2 Existing Conditions

This chapter summarizes the existing land uses, resources, existing facilities, local and regional plans, socioeconomic setting, and visitor uses that will influence the management, operations, and visitor experiences at the Plan Area. This information will provide the baseline data for developing the goals and guidelines for the management policies of the Plan and will serve as the affected environment and environmental setting for the purpose of environmental review.

2.1 Land Use

2.1.1 Surrounding Land Uses / Regional Context

The Plan Area is surrounded by a variety of land uses. Residential and commercial uses exist nearby in the unincorporated community of Santa Nella to the northeast of O'Neill Forebay. Lands to the southeast of the Plan Area between San Luis Reservoir and Los Banos Creek Reservoir include privately owned ranchlands, agricultural lands, an electrical substation, and scattered nonresidential uses. The San Joaquin Valley National Cemetery is northeast of O'Neill Forebay. Immediately west of San Luis Reservoir is Pacheco State Park, owned by CSP. DFW properties are located north of San Luis Reservoir and east of the O'Neill Forebay.

The nearest incorporated cities are Los Banos, approximately 13 miles to the east; Gustine, approximately 18 miles to the north; and Gilroy, approximately 38 miles to the west. Santa Nella lies 2 miles to the northeast. Other nearby communities include Volta and Hollister. The Villages of Laguna San Luis, south of O'Neill Forebay and east of San Luis Reservoir, is an approved community plan that has not been constructed. Agua Fria is another planned community that could be developed south of and adjacent to the Villages of Laguna San Luis. The Agua Fria project is still in the conceptual stage (King 2010).

According to the Merced County Year 2000 General Plan (Merced County 1990), lands surrounding the Plan Area are designated as "Foothill Pasture." This designation generally applies to the Sierra Nevada foothills and the Diablo Range to the east and west sides of the county, respectively. Foothill Pasture areas are typically used for noncultivated agricultural practices such as livestock facilities, wastewater lagoons, and agricultural commercial facilities. Nonagricultural uses include mineral resource extraction and processing, institutional facilities, and outdoor public and private recreational facilities. The zoning classification considered most compatible for Foothill Pasture designated areas is A-2 (Exclusive Agricultural), which applies to the lands around the Plan Area (Merced County 1990).

2.1.2 Plan Area Land Uses

Many areas of the Plan Area are open and undeveloped. Several developed areas support water operations and recreation. Recreational land uses are described in Section 2.9, and management zones are discussed in Section 4.3.

The Plan Area is part of the water storage and delivery system for the SWP and Reclamation's CVP. Excess winter and spring flows from the Delta are conveyed through the California Aqueduct and DMC to O'Neill Forebay and subsequently pumped to the reservoir. San Luis Reservoir provides water to the Santa Clara Valley Water District (SCVWD) and San Benito County Water District. The SCVWD, a CVP contractor, receives water from San Luis Reservoir via the Pacheco Pumping Plant and the Santa Clara Conduit. Nearby, Los Banos Creek Reservoir prevents storm runoff from flooding the California Aqueduct and DMC and nearby communities.

An area of approximately 1,230 acres between B.F. Sisk Dam and SR 152 contains several structures including the dam itself, the Gianelli Pumping Plant (operated by DWR), operating facilities for DWR and CSP, CSP's Four Rivers Sector office, a California Department of Forestry and Fire Protection (Cal Fire) station, and a range used for law enforcement training. The Romero Visitor's Center, operated by the DWR, is along SR 152 west of Gonzaga Road. O'Neill Forebay contains O'Neill Dam (operated by DWR) and has an area of joint agency use for DWR operations. Both dams were closed to public access for security reasons in October 2011.

Los Banos Creek Reservoir has an area of approximately 128 acres that contains Los Banos Dam and associated water operations facilities. The area contains a CSP-managed entrance station where visitors must check in, minimal buildings, and some open and undeveloped areas.

A quarry used for gravel extraction during the construction of the dam is located at the southeast corner of San Luis Reservoir, west of Basalt Use Area. Basalt Quarry is used by the DWR for facility (e.g., dam and canal) repairs on the DWR's systems. The quarry is not open for recreation access.

2.1.3 Indian Trust Assets and Indian Sacred Sites

As a Federal land management agency, Reclamation is responsible for identifying and considering potential impacts of its plans, projects, programs, or activities on Indian Trust Assets. Indian Trust Assets are legal interests in property held in trust by the United States for Indian Tribes or individuals. The nearest Indian Trust Asset is the Chicken Ranch Rancheria approximately 70 miles northeast of the project area (Rivera 2010).

Under Executive Order 13007, in order to protect and preserve Indian religious practices, Reclamation shall:

(1) Accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners; and

(2) Avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of such sacred sites.

The Native American Heritage Commission (NAHC) is responsible for identifying and cataloging places of special religious or social significance to Native Americans. A letter was sent on July 11, 2003, to the NAHC informing the commission of the proposed action and its location. A response received on August 15, 2003, states: "A record search of the sacred land files has failed to indicate the presence of Native American resources in the immediate Plan Area. The absence of specific site information in the sacred lands file does not indicate the absence of cultural resources in any Plan Area." A supplemental request was sent to the NAHC on October 20, 2011. A response received on October 27, 2011, from the NAHC confirmed that the results of the sacred lands file search have not changed.

2.2 Climate and Climate Change

2.2.1 Plan Area Climate

San Luis Reservoir SRA is on the western side of the San Joaquin Valley, which has a hot, dry climate. Wind in the region has a strong influence on climate, with prevailing winds generally coming from the west. However, wind direction changes frequently because of temperature differences between coastal air and valley air. The strongest winds in the region occur from April through August, and velocities can reach 30 to 40 miles per hour.

In the San Joaquin Valley, the combination of low rainfall and a high evaporation rate from hot, dry winds results in very dry soil that typically supports grassland and scrub-type vegetation; other vegetation types such as riparian woodlands occur along stream corridors. The low rainfall at San Luis Reservoir is caused by its location in the "rain shadow" of the Diablo Range—an area of reduced precipitation on the sheltered side of a mountain that results from the warming and drying of air. Rainfall occurs mostly in the winter, and averaged only 10.36 inches per year at San Luis Dam from 1963 through 2007. The evaporation rate in July and August often reaches 18 to 20 inches per month, although the rate can fall to less than 2 inches per month in midwinter.

Winter temperatures in the valley are mild, seldom dipping below freezing. Summers are hot, with the average daily temperature ranging in the 80s and 90s (degrees Fahrenheit [°F]). The frost-free season is 300 to 363 days a year, making for an almost uninterrupted growing season. Table 2-1 presents a monthly climate summary for San Luis Dam. Temperature and precipitation are averaged from the period January 1981 through December 2010. Snowfall and snow depth are averaged from the period of record of January 1963 through December 2007; more recent data for snowfall and snow depth are not available.

Table 2-1
San Luis Dam Monthly Climate Summary

Climate Factor	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Maximum Temperature (°F)	54.9	60.9	66.3	72.2	79.7	86.2	92.2	91.4	87.5	78.3	65.1	55.6	74.3
Average Minimum Temperature (°F)	38.2	42.2	46.4	49.6	55.4	59.7	64.4	64.0	60.8	53.7	44.8	38.2	51.5
Average Total Precipitation (inches)	2.09	2.10	1.60	0.56	0.50	0.05	0.00	0.08	0.16	0.53	1.18	1.61	10.46
Average Total Snowfall (inches)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (inches)	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Western Regional Climate Center (2012)

Note: Temperature and precipitation based on January 1981 through December 2010 data; snowfall and snow depth based on January 1963 through December 2007 data.

°F = degree(s) Fahrenheit

2.2.2 Climate Change

2.2.2.1 Introduction

Executive Order S-13-08 provides direction in developing California's first statewide climate adaptation report (California Natural Resources Agency 2009). The order called on state agencies to develop strategies to identify and prepare for expected changes in climate. The resulting report, the *California Climate Adaptation Strategy* (CAS; California Natural Resources Agency 2009), addresses potential effects of climate change on current and future conditions and how, if at all, these conditions may affect water supply, operations, lake levels, and recreation uses.

