiger salamander or California red-legged frog breeding habitat shall provide:

    - water regimes similar to affected features, with semi-permanent water ranging from depths of 1.5 to 2.5 feet or greater during a typical rainfall year and an inundation period that exceeds 120 consecutive days; a predominance of seasonal wetland plants (at least 75% absolute vegetation cover) during the winter/spring monitoring period (though may support upland species later in the year when pools dry).

- To the greatest practicable extent, CCWD or its contractors shall construct and manage compensation habitat (i.e., replacement ponds) for California red-legged frogs and California tiger salamanders prior to project implementation. A qualified biologist shall ensure that ponds are functioning before the removal and/or inundation of existing California tiger salamander and California red-legged frog aquatic breeding sites.

- Construction within the Kellogg Creek corridor (i.e., creek crossing sites) shall be designed to impact the smallest area required to provide for the installation of pipelines, particularly in the area below Los Vaqueros Dam.

- The CCWD and its contractors shall restore and enhance Kellogg Creek and adjacent natural upland environs in the project area (about 4.0 linear miles) to restore suitable aquatic breeding habitat for California red-legged frogs and restore disturbed upland areas as close as possible to pre-project conditions. Methods of enhancement and restoration could include, but are not limited to, reducing erosion; installing breeding ponds; excluding cattle from sensitive areas; 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.

New mitigation ponds that are created for California red-legged frog and California tiger salamander shall be hydrologically self-sustaining and shall not require a supplemental water supply. Because few natural drainages in the Los Vaqueros Watershed could maintain self-sustaining mitigation ponds, a portion of the pond mitigation locations will likely be identified outside of the watershed.

Impact 4.6.5: Project construction would result in direct and indirect impacts on existing populations of and habitat for the western pond turtle.

Mitigation Measure 4.6.5: Before construction activities begin, a qualified biologist shall conduct western pond turtle surveys within creeks and in other ponded areas affected by the project. Upland areas shall also be examined for evidence of nests as well as individual turtles. The project biologist shall be responsible for the survey and for the relocation of turtles. Construction shall not proceed until a reasonable effort has been made to capture and relocate as many western pond turtles as possible to minimize take. However, some individuals may be undetected or enter sites after surveys, and would be subject to mortality. If a nest is observed, a biologist with the appropriate permits and prior approval from CDFG shall move eggs to a suitable location or facility for incubation, and release hatchlings into the creek system the following autumn. In addition, western pond turtles shall be included in the fish rescue operation described in Mitigation Measure 4.3.3 (Alternatives 1 and 2 only).

Impact 4.6.6: Project construction under Alternatives 1, 2, and 3 would result in direct and indirect impacts on listed vernal pool fairy shrimp and their habitat, and on the non-listed mid-valley fairy shrimp and curved-foot hygrotus diving beetle.

Mitigation Measure 4.6.6a: The CCWD shall assume the presence of listed vernal pool branchiopods in all suitable habitats for which CCWD chooses not to perform protocol-level surveys. Preliminary branchiopod surveys have documented the general distribution of and habitat for vernal pool fairy shrimp in the project area. Longhorn fairy shrimp are not expected in the project areas based on this species' narrow habitat requirements, restricted range, and available habitat.

The CCWD shall minimize impacts on listed vernal pool branchiopods. To avoid and minimize direct and indirect impacts on listed vernal pool branchiopods, standard water quality protection measures shall be implemented as established in Mitigation Measure 4.5.1. Additional measures to minimize and avoid habitat for listed vernal pool branchiopods shall be implemented as required by Service and include:

- Avoidance of potential habitat by narrowing work corridors near potential vernal pool branchiopod habitat to the greatest extent practicable.

- Establishment of 250-foot buffers around potential branchiopod habitat, which is a typical avoidance distance that is recommended by the Service to minimize and avoid direct and indirect impacts.

For the Kellogg Creek vernal pool complex the following protection measures shall be implemented:

- Land uses in the easternmost portion of the Los Vaqueros Watershed shall remain restricted to activities associated with wind energy generation, dry-land farming, grazing, and administration by CCWD.

- East of Los Vaqueros Reservoir, public access shall be restricted from CDFG conservation easement lands at the Kellogg Creek vernal pool complex and lands within 500 feet. Public access shall be restricted to research and occasional educational activities conducted under the supervision of CCWD staff or other designated land management agencies.