Current effects of climate change on the state include increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and both snowmelt and rainwater running off sooner in the year (California Natural Resources Agency 2009). Generally, the CAS report indicates that California should expect overall hotter and drier conditions with a continued reduction in winter snow (with concurrent increases in winter rains), as well as increased average temperatures, accelerating sea level rise, and changes in precipitation patterns and the intensity of extreme weather events (California Natural Resources Agency 2009). The CAS report concludes that more precipitation will fall as rain rather than snow, with important implications for water management in the state and potentially for the Plan Area.

At the federal level, Reclamation is assessing risks to the water resources of the western United States and developing strategies to mitigate risks to help ensure that the long-term water resources management of the United States is sustainable. This effort is part of the Omnibus Public Land Management Act of

2009 (Public Law 111-11) Subtitle F – SECURE Water, also known as the SECURE Water Act.

In 2011, Reclamation prepared a technical memorandum titled *Literature Synthesis on Climate Change Implications for Water and Environmental Resources* (Reclamation 2011a) that provides a summary of recent literature on the effect of climate change on hydrology and water resources, and the implications to key resource areas such water supply, flood control, fisheries and wildlife, water quality, and water demand. Among other regions in Western United States, the literature review addresses the potential climate change consequences in the Mid-Pacific Region, which covers the northern two-thirds of California, most of western Nevada, and part of southern Oregon.

The technical memorandum documents that trends similar to those reported in the CAS have been documented in the Mid-Pacific Region by various researchers. The literature review indicates that over the course of the 20th century, all areas of the Mid-Pacific Region became warmer, with an increase in both spring and winter temperatures. As a result of the increase in temperatures, the western United States and the Mid-Pacific Region experienced a decline in spring snowpack, reduced snowfall-to-winter-precipitation ratios, and earlier snowmelt runoff in the second half of the 20th century. Nationwide, extreme precipitation events have increased in frequency over the past 50 years; however, the Mid-Pacific Region has experienced a smaller increase than the United States as a whole.

The literature review indicates that future climate projections in the Mid-Pacific Region and in California show less snowfall, less snowpack development, and earlier timing of snowmelt runoff. Warmer temperatures are expected throughout California during the 21st century, leading to more intense and heavy rainfall interspersed with longer dry periods. Other projections include an increased risk of winter flooding, decreased water supply in the summer, and decreased hydropower generation.

A second report prepared pursuant to the SECURE Water Act (Reclamation 2011b) identifies the climate change trends and projections for the Sacramento and San Joaquin River basins. Temperature is projected to increase by roughly 5 to 6 degrees during the 21st century, with precipitation slightly decreasing in the southern Central Valley. The projections also suggest annual precipitation in the Sacramento and San Joaquin River basins will remain quite variable over the next century. Annual runoff is projected to increase slightly during the first half of the 21st century and decline in the second half of the century. Moisture falling as rain instead of snow at lower elevations will increase wintertime runoff and decrease summertime runoff.

The projected climate changes have potential impacts for the Sacramento and San Joaquin River basins. Early snowmelt and relatively higher winter rains from warmer conditions could increase flooding. Warmer conditions could increase fishery stress, reduce salmon habitat, increase water demands for instream

ecosystems, and increase potential for invasive species infestations (Reclamation 2011b). Climate change-related surface water decreases are likely to significantly increase future groundwater demands.

California communities have largely depended on runoff from yearly established snowpack to provide the water supplies during the warmer, drier months of late spring, summer, and early autumn. With rainfall and meltwater running off earlier in the year, the state will face increasing challenges of storing the water for the dry season while protecting Californians from floodwaters during the wet season.

2.2.2.2 Water Operations

The DWR, in collaboration with the State Water Resources Control Board (SWRCB), other state agencies, and stakeholders, has initiated a number of projects to begin climate change adaptation planning for the water sector. For example, the recent incorporation of climate change impacts into the California Water Plan Update is an essential step in ensuring that all future decisions regarding water resources management address climate change. As part of the Update, in October 2009 DWR released the country's first state-level climate change adaptation strategy for water resources, and the first adaptation strategy for any sector in California. Entitled *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water* (DWR 2008), the report details how climate change is already affecting the state's water supplies and sets forth ten adaptation strategies to help avoid or reduce climate change impacts to water resources. Because of the large role of local and regional water management, full implementation of Integrated Regional Water Management (IRWM) plans will be central to these adaptation efforts. IRWM plans address regionally appropriate management practices that incorporate climate change adaptation and provide a comprehensive, economical, and sustainable watershed-level water use strategy for California.

San Luis Reservoir levels vary by season and year due to recurring fluctuations in the amount and timing of water delivered via the two supply canals. Historically, San Luis Reservoir levels decline by an average of more than 100 feet from the late winter to summer months. The reservoir was drawn down to facilitate repairs in 1981 and 1982 and also during droughts in 1977, 1989, and 2008 (Reclamation 2011c). Given the potential for the climate changes discussed above, increased variability of precipitation has the potential to increase the frequency and magnitude of reservoir levels fluctuations. In addition, a reduced snowpack and the seasonal timing shift in runoff could lead to reduced water supplies in the reservoir in the summer months. Climate change adaptation strategies at state, regional, and local levels will need to be part of the planning process for future water operations, which are under DWR jurisdiction.

2.2.2.3 Greenhouse Gases

Climate change as it relates to greenhouse gas (GHG) emissions is discussed further in Section 2.5.3.

2.3 Topography, Geology, and Soils

2.3.1 Topography

San Luis Reservoir is bordered to the west by the eastern foothills of the Diablo Range, which are marked by minor drainages. These drainages spread out to form several relatively flat valleys opening eastward into the San Joaquin Valley. The San Luis Flat is one such valley, formed in part by the fanning of San Luis and Cottonwood creeks. The inundation of the San Luis Flat created San Luis Reservoir.

The reservoir's north and south shores consist of mostly rugged, undulating terrain. Grades in these areas range between 0 percent and 20 percent. O'Neill Forebay is located northeast of San Luis Reservoir and below the dam. The majority of the area surrounding the forebay is relatively flat and less rugged than that of the main reservoir. Although grades in the forebay area also range between 0 percent and 20 percent, they are less undulating. Map 3 illustrates the elevation ranges in the Plan Area and surrounding vicinity.

2.3.2 Geology

The geology of the Plan Area is the result of several major changes over geologic time. During the late Jurassic and Upper Cretaceous periods, an open sea extended inland over what is now Merced County. During the late Pliocene and early Pleistocene eras, major folding, faulting, and uplift took place in the Coast and Sierra Nevada ranges.

The Plan Area includes portions of four geologic formations. The entire western side and the southern tip of the shoreline of San Luis Reservoir lie within the Franciscan formation. This formation is the oldest rock formation found in western Merced County. It is a thick assemblage of sedimentary, igneous, and metamorphic rocks. The sedimentary rocks consist of sandstone, shale, chert, and minor amounts of conglomerate.

The Panoche formation makes up most of the eastern shore of San Luis Reservoir and is broken only by the intrusion of the Plio-Pleistocene nonmarine and fan deposits of the Great Central Valley. The Panoche formation consists of arenaceous shale and thinly bedded sandstone, approximately 25,000 feet thick. Buff-colored, cavernous exposures are the result of weathering of limy, concretionary, gray, biotitic sandstones. The sedimentary sequence of the Panoche formation contains lenses of coarse-grained conglomerate consisting of boulders, cobbles, and pebbles of porphyritic and granitic rock.

The Tulare formation occurs mostly on the shore of O'Neill Forebay and in the area adjacent to O'Neill Forebay Dam. This formation, which varies in depth from 100 to 500 inches, overlies all the older formations. The Tulare material is composed of nonmarine gravel, sand, and silt and has its origin from rocks derived from the Franciscan formation. Stream terraces also are found in the Tulare formation. They are the sedimentary deposits of streams when they were at other levels.

The Tertiary Volcanic formation appears in small scattered deposits along the eastern and western shores of San Luis Reservoir. Among the volcanic rocks are pink and gray andesite and white to gray rhyolite, dark gray to black basalt, and limonite. A remnant basalt flow occurs at Basalt Hill just south of the Basalt Use Area. This hill appears to have been the vent from which the basalt was extruded. Lastly, fan deposits are limited to the shore of O'Neill Forebay and occur principally on the eastern side. Recent alluvium masks all older formations along the western side of the San Joaquin Valley.

According to the California Geological Survey, an area containing serpentine and ultramafic rock (rocks with naturally occurring asbestos) lies approximately 1.5 miles north-northwest of the northern Plan Area boundary, near the Stanislaus County line (California Geological Survey 2000).

2.3.3 Soils

2.3.3.1 Soil Associations

Of the soil associations that occur within the boundaries of the Plan Area, the Denverton, Kettleman, and Altamont clays occupy 2,650 acres of Plan Area lands surrounding San Luis Reservoir. Rough Stony Land is the second most common soil type in the reservoir area. It occupies roughly 2,000 acres confined mostly to the western side of the reservoir. There are several other minor soil associations, including the Rincon-Pleasanton association, composed of Pleasanton gravelly sandy loam, Los Banos clay loams, Rincon clay, and Rincon loam; Altamont-Kettleman loam to the northeast shore of O'Neill Forebay; Sobrante, Vallecitos, and Contra Costa loams; Herdlyn clay loam and Solano silt loam; Herdlyn clay loam on the southern and eastern shores of O'Neill Forebay; and Sorrento, Mocho, and Esparto loams in small, scattered areas at the reservoir.

2.3.3.2 Soil Series

The following is a description of the soil series in the use areas surrounding San Luis Reservoir and O'Neill Forebay. Altamont clay, the predominant soil in the San Luis Creek Use Area, occupies a combined area of 160 acres. Other soils that occur here are Altamont clay in the steep phase, Denverton clay (adobe), and Contra Costa gravelly loam. The predominant soil in the Basalt Use Area is Kettleman silty clay loam. Altamont clay is the next most important soil with a small portion of the rolling phase, and Altamont loam also exists in the rolling phase. Rincon clay loam is a major soil type at Basalt. The Medeiros Use Area has a combination of soil types scattered at random. The only soil type found in the Dinosaur Point Use Area is Vallecitos stony clay loam.

2.3.3.3 Erosion Potential

The Natural Resources Conservation Service (NRCS) and the California Geological Survey (CGS) have surveyed and classified the erosion hazard for soils through the United States. The ratings indicate the hazard of soil loss in off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor "K." Potential soil loss would be caused by sheet or rill erosion in off-road or off-trail areas where 50 to

Source: USGS DLG / USGS 30m DEM

1 0.5 0 1 2 Miles

Scale 1 : 79,200
1" = 1.25 miles

N

Elevation Ranges

- Less than 200 feet
- 200 to 600 feet
- 600 to 1000 feet
- 1000 to 1400 feet
- 1400 to 1800 feet
- 1800 to 2200 feet
- 2200 to 2600 feet
- over 2600 feet

U.S. Department of the Interior Bureau of Reclamation

California State Parks Since 1864

San Luis Reservoir State Recreation Area

MAP 3
Elevation Ranges

X:\x_env_permit\BUREC\San Luis\San Luis RMP\Existing Maps (EDAW)\Revised Files\Map3.pdf 1-22-09

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75 percent of the surface has been exposed by logging, grazing, mining, or other types of disturbance.

The ratings are both verbal and numerical, and erosion hazard is described verbally as either "slight," "moderate," "severe," or "very severe." A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion control measures may be needed; "severe" indicates that erosion is very likely and that erosion control measures, including revegetation of bare areas, are advised; and "very severe" indicates that substantial erosion is expected, loss of soil productivity and off-site damage are likely, and erosion control measures are costly and generally impractical.

Within the Plan Area, the erosion hazard classifications of the land are as follows: 36 percent—slight; 10 percent—moderate; 46 percent—severe; and 8 percent—very severe (see Map 4) (NRCS 2008). The majority of developed lands in the Plan Area, including most recreation areas, are in areas with a slight or moderate erosion hazard.

2.3.3.4 Seismicity

San Luis Reservoir is in a seismically active area and is close to three geologic faults. The Ortigalita fault passes under the reservoir, and the Calaveras and San Andreas faults are 23 and 28 miles away, respectively. These faults and their segments can cause earthquakes at or near the reservoir. From May 1984 to December 1999, three earthquakes with magnitudes between 3.0 and 4.0 occurred within 10 miles of the reservoir. The epicenter of one of the earthquakes was in the reservoir itself; another was in O'Neill Forebay.

The Los Banos Valley and Cottonwood Arm sections of the Ortigalita fault (see Map 5) have each been designated as Alquist-Priolo fault zones in the vicinity of the Plan Area. Alquist-Priolo fault zones designate areas of existing surface fault rupture hazards (though not other earthquake hazards). Under the Alquist-Priolo Earthquake Fault Zoning Act, buildings used for human occupancy cannot be constructed on active faults or within Alquist-Priolo fault zones.

The B.F. Sisk (San Luis) Dam, located on San Luis Creek, was constructed in 1967 to withstand the effects of an earthquake with a magnitude close to 8.0. Five layers, or zones, of material make up the dam, and the dam's core material (Zone 1) is resistant to progressive erosion. In addition, its primary structures were built on a firm rock foundation (Reclamation 2011d). A series of studies completed in 2006 determined that improvements to the dam are necessary to reduce risk to the downstream public. As a result, Reclamation and DWR initiated a Corrective Action Study to investigate and determine a course of action to mitigate risk (Reclamation 2011e). The B.F. Sisk (San Luis) Dam Safety of Dams Project is described further in Section 3.3.9.

Currently, no structures that are subject to the Alquist-Priolo Earthquake Fault Zoning Act exist in the fault zones within the Plan Area, and there are no plans to construct buildings within these zones.

The CGS maintains data expressing probabilistic shaking due to seismic hazards. Ground motions are expressed as a fraction of the acceleration due to gravity, or *g*. Within the Plan Area, the CGS has projected that ground shaking would be between 30 and 40 percent of acceleration due to gravity (California Department of Conservation 2003).

2.4 Hydrology, Floodplain, and Water Quality

San Luis Reservoir is a major offstream reservoir that stores excess winter and spring flows from the Delta and supplies water to service areas for both the SWP and the CVP. San Luis Reservoir has a capacity of 2,040,600 acre-feet (af), used primarily to supplement water supply to approximately 20 million residents and approximately 660,000 acres of irrigated farmland. The Plan Area also includes two smaller reservoirs, O'Neill Forebay and Los Banos Creek Reservoir. O'Neill Forebay has a capacity of 56,400 af and is used primarily for water supply. Los Banos Creek Reservoir has a capacity of 34,560 af and is used primarily for flood control. SWP water (conveyed through the California Aqueduct) and CVP water (pumped from the DMC via the O'Neill Pumping-Generating Plant) mix in O'Neill Forebay. During the fall and winter months, water is pumped into San Luis Reservoir through the Gianelli Pumping-Generating Plant.

The major drainage of the San Luis Reservoir area is San Luis Creek. The hydrology and floodplain of the watershed have been substantially altered by the development of the reservoirs. The Plan Area lies in the Panoche–San Luis Reservoir watershed, part of the San Joaquin River Basin, which drains into San Luis Creek. Historically, San Luis Creek flowed into the San Joaquin River, which emptied into the San Francisco Bay. Since completion of San Luis Dam, runoff from San Luis Creek has been captured in San Luis Reservoir and diverted for SWP and CVP purposes.