- The Eastside trail and other public access trails located in proximity to the vernal pool complex shall be 500 feet or farther from the CDFG conservation easement and beyond direct line of sight to rock outcrop features.

- The eastern boundary of the public access area shall be fenced to prevent human access to the vernal pool complex and this fence and the Kellogg Creek vernal pools area shall be patrolled to ensure that no trespassing happens and that the fence remains intact.

- Before opening the Eastside trail to public access, a biological evaluation shall be prepared by CCWD that establishes baseline environmental conditions at the vernal pool complex. Elements to be assessed include signs of trespass (e.g., trash, fires, site trampling, wear marks, rocks or other features in pools, or bicycle tire tracks), an evaluation of water quality during winter months to include at a minimum total dissolved solids, pH, and alkalinity, and documentation of any site damage. These conditions will be used as a basis for later site evaluations. An assessment of branchiopod populations shall also be provided as a component of the baseline evaluation.

- If excessive trespass, defined here as noticeable site deterioration relative to baseline conditions, is identified at the vernal pool complex CCWD shall immediately coordinate with the Service. If site damage is identified, corrective remedies shall be implemented to prevent further harm to the complex. Such actions may include removing trash or debris from the complex, closing portions of the Eastside trail to public access, enhancing site fencing, or other remedies to prevent trespass.

- While the Eastside trail remains open to public access, annual reports shall be prepared to document site conditions relative to baseline conditions.

- Permanent signage shall be installed within 50 feet of the Kellogg Creek vernal pool complex (or on the surrounding fence) that specifies that, “This area is habitat of the vernal pool fairy shrimp, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.”

- A Service-approved construction monitor shall be present during construction within 0.5 mile of the Kellogg Creek vernal pool complex, as identified in the 1995 BO (Service 1995).

Mitigation Measure 4.6.6b: The CCWD shall mitigate for impacts to vernal pool fairy shrimp habitat through one or more of the following steps to provide compensatory habitat: (a) salvage of cysts and creation of replacement pool habitat in the local area at a replacement ratio of at least 3:1, (b) restoration of affected pools onsite after construction completion, or (c) acquisition of credits from a local mitigation bank(s).

To mitigate for the loss of aquatic sites on the Delta-Transfer Pipeline and Transfer-Bethany Pipeline alignments where vernal pool branchiopods are presumed present, CCWD shall implement the following measures:

- The CCWD shall mitigate for the loss of branchiopod habitat that will be filled or otherwise directly affected by the project (estimated to be 17 pools) by providing compensatory habitat.

- For portions of the Transfer-Bethany Pipeline alignment near Byron Airport (e.g., adjacent to Wildlands’ Byron Conservation Bank and Contra Costa County lands at Byron Airport) that support vernal pools, CCWD shall conduct a preconstruction land survey of the pipeline construction area to document current conditions of topography and existing drainage patterns, and to document shallow soil lithology within the construction area footprint as a baseline for restoring vernal pool hydrology following construction. In areas where claypan soils are encountered within critical habitat for vernal pool fairy shrimp (and Contra Costa goldfields) the upper clay soil layer shall be locally stockpiled and reestablished in place following pipeline installation. Upon completion of construction activities, final grading shall be completed to maintain surface flow conditions, local hydrology and similar compaction of surface soils to that of the documented current conditions prior to construction activities.

- The CCWD shall develop and implement a mitigation, monitoring, and management plan, with input from regulatory agencies that shall outline long-term management strategies and performance standards to be attained to compensate for habitat losses resulting from the project. At a minimum, the plan shall include standards for mitigation site selection and construction specifications for mitigation sites, a description of site conditions including aerial maps, an analysis of local branchiopod habitat, and performance criteria by which site quality can be assessed over time (e.g., size, vegetation species present, date of initial ponding, ponding duration, and wildlife usage). A monitoring program will be established to track the development of habitat conditions that are conducive to the establishment of vernal pool branchiopods.

- To the greatest practicable extent, CCWD or its contractors shall construct compensation habitat (i.e., replacement pools) before habitat disturbances are incurred; or directly within the project footprint after construction. A qualified biologist shall ensure that ponds are functioning as designed.

- The CCWD shall submit the name and credentials of a biologist qualified to act as construction monitor to the Service for approval at least 15 days before construction work begins.