The Panoche–San Luis Reservoir watershed encompasses approximately 1,213 square miles (776,781 acres). The Plan Area includes four tributaries to San Luis Creek and more than 35 tributaries to San Luis Reservoir, as shown on the U.S. Geological Survey (USGS) 7.5-minute quadrangles for Pacheco Pass, Volta, Crevison Peak, Ingomar, Howard Ranch, San Luis Dam, Mariposa Peak, Ortigalita Peak, and Los Banos Valley.

Groundwater is recharged in the Plan Area by percolation of runoff into underground aquifers. Groundwater supports many of the springs throughout the area and supplies 93 percent of the public water supply in the Panoche–San Luis Reservoir watershed.

San Luis Reservoir

O'Neill Forebay

Los Baños Creek Reservoir

152

33

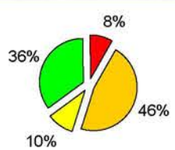
5

1 0.5 0 1 2 Miles

Scale 1 : 79,200

1 " = 1.25 miles

N



Erosion hazard (off-road, off-trail)

- Very severe (1066 acres)
- Severe (5907 acres)
- Moderate (1233 acres)
- Slight (4541 acres)

Plan Area

Data source: USDA - NRCS, URS 2008

San Luis Reservoir State Recreation Area

MAP 4
Erosion Hazard

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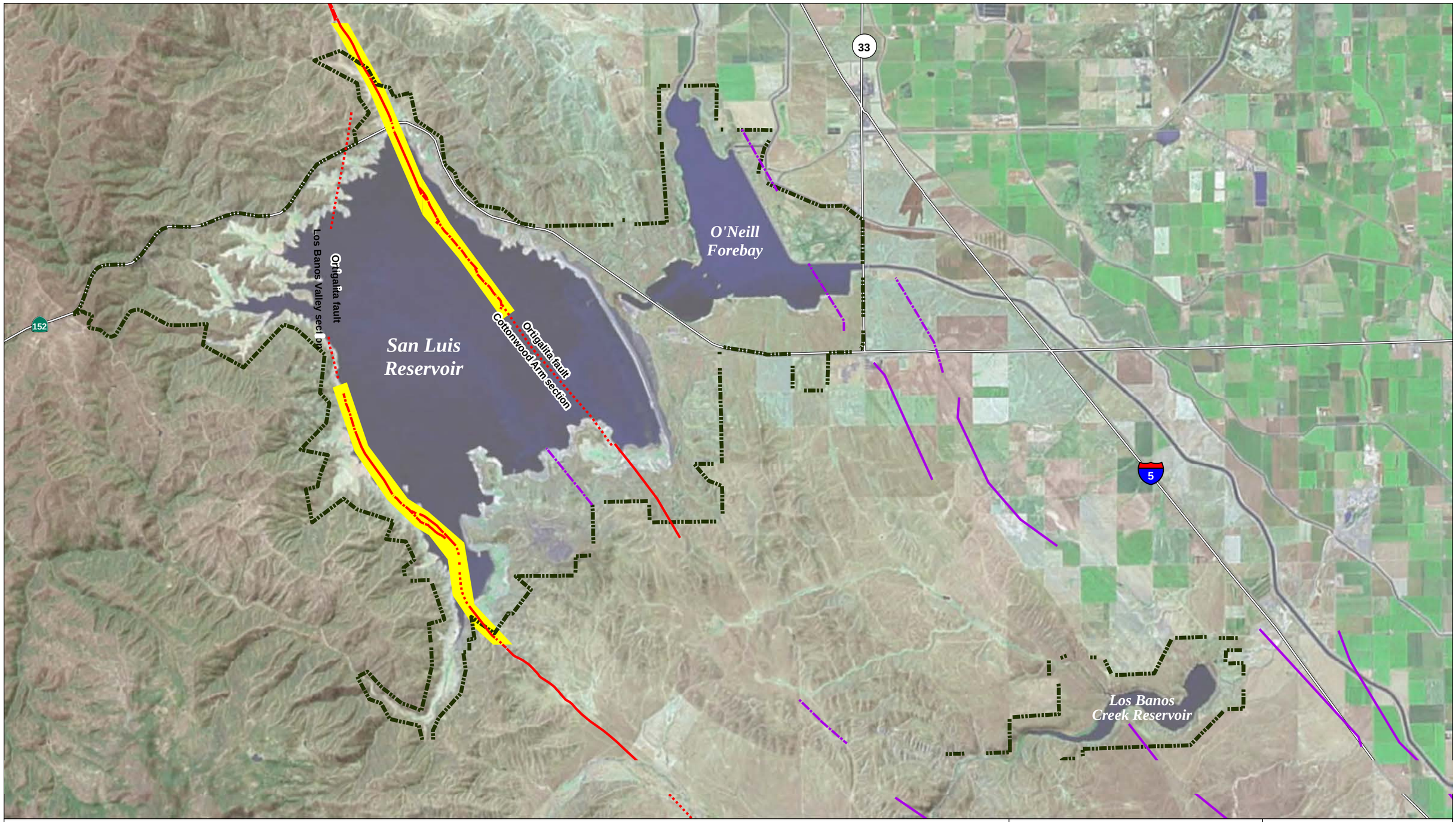

1 0.5 0 1 2 Miles

Scale 1 : 79,200

1 " = 1.25 miles

N

Holocene (< 15K years old)
- Approximate
- Concealed
- Certain

Late Quaternary (< 130k years old)
- Approximate
- Concealed
- Certain

- Plan Area
- Alquist-Priolo Fault Zones

Data source: California Geological Survey; URS, 2012

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

CALIFORNIA STATE PARKS SINCE 1864

San Luis Reservoir State Recreation Area

MAP 5
Faults

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The Federal Emergency Management Agency (FEMA) has mapped the Plan Area as Zone D, an area of undetermined but possible flood hazard. The potential for flooding exists primarily in the low-lying areas along San Luis Creek, Cottonwood Creek, and Los Banos Creek, and along the banks of San Luis and Los Banos Creek reservoirs. Flood potential in O'Neill Forebay is extremely low because water is pumped into it. The USGS formerly maintained one flow gauge within the Plan Area at the Wolf Creek station, located in the vicinity of Dinosaur Point. Peak flow data are available from 1959 through 1969, during which floods occurred early in 1963 and early in 1967.

San Luis Reservoir levels vary by season and year due to recurring fluctuations in the amount and timing of water delivered via the two supply canals. Despite these variations, water levels are rarely low enough to substantially affect water recreation opportunities. Historically, San Luis Reservoir levels decline by an average of over 100 feet from late winter to summer months. In addition, the reservoir was drawn down to facilitate repairs in 1981 and 1982 and also during droughts in 1977, 1989, and 2008 (Reclamation 2011c).

2.4.1 Regulatory Setting

The objective of the Clean Water Act of 1977 is to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." To achieve this objective, the act sets forth the following goals:

> (1) that the discharge of pollutants into the navigable waters of the United States be eliminated by 1985; (2) that as an interim goal there be attained by 1983 water quality which provides for the protection and propagation of fish, shellfish and wildlife, and provides for recreation in and on the water; (3) that the discharge of toxic pollutants in toxic amounts be prohibited; (4) that Federal financial assistance be provided to construct publicly owned waste treatment works; (5) that area wide waste treatment management planning processes be developed and implemented to assure adequate control of source pollutants in each State; (6) that a major research and demonstration effort be made to develop technology necessary to eliminate the discharge of pollutants into navigable waters, waters of the contiguous zone, and the oceans; and (7) it is the national policy that programs for the control of non point sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution.

The basic means to achieve the goals of the Act is through water quality standards, discharge limitations, and permits. The Act authorizes the U.S. Environmental Protection Agency (USEPA) to require owners and operators of point source discharges to monitor, sample, and maintain effluent records. If the water quality of a water body is potentially affected by a proposed action (e.g., construction of a wastewater treatment plant), a National Pollutant Discharge Elimination System (NPDES) permit (Section 402 of the Clean Water Act) may be required. In most cases, the USEPA has given this responsibility to the states as long as the state program is acceptable to the USEPA.