- With concurrence from the Service, a Service-approved biologist shall salvage soils from sites that are known to support vernal pool branchiopods at least 2 weeks before the onset of construction, or during the preceding dry season if pools are anticipated to hold water when construction begins. The salvaged soil samples will be stored and used to inoculate created pools once minimum performance standards are met at these locations.

- A Service-approved biologist shall be present at each active work site within 0.5 mile of potential fairy shrimp habitat until habitat disturbance has been completed. Thereafter, the contractor or CCWD shall designate a person to monitor onsite compliance with all minimization measures. A Service-approved biologist shall ensure that this individual receives training consistent with Service requirements.

- A Service-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the vernal pool fairy shrimp and their habitat, the importance of these species and their habitat, the general measures that are being implemented to conserve fairy shrimp as they relate to the project, and the boundaries within which the project construction shall occur.

- All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 100 feet from any fairy shrimp habitat.

Impact 4.6.7: Project construction would have temporary and permanent impacts on potential San Joaquin kit fox habitat and permanently reduce potential regional movement opportunities in one location for this species.

Mitigation Measure 4.6.7a: The CCWD shall implement San Joaquin kit fox protection measures. The following measures, which are intended to reduce direct and indirect project impacts on San Joaquin kit foxes, are derived from the Service's 1999 San Joaquin Kit Fox Survey Protocol for the Northern Range and the Service's 1999 Standardized Recommendations for Protection of the San Joaquin Kit Fox. These measures shall be implemented for construction areas along pipeline corridors, staging areas, and facilities within the watershed:

- Preconstruction surveys shall be conducted within 200 feet of work areas to identify potential San Joaquin kit fox dens or other refugia in and surrounding workstations. A qualified biologist shall conduct the survey for potential kit fox dens 14 to 30 days before construction begins. All identified potential dens shall 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 shall be closed following guidance established in Service's Standardized Recommendations document.

- If kit fox occupancy is determined at a given site, the construction manager should be immediately informed that work should be halted within 200 feet of the den and the Service contacted. Depending on the den type, reasonable and prudent measures to avoid effects to kit foxes could include seasonal limitations on project construction at the site (i.e., restricting the construction period to avoid spring-summer pupping season), and/or establishing a construction exclusion zone around the identified site, or resurveying the den a week later to determine species presence or absence.

- To minimize the possibility of inadvertent kit fox mortality, project-related vehicles shall observe a maximum 20 miles per hour speed limit on private roads in kit fox habitat. Nighttime vehicle traffic shall be kept to a minimum on non-maintained roads. Off-road traffic outside the designated project area shall be prohibited in areas of kit fox habitat.

- To prevent accidental entrapment of kit fox or other animals during construction, all excavated holes or trenches greater than 2 feet deep shall be covered at the end of each work day by suitable materials, fenced, or escape routes constructed of earthen materials or wooden planks shall be provided. Before filling, such holes shall be thoroughly inspected for trapped animals.

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

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

Mitigation Measure 4.6.7b: To compensate for impacts on San Joaquin kit fox habitat outside of dedicated CDFG conservation easements, CCWD shall provide mitigation either through acquiring and dedicating lands into conservation easements or purchasing mitigation credits at compensation ratios that have been approved by state and Federal resource agencies.

Consistent with MSCS and Service guidance, mitigation ratios applied for impacts on San Joaquin kit fox habitat shall be 1:1 to 1.1:1 for temporary impacts; 1:1 to 2:1 for long-term temporary impacts; and 1:1 to 3:1 for permanent impacts. The CCWD shall acquire San Joaquin kit fox mitigation lands based on anticipated impacts to suitable habitat and mitigation ratios identified by the MSCS and the Service.

San Joaquin kit fox mitigation obligations may concurrently satisfy burrowing owl mitigation obligations identified in Mitigation Measure 4.6.8, below, if suitable habitat is present for both species in mitigation lands. The availability of mitigation lands to satisfy mitigation requirements for these species is discussed in the Comprehensive Biological Resources Mitigation and Compensation Program.

Mitigation Measure 4.6.7c: The CCWD shall replace any acreage of existing kit fox easement affected by the project with an equivalent amount of acreage within the watershed to maintain under conservation easement the full amount required for the original Los Vaqueros Reservoir Expansion Project. In addition, CCWD shall provide compensation for conservation easement acreage affected at a ratio of up to 3:1, including conservation easement lands that are isolated by the project. Compensation for temporary impacts to lands within conservation easements shall be provided at a ratio of 1:1 to 1.1:1.