Similarly, if a project may result in the placement of material into waters of the United States, a U.S. Army Corps of Engineers (USACE) Dredge and Fill Permit

(Section 404 of the Clean Water Act) may be required. It should be noted that the Section 404 permit also pertains to activities in wetlands and riparian areas. Prior to the issuance of either an NPDES or a Section 404 permit, the applicant must obtain a Section 401 certification. This declaration states that any discharge must comply with all applicable effluent limitations and water quality standards. Certain federal projects may be exempt from the requirements of Section 404 if the conditions set forth in Section 404(r) are met.

Section 319, Nonpoint Source Management Programs, was added to the Clean Water Act by Public Law 100-4. The purpose of Section 319 is to have the states establish nonpoint source management plans that are designed to deal with each state's nonpoint source pollution problems. Section 319(k) requires each federal department and agency to allow states to review individual development projects and assistance applications and accommodate, in accordance with Executive Order 12372, the concerns of the state regarding the consistency of these applications or projects with the state nonpoint source pollution management program.

The Safe Drinking Water Act of 1974 provides for the safety of drinking water supplies throughout the United States by establishing national standards that the states are responsible for enforcing. The Act provides for the establishment of primary regulations for the protection of the public health and secondary regulations relating to the taste, odor, and appearance of drinking water. Primary drinking water regulations, by definition, include either a maximum contaminant level (MCL) or, when an MCL is not economically or technologically feasible, a prescribed treatment technique that would prevent adverse health effects to humans. An MCL is the permissible level of a contaminant in water that is delivered to any user of a public water system. Primary and secondary drinking water regulations are stated in 40 CFR 141 and 143, respectively.

2.4.2 Water Quality Setting

This section contains a discussion of the water quality characteristics of San Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir. Information in this section was obtained from the *Los Banos Grandes Facilities Draft EIR* (DWR 1990), *California State Water Project Watershed Sanitary Survey Update Report 2001* (DWR 2001), *California State Water Project Watershed Sanitary Survey 2006 Update* (DWR 2007a), *Water Quality in the State Water Project, 2004 and 2005* (DWR 2009), DWR's compilation of water quality data, and discussions with DWR staff.

Surface water quality in the Panoche–San Luis Reservoir watershed falls under the management of the SWRCB. This watershed is categorized as largely impaired, and several of its water bodies are listed in the SWRCB *2010 Integrated Report* (SWRCB 2010) as Category 5, where at least one beneficial use is not supported and a total maximum daily load (TMDL) is needed. Both San Luis Reservoir and O'Neill Forebay are listed as Category 5. Los Banos Reservoir itself is not listed, but Los Banos Creek is also listed as Category 5. Water quality issues identified throughout the basin include pesticide contamination, high

nutrient concentrations in smaller tributaries, native fish habitat disruption, poor water chemistry, and high agricultural runoff. The USEPA has set standards for allowable maximum pollutant and nutrient concentrations.

San Luis Reservoir water is delivered to the San Joaquin Valley, the Santa Clara Valley, and Southern California when water supply in the California Aqueduct and the DMC is insufficient. The SCVWD, a CVP contractor, receives water from San Luis Reservoir through the Pacheco Intake. Because of constant pumping and mixing of its water, San Luis Reservoir does not typically develop a thermocline[2] (Borba 2003). Similarly, O'Neill Forebay does not develop a thermocline because of the highly regulated pumping-generating plants that require constant exchange of water in the forebay (Borba 2003).

Los Banos Creek Reservoir was constructed to protect the San Luis Canal portion of the California Aqueduct from flood damage, by controlling flows of the streams crossing the canal. Los Banos Creek Reservoir thermally stratifies during the summer months with an anoxic hypolimnion.[3] The reservoir destratifies in the autumn and remains oxygenated and at a uniform temperature throughout the winter and spring.

2.4.2.1 Beneficial Uses

Water in San Luis Reservoir and O'Neill Forebay is used for agricultural, industrial, municipal, and recreational uses as well as for fish and wildlife enhancement. Los Banos Creek Reservoir provides flood control management as well as recreational opportunities.

The Central Valley Regional Water Quality Control Board (RWQCB) Basin Plan identifies beneficial uses for surface water bodies in the Sacramento and San Joaquin river basins that are critical to management of water quality in California. Protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning. San Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir are located within the jurisdiction of the Central Valley RWQCB. Beneficial uses for these water bodies are shown in Table 2-2. The beneficial uses shown in Table 2-2 have been modified from the Basin Plan descriptions to reflect actual uses at these facilities.

[2] Thermocline is a region of a lake where the temperature changes rapidly with depth. For temperate lakes, the thermocline can be defined as the region where temperature changes are greater than 1 degree Celsius per meter of depth.

[3] Anoxic hypolimnion is the total depletion of oxygen in the dense bottom layer of water in a thermally stratified lake.

Table 2-2
Water Uses of San Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir

Beneficial Uses	Description of Beneficial Uses	San Luis	O'Neill	Los Banos[1]
Municipal and Domestic Supply	Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.	X	X	X
Agricultural Supply – Irrigation	Uses of water for farming, horticulture, or ranching, including, but not limited to, irrigation (including leaching of salts) and stock watering.	X	X	—
Agricultural Supply – Stock Watering		X	X	—
Industrial Supply – Service	Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.	X	—	—
Industrial Supply – Power	Use of water for hydropower generation.	X	—	X
Water Contact Recreation	Uses of water for recreational activities involving body contact, where water ingestion is reasonably possible. Uses include, but are not limited to, swimming, wading, water-skiing (except Los Banos Creek), skin and scuba diving, wind surfing, or fishing.	X	X	X
Noncontact Water Recreation	Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.	X	X	X
Warm Freshwater Habitat	Uses of water that support warm water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	X	X	X
Cold Freshwater Habitat	Uses of water that support cold water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	—	—	X
Spawning, Reproduction, and/or Early Development	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish. (Los Banos Creek Reservoir supports an active warm water largemouth bass and white crappie fishery, and rainbow trout, a coldwater species, is periodically stocked there by DFW.)	—	—	X

Table 2-2
Water Uses of San Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir

Beneficial Uses	Description of Beneficial Uses	San Luis	O'Neill	Los Banos[1]
Wildlife Habitat	Uses of water that support terrestrial or wetland ecosystems, including, but not limited to, preservation or enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.	X	—	X

Source: RWQCB 2007.

[1] The beneficial uses of Los Banos Creek Reservoir are not provided specifically for the reservoir. The Basin Plan considers the reservoir as part of a category called "Other Lakes and Reservoirs in San Joaquin R. Basin (Excluding Hydro Unit Nos. 531-533, 543, 544)." Therefore, the beneficial uses listed for Los Banos Creek Reservoir apply to all lakes and reservoirs in that category.

2.4.2.2 Water Quality Objectives

To protect and maintain beneficial uses of surface water bodies, quantitative and qualitative water quality objectives are defined in the Basin Plan (RWQCB 2009). The water quality objectives that apply to the protection of the above beneficial uses are described below, followed by a summary of the existing water quality at San Luis Reservoir and O'Neill Forebay.

Bacteria. The Basin Plan currently states that "in waters designated for contact recreation, the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 [milliliters (ml)], nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml."

Chemical Constituents. The Basin Plan states that "[w]aters shall not contain chemical constituents in concentrations that adversely affect beneficial uses… At a minimum, water designated for use as a domestic or municipal supply shall not contain concentrations of chemical constituents in excess of the MCLs specified in the provisions of Title 22 of the California Code of Regulations."