Impact 4.6.8: Project construction would result in temporary and permanent loss of habitat for burrowing owls.

Mitigation Measure 4.6.8a: The CCWD shall implement the measures listed below for grassland habitats to reduce potential impacts to a less-than-significant level and to avoid incidental take of burrowing owls. In advance of construction, CCWD shall follow the current CDFG burrowing owl survey guidance, presently the Burrowing Owl Consortium multi-phase approach to evaluate burrowing owl use. Measures shall apply to all construction activities near active nests or within potential burrowing owl nesting habitat, to avoid, minimize, or mitigate impacts on burrowing owls:

Breeding season surveys shall be performed to determine the presence of burrowing owls for the purposes of inventory, monitoring, avoidance of take; begins as early as February 1 and continues through August 31. Under the Burrowing Owl Consortium's multi-phase survey methodology, for areas within 500 feet of construction boundaries, CCWD shall: 1) perform a habitat assessment to identify essential components of burrowing owl habitat, including artificial nest features; 2) perform intensive burrow surveys in areas that are identified to provide suitable burrowing owl habitat, and; 3) perform at least four appropriately-timed breeding season surveys (four survey visits spread evenly [roughly every 3 weeks] during the peak of the breeding season, from April 15 to July 15) to document habitat use.

Pre-construction surveys shall be used to assess the owl presence before site modification is scheduled to begin. Initial pre-construction surveys should be conducted outside of the owl breeding season (February 1–August 31), but as close as possible to the date that ground-disturbing activities will begin. Generally, initial pre-construction surveys should be conducted within 7 days, but no more than 30 days prior to ground-disturbing activities. Additional surveys may be required when the initial disturbance is followed by periods of inactivity or the development is phased spatially and/or temporally over the project area. Up to four or more survey visits performed on separate days may be required to assure with a high degree of certainty that site modification and grading will not take owls. The full extent of the pre-construction survey effort shall be described and

mapped in detail (e.g., dates, time periods, area[s] covered, and methods employed) in a biological report that will provided for review to CDFG.

In addition to the above survey requirements, the following measures shall be implemented to reduce project impacts to burrowing owls:

- Construction exclusion areas (e.g., orange exclusion fence or signage) shall be established around occupied burrows, where no disturbance shall be allowed. During the non-breeding season (September 1 through January 31), the exclusion zone shall extend at least 160 feet around occupied burrows. During the breeding season (February 1 through August 31), exclusion areas shall extend 250 feet around occupied burrows (or farther if warranted to avoid nest abandonment).

- If work or exclusion areas conflict with owl burrows, passive relocation of onsite owls could be implemented as an alternative, but only during the non-breeding season and only with CDFG approval. The approach to owl relocation and burrow closure will vary depending on the number of occupied burrows. Passive relocation shall be accomplished by installing one-way doors on the entrances of burrows within 160 feet of the project area. The one-way doors shall be left in place for 48 hours to ensure the owls have left the burrow. The burrows shall then be excavated with a qualified biologist present. Construction shall not proceed until the project area is deemed free of owls.

- Unoccupied burrows within the immediate construction area shall be excavated using hand tools, and then filled to prevent reoccupation. If any burrowing owls are discovered during the excavation, the excavation shall cease and the owl shall be allowed to escape. Excavation could be completed when the biological monitor confirms the burrow is empty.

- Artificial nesting burrows will be provided as a temporary measure when natural burrows are lacking. To compensate for lost nest burrows, artificial burrows shall be provided outside the 160-foot buffer zone. The alternate burrows shall be monitored daily for 7 days to confirm that the owls have moved in and acclimated to the new burrow.

Mitigation Measure 4.6.8b: The CCWD shall compensate for permanent habitat losses at a minimum 2:1 ratio (possibly concurrent with other mitigation commitments, such as those for San Joaquin kit fox, provided habitat is present for both species). Compensation could consist of purchasing and enhancing suitable habitat, converting it to a conservation easement, and conveying the easement to a managing agency or institution in perpetuity; participating in a resource agency-approved mitigation bank that provides offset mitigation credits for loss of burrowing owl habitat; or a combination of both. Burrowing owl mitigation areas shall support burrowing owl populations in similar or greater densities to those on impacted burrowing owl habitat.

Impact 4.6.9: Project construction and operation activities would result in direct and indirect impacts on existing populations of and habitat for the golden eagle, bald eagle, and Swainson's hawk.

Mitigation Measure 4.6.9a: The CCWD shall ensure that nesting golden eagles, bald eagles, and Swainson's hawks are protected. The following measures address potential impacts on nesting golden eagles and Swainson's hawks in the project vicinity. Measures that pertain to golden eagles and their nests would apply to nesting bald eagles, were they found in the Los Vaqueros Watershed prior to construction.

- Whenever feasible, construction near recently active nest sites shall start outside the active nesting season. The nesting period for golden eagles is between March 1 and August 15. Bald eagles and Swainson's hawks nest between March 15 and August 15.

- If groundbreaking activities begin during the nesting period, a qualified biologist shall perform a preconstruction survey 14 to 30 days before the start of each new construction phase to search for golden eagle and Swainson's hawk nest sites within 0.5 mile of proposed activities. If active nests are not identified, no further action is required and construction may proceed. If active nests are identified, the avoidance guidelines identified below shall be implemented.

- For golden eagles, construction contractors shall observe CDFG avoidance guidelines, which stipulate a minimum 500-foot buffer zone around active golden eagle nests. Buffer zones shall remain until young have fledged. For activities conducted with agency approval within this buffer zone, a qualified biologist shall monitor construction activities and the eagle nest(s) to monitor eagle reactions to activities. If activities are deemed to have a negative effect on nesting eagles, the biologist shall immediately inform the construction manager that work should be halted, and CDFG will be consulted. The resource agencies do not issue take authorization for this species.

- If construction begins during the Swainson's hawk nesting period, a qualified biologist shall conduct preconstruction surveys at least 2 weeks prior to construction following CDFG guidance (e.g., CDFG, 2000) in areas that potentially provide nesting opportunities to verify species presence or absence. If the survey indicates presence of nesting Swainson's hawks within a 0.5-mile radius, the results shall be coordinated with CDFG to develop and implement suitable avoidance measures that include construction buffers and nest monitoring.

- Consistent with the Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California (CDFG, 1994), mitigation shall include the following approach:

    1. No intensive new disturbances or other project-related activities that could cause nest abandonment or forced fledging shall be initiated within 0.25 mile (buffer zone) of an active nest between March 15 and September 15.

    2. Nest trees shall not be removed unless no feasible avoidance exists. If a nest tree must be removed, CCWD shall obtain a management authorization (including conditions to offset the loss of the nest tree) from CDFG. The tree removal period specified in the management authorization is generally between October 1 and February 1.

    3. Monitoring of the nest by a qualified biologist may be required if the project-related activity has the potential to adversely impact the nest.

- The CDFG often allows construction activities that are initiated outside the nesting season to continue without cessation even if raptors such as golden eagles choose to nest within 500 feet of work activities. Thus, work at the dam construction site may continue without delay if surveys verify the local absence of nesting golden eagles, or if groundbreaking begins outside the nesting period (August 16 through February 28).

- After construction, CCWD shall survey for and monitor golden eagle and bald eagle nesting sites in the Los Vaqueros Watershed to ensure that recreational activity and other beneficial uses of the watershed do not disrupt eagle nest sites. Surveys will be performed at the beginning of the nesting season and continue through the nesting season. Consistent with present policy, recreational access and other disruptive activities will be suspended within 500 feet of active eagle nests until the young eagles have fledged.

Mitigation Measure 4.6.9b: The CCWD shall acquire and/or restore foraging habitat for Swainson's hawks and golden eagles in accordance with CALFED and CDFG guidelines, set forth in Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California (CDFG, 1994), as follows:

- Compensate for permanent foraging habitat losses (e.g., agricultural lands and annual grasslands) within 1 mile of active Swainson's hawk nests (acreage to be determined during preconstruction surveys) at a ratio of 1 acre of mitigation lands for each acre of permanent development (i.e., 1:1 replacement ratio). Foraging habitat impacts will be largely limited to valve structures (roughly 10-foot square) every few hundred feet along pipeline routes, with less than an acre of anticipated foraging habitat loss.

- Consistent with MSCS guidance, impacts to golden eagle foraging habitat will be provided by enhancing or restoring foraging habitat at ratio from ratio of 1:1 to 5:1.