Dissolved Oxygen. The Basin Plan states that "monthly median of the mean daily dissolved oxygen (DO) concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75 percent of saturation." The dissolved oxygen concentrations shall not be reduced below the following minimum levels at any time:

- Warm Freshwater Habitat (WARM): 5.0 milligrams per liter (mg/L)
- Cold Freshwater Habitat (COLD): 7.0 mg/L
- Spawning, Reproduction, and /or Early Development (SPWN): 7.0 mg/L

Oil and Grease. The Basin Plan states that "waters shall not contain oils, greases, waxes or other materials in concentrations that cause nuisance, result in a visible

film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses."

pH. The Basin Plan states that "the pH shall not be depressed below 6.5 nor raised above 8.5."

Pesticides. The Basin Plan indicates that "no individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses," and specifically highlights waters designated for use as domestic or municipal supply in excess of MCLs.

Sediment. The Basin Plan states that "the suspended sediment and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses."

Suspended Material. The Basin Plan states that "waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses."

Tastes and Odors. The Basin Plan states that "water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or . . . otherwise affect beneficial uses."

Temperature. The Basin Plan states that "[a]t no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5ºF above natural receiving water temperature."

Turbidity. The Basin Plan states that "[w]aters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses." Limitations on the increases in turbidity are identified for specific ranges of existing turbidity measurements.

2.4.3 Existing Water Quality Data

The most current water quality data for the San Luis Reservoir SRA are taken when available from four documents: Los Banos Grandes Facilities Draft EIR (DWR 1990), California State Water Project Watershed Sanitary Survey Update Report 2001 (DWR 2001), California State Water Project Watershed Sanitary Survey 2006 Update (DWR 2007a), and Water Quality in the State Water Project, 2004 and 2005 (DWR 2009).

Water quality indicators for the SRA are provided in *Water Quality in the State Water Project, 2004 and 2005* (DWR 2009). DWR Operations and Maintenance began a SWP water quality monitoring program in 1968. The program was initiated to monitor eutrophication in the SWP facilities and salinity for agricultural users. Over time, the SWP monitoring program expanded to emphasize parameters of concern for drinking water, recreation, and fish and wildlife purposes. The DWR conducts water quality monitoring throughout its facilities as noted below, and consists of both discrete (grab) samples and

continuous automated station data. The DWR maintains two automated monitoring stations at and near San Luis Reservoir, as follows:

- Check 13, located at the outlet of O'Neill Forebay; and
- Pacheco Pumping Plant, located on the west side of San Luis Reservoir.

Water quality data for Check 13 consist of both grab and automated data for a variety of water quality parameters. Monthly grab sample data at this location are available from January 1995 through August 2003 and include minerals, minor elements, and nutrients. Other conventional parameters (i.e., conductivity, temperature, pH, and turbidity) are reflected in the hourly automated data that have been collected since 1990. Archived water quality data date back to 1988. At the Pacheco Pumping Plant on the west side of the San Luis Reservoir, automated data for conductivity, temperature, and turbidity have been gathered since July 1989. In addition, grab samples for conventional constituents are collected at a monitoring station at the dam trashracks on the east side of the San Luis Reservoir. Grab samples for nonconventional constituents are collected by the SCVWD, and therefore the data are not available in the DWR database (Erickson 2003). Of the quantitative water quality parameters established in the Basin Plan, dissolved oxygen data are not available at San Luis Reservoir. In addition, only qualitative coliform data and monthly grab (i.e., field) dissolved oxygen data are available for O'Neill Forebay.

The data for both sites are summarized in the DWR's biennial water quality assessment of SWP facilities conducted by the California Resources Agency. The most recent version, *Water Quality in the State Water Project*, was completed in April 2009 (DWR 2009), based on samples taken during 2004 and 2005 (Table 2-3). In addition to this report, the *Sanitary Survey Update Report 2001* (DWR 2001) includes an analysis of specific water quality parameters between January 1996 and December 1999 as they relate to potential contaminant sources and activities at SWP facilities. The water quality data described in this section are based on DWR (2009).

2.4.3.1 Data by Water Body

San Luis Reservoir General chemistry, metals, and nutrients recorded in samples from San Luis Reservoir at Pacheco Pumping Plant during 2004 and 2005 are summarized in Table 2-3. Monthly salinity and related dissolved parameters in San Luis Reservoir fluctuated within a narrow range. Conductivity in San Luis Reservoir varied by about 90 microSiemens per centimeter (µS/cm) during the two years, ranging from 441 to 529 µS/cm, while turbidity ranged from <1 to 5 NTU. Organic carbon ranged between 3.0 and 4.7 mg/L. Existing MCLs for the analyzed parameters in treated drinking water were not exceeded, with the exception of pH and manganese. The pH detected in the San Luis Reservoir in 2004 and 2005 ranged from 6.3 to 9.1, which exceeds both ends of the USEPA secondary MCL range of 6.5 to 8.5. The pH of drinking water is not a public health concern, and thus this secondary MCL has not been adopted as an

Table 2-3
San Luis Reservoir Water Quality Summary, 2004 to 2005

Parameter	Concentration (mg/L, unless otherwise noted)					
	Pacheco Pumping Plant[1]			Dam Trashracks[2]		
	Median	Low	High	Median	Low	High
General Chemistry						
Alkalinity (as $CaCO_3$)	81	77	93	85	78	92
Boron	0.2	0.1	0.2	0.2	0.1	0.2
Bromide	0.22	0.14	0.29	0.23	0.13	0.27
Chloride	77	70	89	78	68	87
Conductivity (µS/cm)	494	441	524	449	441	529
Dissolved Organic Carbon (as C)	3.5	3.0	4.7	—	—	—
Hardness (as $CaCO_3$)	108	97	124	113	97	122
pH (pH units)	6.9	6.3	8.9	7.4	6.4	9.1
Sulfate	41	35	43	41	35	45
Total Dissolved Solids	280	265	301	282	259	292
Total Organic Carbon (as C)	3.7	3.2	4.5	—	—	—
Turbidity (NTU)	2	1	5	2	<1	5
Metals						
Aluminum	—	—	—	—	<0.01	<0.01
Antimony	—	<0.001	<0.001	—	<0.001	<0.001
Arsenic	0.003	0.002	0.004	0.003	0.002	0.004
Barium	—	—	—	—	<0.05	<0.05
Beryllium	—	<0.001	<0.001	—	<0.001	<0.001
Cadmium	—	—	—	—[3]	<0.001	0.002
Calcium	22	19	25	22	19	24
Chromium +3	0.003	0.001	0.005	0.002	0.002	0.004
Copper	0.003	0.002	0.005	0.002	0.001	0.002
Fluoride	—[4]	<0.1	0.1	—[5]	<0.1	0.1
Iron	—[6]	0.005	0.032	—[5]	<0.001	<0.001
Lead	—	<0.001	<0.001	—	<0.001	<0.001
Magnesium	13	12	15	13.5	12	15
Manganese	—[7]	<0.005	0.1	—	<0.005	<0.005
Mercury	—	—	—	—	<0.0002	<0.0002
Nickel	0.001	0.001	0.002	0.001	0.001	0.002
Selenium	0.001	<0.001	0.002	0.001	0.001	0.002
Silver	—	—	—	—	<0.001	<0.001
Sodium	52	49	59	54	48	60
Zinc	—	<0.005	<0.005	—[3]	<0.005	0.014

Table 2-3
San Luis Reservoir Water Quality Summary, 2004 to 2005

Parameter	Concentration (mg/L, unless otherwise noted)					
	Pacheco Pumping Plant[1]			Dam Trashracks[2]		
	Median	Low	High	Median	Low	High
Nutrients						
Total Kjeldahl Nitrogen (as N)	0.3	0.1	1.7	0.4	0.2	1
Nitrate + Nitrate (as N)	0.795	0.12	1	0.605	0.04	1
Ammonia (as N)	<0.01	<0.01	0.02	0.01	<0.01	0.12
Total Phosphorus	0.1	0.07	0.16	0.09	0.05	0.36
Ortho-Phosphate (as P)	0.009	0.06	0.12	0.07	0.04	0.1

Source: DWR 2009.

[1] Data were collected at San Luis Reservoir at Pacheco Pumping Plant Monitoring Station SLR00000.