Impact 4.6.10: Project construction and increased reservoir water levels would result in temporary and permanent loss of potential and occupied habitat for Alameda whipsnakes.

> **Mitigation Measure 4.6.10a:** The CCWD shall minimize and/or avoid construction-related impacts on Alameda whipsnakes through the development and implementation of an Alameda whipsnake protection and monitoring plan. The Service shall approve this plan during formal consultation under FESA section 7, and shall establish 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 shall prohibit or restrict activities that could harm or harass this species. Habitat restoration and compensation shall also be included in the plan. Measures in this plan shall include, but are not limited to, the following:

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

- A procedure for conducting preconstruction surveys and/or trapping surveys before the onset of initial ground-disturbing activities in areas with high quality habitat, as well as monitoring to be conducted before construction and/or restoration begin each day that these activities shall occur.

- Direct monitoring by a qualified 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 areas have been surveyed to capture and relocate as many Alameda whipsnakes as reasonably possible to minimize take. However, some individuals may be undetected or move in following surveys and would be subject to take.

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

- 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, documenting compliance in monitoring reports, and notifying the Service within 24 hours of observation of whipsnakes within or next to a construction area.

- Limit stockpiling and staging activities and vehicle and equipment refueling and maintenance to occur in non-sensitive areas.

- The CCWD shall prepare and implement a re-vegetation plan that describes pre-project conditions and available habitats for Alameda whipsnakes; invasive species control measures, and restoration and monitoring success criteria for undeveloped areas disturbed during project construction. The plan will provide the basis for the reestablishment of scrub habitat in disturbed areas and mitigation sites, and will include at a minimum an identification of mitigation areas, site preparation requirements, specifications for planting and/or seeding (e.g., what species and how many plantings), seasonal considerations for planting and site maintenance, the proposed irrigation strategy, performance criteria (e.g., 70 percent survival of plantings 5 years following installation, and 70 percent of plants exhibiting fair or better condition), any contingency measures that may be anticipated, and a provision for semi-annual monitoring and reporting.

Mitigation Measure 4.6.10b: Consistent with MSCS guidelines, CCWD shall provide compensation for permanent and temporary loss of upland scrub habitat that may support Alameda whipsnakes by either (1) compensating for permanent habitat losses by acquiring, protecting, and managing 2 to 5 acres of existing occupied habitat for every acre within the same area of occupied habitat that would be affected, and/or (2) enhancing or restoring 2 to 5 acres of suitable habitat near the affected areas for every acre of occupied habitat affected (CALFED, 2000).

Impact 4.6.11: Project construction activities could result in direct and indirect impacts on the valley elderberry longhorn beetle and its habitat.

Mitigation Measure 4.6.11: The CCWD shall implement the Service's guidelines (1999 or more current) for avoiding, minimizing, and mitigating project impacts on valley elderberry longhorn beetles. If avoidance is not feasible, the Service's general compensation guidelines call for replacement of elderberry plants in designated mitigation areas at a ratio from 2:1 to 5:1 for each stem greater than 1 inch in diameter. Note that replacement ratios are by stem and not by elderberry shrub. Replacement stock shall be obtained from local sources. Plants are generally replaced at a 2:1 ratio for stems greater than 1 inch in diameter at ground level with no adult emergence holes, 3:1 for stems where emergence holes are evident in less than 50 percent of the shrubs, and 5:1 for stems greater than 1 inch in diameter with emergence holes.

Impact 4.6.12: Project construction activities could affect active breeding bird nest sites and new power lines could affect migratory birds.

Mitigation Measure 4.6.12a: The CCWD shall ensure that active nests of raptors and other special-status nesting birds are not disturbed during construction. If active construction work (i.e., ground clearing and grading, including removal of trees or shrubs) is scheduled to take place during the non-breeding season (September 1 through January 31), no mitigation is required. If such construction activities are scheduled during the breeding season (February 1 through August 31), the following measures shall be implemented to avoid impacts on nesting raptors and other protected birds:

- Within 30 days of construction, a qualified wildlife biologist shall conduct preconstruction surveys of all potential nesting habitats within 500 feet of construction sites where access is available.