[2] Data were collected at San Luis Reservoir Dam Trashracks Monitoring Station SL001000.

[3] One positive detection.

[4] Two positive detections.

[5] Three positive detections.

[6] Eight positive detections.

[7] Four positive detections.

enforceable standard by the California Department of Public Health. Of the 24samples collected from San Luis Reservoir at Pacheco Pumping Plant in 2004 and 2005, four had manganese levels that were above the reporting limit. The maximum detected manganese concentration was 0.1 mg/L, two times greater than the secondary MCL of 0.05 mg/L. The MCL for manganese was established to address issues of drinking water aesthetics rather than public health protection. Noticeable effects of manganese in water above the secondary MCL can include dark coloration, black staining from oxides of manganese, and a bitter metallic taste (USEPA 1992 as cited in State of California Resources Agency 2007). Water collected from San Luis Reservoir at Pacheco Pumping Plant originates from near the bottom of the reservoir, where manganese solubility can increase due to lower dissolved oxygen concentrations at depth, resulting in the higher manganese levels (DWR 2007b).

2001 Sanitary Survey Update In accordance with the California Department of Health Services (CDHS) California Surface Water Treatment regulations, all water purveyors are required to conduct a sanitary survey of their watersheds and update it every five years. The DWR conducted its first Sanitary Survey in 1990 and updated it in 1996, 2001, and most recently, 2006 (DWR 2007a). The 2006 survey is discussed below. The purpose of the 2001 survey was to describe and control management practices, describe potential contaminant sources (PCS) or activities and their effect on drinking water source quality, determine if appropriate treatment is provided, and identify appropriate actions and recommendations to improve or control contaminant sources (DWR 2001). The survey includes all major SWP features, including O'Neill Forebay and San Luis

Reservoir. The water quality data in the *Sanitary Survey Update Report 2001* (DWR 2001) were evaluated against MCLs[4] as established in Title 22 of the California Code of Regulations, Domestic Water Quality, and Monitoring Regulation. MCLs are usually applied to finished water, but they are useful as a conservative indicator of source water contaminants. If source water concentrations are below MCLs, then contaminants are not as likely to be of concern to the finished water supplies. In addition, if MCLs are not exceeded, beneficial uses as established by the Basin Plan would also be protected.

California State Water Project Watershed Sanitary Survey 2006 Update The *California State Water Project Watershed Sanitary Survey 2006 Update* (DWR 2007a) concentrates on key water quality issues that challenge SWP Contractors. As requested by the CDHS, this survey addresses emergency response procedures, addresses efforts to coordinate pathogen monitoring in response to the Long Term 2 Enhanced Water Treatment Rule, and reviews substantial changes to the watersheds and their impacts on water quality. The purpose of the 2006 update was to evaluate the sources of water quality problems and recommend actions that the SWP Contractors can take to improve water quality over the next five years. This survey is not an update of all of the information from the previous three surveys, so much of the information from the 2001 survey is still the most current.

Chapter 6 of the *Sanitary Survey Update Report 2001* (DWR 2001) identifies the PCS in the 85-square-mile San Luis Reservoir Watershed. The PCS, the types of contaminants resulting from these sources, and the likelihood of such contamination are described in Table 2-4. As described in the *Sanitary Survey Update Report 2001*, substantial contaminant sources and water quality problems at the reservoir are associated with watershed activities and source water from the aqueduct and the DMC.

Table 2-4
Potential Contaminant Sources for San Luis Reservoir

Potential Contaminant Sources (PCS)	Types of contaminants resulting from PCS	Potential for Contamination from PCS
Recreation (body contact and non-body contact activities)	Turbidity and pathogens in runoff; diesel fuels, gasoline, hydrocarbon, and methyl tertiary butyl ether (MTBE) from boating activities	Recreation can contribute to water quality issues in the reservoir; body contact recreation may be a major source of pathogens. MTBE did not appear to be a serious water quality concern in the reservoir, according to a 1997 study. MTBE is no longer used as a fuel additive in California.

[4] MCL is the highest level of a contaminant that is allowed in drinking water. The federal Safe Drinking Water Act (SWDA) of 1974 authorizes the USEPA to set enforceable health standards (MCLs). The State of California implements the federal SDWA on behalf of the USEPA, and has developed and implemented its own drinking water standards that must be at least as stringent as federal standards.

Table 2-4
Potential Contaminant Sources for San Luis Reservoir

Potential Contaminant Sources (PCS)	Types of contaminants resulting from PCS	Potential for Contamination from PCS
Wastewater Treatment Facilities	Pathogens	The potential for contamination to water from these facilities is unknown.
Animal Populations (livestock grazing trespass, wild animal populations)	Nutrients, turbidity, and pathogens in runoff and erosion	Droppings from large populations of migrating waterfowl may be a water quality concern during winter months. Contribution of contaminants from animal populations is unknown.
Algal Blooms	Nutrients	Algal blooms are likely if other enrichment conditions are met. Nutrients in the reservoir were high during 1996 to 1999. Taste and odor in the reservoir are more serious water quality concerns during drought years. Historical data suggest that algal blooms caused taste and odor problems for SCVWD during the drought years from 1992 to 1993. During the survey period from 1996 to 1999, SCVWD did not report any serious algal blooms or taste and odor issues.[1]
Agricultural Activities	Pesticides and agricultural drainage in runoff	Agricultural activities are considered a minor threat to water quality.
Traffic Accidents / Spills	Oil, grease, other hydrocarbons in runoff, hazardous wastes from truck spills	There were no documented spills or accidents reported in the watershed from 1996 to 2000. However, a potential exists for hazardous waste contamination associated with truck accidents on SR 152.
Geologic Hazards	Turbidity from landslide / erosion caused by wave actions from seismic and boating activities	Landslides and erosion are considered moderate threats to water quality.
Fires	Nutrients, turbidity, and sediment loads	The indirect effect of runoff from burned areas on the reservoir's water quality has not been determined.

Source: Sanitary Survey Update Report 2001 (DWR 2001).

[1] SCVWD reported (DWR 2007a) that during the late summer and early fall, when water levels in the San Luis Reservoir typically reach their minimum, a thick layer of algae grows on the surface. The reservoir contains sufficient nutrients to stimulate algal blooms, a problem that becomes more severe when water levels are low. When the amount of water drops to the beginning of the low point of about 406 feet above mean sea level (300,000 acre-feet), algae begins to enter the San Felipe Division intake, degrading water quality and making the water harder to treat. In response, operations of the reservoir have been changed such that water levels are maintained above the low-point elevation, and the Low Point Project is being developed to further address solutions.

The SCVWD collected pathogen data from water from the San Luis Reservoir at the Santa Teresa Water Treatment Intake; Table 2-5 presents the microbiological data of the raw water (100 percent from the reservoir) for January 1996 through December 1999. According to the *Sanitary Survey Update Report 2001* (DWR 2001), the samples that tested positive for coliform levels were below the state regulatory numerical values for freshwater beaches (DWR 2001).

Table 2-5
Pathogens in Source Water at Santa Teresa Water Treatment Plant, 1996 through 1999

Pathogen	Most Probable Number per 100 ml[1]			
	Mean	Median	Low	High
Total Coliform	15	6	2	500
Fecal Coliform	9	4	2	50
E. coli	8	4	2	50
Cryptosporidium	ND[2]	—	—	—
Giardia	ND[2]	—	—	—

Source: DWR 2001.

[1] Data provided by SCVWD. Raw water was 100% from San Luis Reservoir. Nondetects were not used for computation of statistics.

[2] Sampled results below their respective detection limits.

ND = nondetect

According to the *Watershed Sanitary Survey 2006 Update* (DWR 2007a), the SCVWD has monitored for *Cryptosporidium* and *Giardia* since January 2000 at the intake of the Santa Teresa Water Treatment Plant (WTP). Samples are collected monthly or bimonthly, and as of December 2005, 98 samples had been analyzed. *Cryptosporidium* was never detected, and *Giardia* was found at 0.1 cysts/L in only one sample collected on June 14, 2005 (DWR 2007a).