- If active nests are found during preconstruction surveys, a no-disturbance buffer (acceptable in size to CDFG) shall be created around active raptor nests and nests of other special-status birds during the breeding season, or until it is determined that all young have fledged. Typical buffers include 500 feet for raptors and 250 feet for other nesting birds (e.g., shorebirds, waterfowl, and passerine birds). The size of these buffer zones and types of construction activities restricted in these areas could be further modified during construction in coordination with CDFG and shall be based on existing noise and human disturbance levels in the project area.

- If preconstruction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, no further mitigation shall be required. Trees and shrubs within the construction footprint determined to be unoccupied by special-status birds, or that are outside the no-disturbance buffer for active nests, could be removed.

- If construction commences during the non-breeding season and continues into the breeding season, most songbirds that choose to nest next to active construction sites are generally considered to acclimate to construction activities, though nest abandonment may occur in some instances. However, nesting site monitoring shall be conducted by CCWD and no-disturbance buffer zones established in coordination with CDFG around active nests to prevent impacts on nesting birds and their young.

Mitigation Measure 4.6.12b: The CCWD shall follow Avian Protection Plan guidelines for power lines.

CCWD shall use state-of-the-art guidelines to reduce raptor mortality from interactions with power lines. The Avian Power Line Interaction Committee (1994) and the Service recommends the following:

- Provide 60-inch minimum horizontal separation between energized conductors or energized conductors and grounded hardware,

- Insulate hardware or conductors against simultaneous contact if adequate spacing is not possible,

- Use Western-approved poles that minimize impacts to birds, and,

- Increase the visibility of conductors or shield wires to prevent and minimize bird collisions.

Mitigation Measure 4.6.12c: Measures to reduce noise and vibration impact on nesting raptors near the dam and 275-TAF borrow area.

As identified in Measure 4.6.12a, a qualified biologist will conduct preconstruction surveys and establish suitable avoidance buffers around active bird nests. Construction at the 275-TAF borrow area will begin either outside the active nesting season or after verification that breeding birds are absent within 500 feet of work areas. If it appears that noise or vibration from ongoing blasting or jack-hammering at the dam or 275-TAF borrow area could affect nesting raptors that arrive after the start of construction, specific measures shall be implemented to reduce noise levels.

During blasting or jack-hammering, a noise level of no greater than 85 decibels (measured at the nest) will be used as general guidance for raptor nests that are established after construction. This parameter may be met through a variety of standard noise-reducing procedures for construction equipment, including the use of noise dissipaters and blasting mats. Contract specifications will include requirements for the use of blasting methods, including qualifications for the blasting contractor, the use of noise control methods and threshold noise levels, and other limitations. The specifications will also require the submittal of a blasting plan by the contractor that will cover the proposed noise control techniques, blasting charge size and limits, and hours of blasting.

Impact 4.6.13: Project construction activities under Alternatives 1 and 2 could affect designated critical habitat for listed species (vernal pool fairy shrimp and Contra Costa goldfields).

See Mitigation Measures 4.6.2a, 4.6.2b, 4.6.6a and 4.6.6b.

Impact 4.6.14: Project construction activities could affect non-listed special-status reptile species (San Joaquin coachwhip and coast horned lizard).

Mitigation Measure 4.6.14: The CCWD shall ensure that habitat disturbances are minimized in areas that are known or suspected to support San Joaquin coachwhip and coast horned lizard. Within 30 days before surface-disturbing activities, concurrent with other preconstruction wildlife surveys, a qualified biologist shall survey for special-status reptile populations. If individuals of these species are found in the project area, they shall be relocated to suitable habitat 0.5 mile or farther from the project area. Some individuals may be undetected or enter sites after surveys and would be subject to harm.

Impact 4.6.15: Project construction activities could affect non-listed special-status mammal species (American badger, special-status bats, and San Joaquin pocket mouse).

Mitigation Measure 4.6.15a: The CCWD shall minimize impacts to badgers through a combination of worker training, preconstruction surveys, and passively or actively relocating animals. Impacts on the San Joaquin pocket mouse and American badger would be reduced by limiting the footprint of direct project effects within the Western alignment.

- A qualified biologist shall conduct a training session for all construction personnel focused on the protection and conservation of protected, non-listed special-status wildlife species, including American badgers. At a minimum, the training shall include a species and habitat description for the American badger (in addition to other non-listed special-status species). The training session shall identify the general measures that are being implemented to minimize impacts on these species as they relate to the project, and the boundaries within which the project could be accomplished.

- Concurrent with other required surveys (e.g., as required for Mitigation Measure 4.7), during winter/spring months before new project activities, and concurrent with other preconstruction surveys (e.g., kit fox and burrowing owl), a qualified biologist shall perform a pre-activity survey to identify the presence of American badgers. If this species is not found, no further mitigation shall be required. If badgers are identified, they shall be passively relocated using burrow exclusion (e.g., installing one-way doors on burrows) or similar CDFG-approved exclusion methods. In unique situations it might be necessary to actively relocate badgers (e.g., using live traps) to protect individuals from potentially harmful situations. Such relocation could be performed with advance CDFG coordination and concurrence. When unoccupied dens are encountered outside of work areas but within 100 feet of proposed activities, vacated dens shall be inspected to ensure they are empty and temporarily covered using plywood sheets or similar materials.

- If badger occupancy is determined at a given site within the work area, the construction manager should be informed that work should be halted. Depending on the den type, reasonable and prudent measures to avoid harming badgers will be implemented and may include seasonal limitations on project construction near the site (i.e., restricting the construction period to avoid spring-summer pupping season), and/or establishing a construction exclusion zone around the identified site, or resurveying the den a week later to determine species presence or absence.

- To minimize the possibility of inadvertent badger mortality, project-related vehicles shall observe a maximum 20 miles per hour speed limit on private roads.

- To prevent accidental entrapment of badgers or other animals during construction, all excavated holes or trenches greater than 2 feet deep shall be covered at the end of each work day by suitable materials, or escape routes constructed of earthen materials or wooden planks shall be provided. Before filling, such holes shall be thoroughly inspected for trapped animals.

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

- To prevent harassment and mortality of badgers or destruction of their dens, no pets shall be allowed in the project area.

Direct impacts to San Joaquin pocket mice would be minimized in the Western power line alignment under Power Option 2 by limiting project activities within iodine bush scrub and short grasslands habitat to the smallest possible extent. The implementation of Measure 4.6.7b, which provides habitat compensation for temporary and permanent impacts to annual grasslands that are potentially occupied by San Joaquin kit fox, would additionally benefit American badgers and San Joaquin pocket mice.

Mitigation Measure 4.6.15b: The CCWD shall minimize impacts on special-status bats by performing pre-construction surveys and creating no-disturbance buffers around active bat roosting sites. Before construction activities (i.e., ground clearing and grading, including trees or shrub removal) within 200 feet of trees that could support special-status bats, a qualified bat biologist shall survey for special-status bats. If no evidence of bats (i.e., direct observation, guano, staining, or strong odors) is observed, no further mitigation shall be required. If evidence of bats is observed, CCWD and its contractors shall implement the following measures to avoid potential impacts on breeding populations:

- A no-disturbance buffer of 250-feet shall be created around active bat roosts during the breeding season (April 15 through August 15). Bat roosts initiated during construction are presumed to be unaffected by the indirect effects of noise and construction disturbances. However, the direct take of individuals will be prohibited.

- Removal of trees showing evidence of active bat activity shall occur during the period least likely to affect bats, as determined by a qualified bat biologist (generally between February 15 and October 15 for winter hibernacula, and between August 15 and April 15 for maternity roosts). If the exclusion of bats from potential roost sites is necessary to prevent indirect impacts due to construction noise and human activity adjacent, bat exclusion activities (e.g., installation of netting to block roost entrances) shall also be conducted during these periods. If special status bats are identified in the dam or special allowances must be made to relocate bats, CCWD will coordinate the effort in advance with CDFG.

Impact 4.6.16: Draining the reservoir during project construction under Alternatives 1, 2, and 3 could affect Pacific Flyway species, including waterfowl and shorebirds.

Mitigation Measure: none proposed

Impact 4.6.17: The project would not result in conflicts with local and regional conservation plans, or local plans or ordinances protecting biological resources.

Mitigation Measure: none proposed

Impact 4.6.18: Project construction would not make a cumulatively considerable contribution to cumulative effects on special-status species and habitats.

Mitigation Measure: none proposed

Appendix D

Biological Opinion on the Los Vaqueros Reservoir Expansion Project, Contra Costa County, California. 81420-2009-F-0201-1

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
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).

Alameda Whipsnake

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.

Valley Elderberry Longhorn Beetle

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.

cc:
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