Water enters SVCWD facilities from the west side of San Luis Reservoir at Pacheco Pumping Plant, from which it is pumped by tunnel and pipeline to water treatment and groundwater recharge facilities in the Santa Clara Valley. The *Watershed Sanitary Survey 2006 Update* (DWR 2007a) included samples of water pumped from San Luis Reservoir at Pacheco Pumping Plant from 2000 to 2006. Total monthly median coliform levels for the area were found to be consistently less than 100 most probable number (MPN)/100 ml, with the exception of August 2003. *E. coli* monthly medians were always less than 20 MPN/100 ml and generally less than 2 MPN/100 ml (DWR 2007a).

Data for the DWR WTP were also recorded in the *Watershed Sanitary Survey 2006 Update* (DWR 2007a) from 2000 to 2006. Both total and fecal coliform levels were low until 2005. From September 2005 to April 2006, both total and fecal coliforms were reported as greater than 23 MPN/100 ml. In May and June 2006, both total and fecal coliform levels were reported as greater than 1,600 MPN/100 ml. Although it is difficult to determine the source of the higher coliform levels because the DWR WTP intakes from both O'Neill Forebay and San Luis Reservoir, the higher levels were found in summer months when water is normally being released from San Luis Reservoir (DWR 2007a).

Although water quality levels generally meet drinking water standards, land use and source water information suggested the possibility of several water quality concerns:

- High turbidity and total dissolved solids (TDS) levels in the reservoir;
- Algal blooms and taste and odor problems (during a drought year);
- High total organic carbon (TOC) and bromide concentration from the source water; and
- Pathogen contamination through grazing trespass and recreation.

Algal blooms occur when the reservoir level is low during summer and/or drought periods and the air temperature is high. Algal blooms degrade water quality and lessen the reservoir's appeal to recreational users because of odor, taste, and interference with boating and angling. During algal blooms, recreational use patterns often shift, with lower use of San Luis Reservoir and higher use of O'Neill Forebay, where algal blooms are less prevalent. See Section 3.3.8 for a discussion of the San Luis Reservoir Low Point Improvement Project, which was designed to address water quality delivery issues related to algal blooms.

To address potential water quality concerns, the *Sanitary Survey Update Report 2001* identifies specific recommendations to address the potential threat of drinking water quality degradation from the priority PCS. The conclusions and recommendations are summarized in Table 2-6.

Table 2-6
Conclusions and Recommendations of the *Sanitary Survey Update 2001*, San Luis Reservoir

Conclusion	Recommendation
Body contact recreation and boating are potential sources of microbial pathogens; wind and boating activities increase turbidity. Motorized boats did not appear to contribute substantial MTBE.	Coordination between DWR and CSP to improve public awareness of water quality and provide more restrooms. If future recreational use increases, investigate the need to restrict swimming and reduce the number and speed of boats.
Runoff from campgrounds, parking grounds, and boat ramps contributes to contaminants such as turbidity and TOC.	Consider conducting studies to estimate total runoff in the watershed and quantify contaminants that enter the reservoir.
Seasonal animal grazing trespass, wild animals, and large numbers of migrating waterfowl are considered substantial contributors of turbidity, nutrients, TOC, and pathogens. Animals were found in direct contact with water in the reservoir. The number of seasonal grazing animals and the species and number of wild animals are not known.	Build fences as needed to confine grazing animals and wildlife; provide alternative water supplies for animals; conduct studies on the effects of animal populations on water contamination; review existing grazing leases; divert runoff immediately downstream of wildlife areas.
SWP source water contains high concentrations of nutrients that support algal growth.	Review existing flavor profile and investigate need to control algae during drought years.
Approximately 10 miles of SR 152 parallel the reservoir. Potential hazardous chemical spills from truck accidents.	DWR coordinate with other agencies to identify emergency action plans.
Fires contribute turbidity, TOC, and TDS.	Evaluate level of public education on fire dangers.
Source water from the DMC and the California Aqueduct can contribute to TOC, turbidity, and TDS.	Determine the relative contributions of these constituents from each source and operational scenarios to reduce concentrations.

Source: DWR 2001.

Note: Recommendations from this study are general and do not commit Reclamation or CSP to the recommended actions.

O'Neill Forebay Delta exports enter O'Neill Forebay from the California Aqueduct and the DMC. Increased outflow from O'Neill Forebay to the California Aqueduct generally coincides with San Luis Reservoir releases during spring and summer. Water from the forebay is pumped into San Luis Reservoir largely during fall and winter when SWP demands are low and excess water can be stored. The combined operation of these facilities determines the quality of water in the forebay. The types of contaminants resulting from PCS, and likelihood for such contamination, are described in Table 2-7.

Table 2-7
Potential Contaminant Sources for O'Neill Forebay

Potential Contaminant Sources (PCS)	Types of contaminants resulting from PCS	Potential for Contamination from PCS
Delta-Mendota Canal (DMC)	Salt, carbon loads, agricultural drainage, and other unspecified water quality constituents	Inflows from the DMC, California Aqueduct, and San Luis Reservoir largely control water quality in O'Neill Forebay. The DMC generally has higher salinity than the California Aqueduct upstream of O'Neill Forebay, as evidenced by data in 1995, which showed the DMC loads for TDS, TOC, and bromide were higher than those of the California Aqueduct. The high number of bridge and railroad crossings above the DMC as well as drain inlets into the DMC may contribute to contaminants.
Recreation[1]	Turbidity and pathogens in runoff; diesel fuels, gasoline, hydrocarbon, and MTBE from boating activities	There have been no reports of spills or leaks from wastewater facilities (also unlikely to pose a threat because of sufficient capacity, distance from the forebay, and features that would alert of potential spills). Portable and permanent pit toilets pose a potential source of fecal contamination, but they are monitored and emptied as needed. With respect to hydrocarbons and MTBE, samples collected at the outlet from 1996 to 1999 contained no volatile organics, and on one occasion only 0.5 mg/L of MTBE. It is possible that the large inflow volumes to the forebay quickly dilute any MTBE released by boating activity. Total coliforms were present in all samples at the north and south swimming beach locations, and E. coli was present in 13 of the 17 samples collected from the north beach and 6 of the 17 samples from the south beach.
Animal Populations (livestock grazing)	Nutrients, turbidity, and pathogens in runoff and erosion	Runoff from adjacent rangeland would likely be minimal due to the lack of major drainage channels and the flat topography.
Traffic Accidents / Spills	Oil, grease, other hydrocarbons in runoff, hazardous wastes from truck spills	No documented vehicle incidents during 1996 to 1999. However, SR 33 and 152 cross portions of O'Neill Forebay.
Fire	Nutrients, turbidity, and sediment loads	Minor threat to water quality.

Source: DWR 2001.

Notes: DMC = Delta-Mendota Canal; TDS=total dissolved solids; TOC=total organic carbon; MTBE= Methyl tertiary butyl ether

[1] Because the drawdown of San Luis Reservoir sometimes affects its recreation potential, a proportionately greater investment was made toward recreation amenities at O'Neill Forebay. MTBE is no longer used as a fuel additive in California.

Coliform samples were collected from the north and south swimming beaches in O'Neill Forebay during the nonpeak workweek, when there was little or no swimming activity. Coliform and *Escherichia coliform* (*E. coli*) were recorded as either present or absent; quantitative values were not determined (DWR 2001). Total coliforms were present in all samples at both beach locations, and *E. coli* was present in 13 of the 17 samples collected from the north beach and 6 of the 17 samples from the south beach. Although quantitative data are not available, the available information suggests that occurrence of coliforms may be more frequent and concentrations may be higher during the high-use periods (weekends and holidays).

DWR routinely collects water quality samples in the DMC upstream of its connection with O'Neill Forebay, including minerals, minor elements, nutrients, and other constituents such as total carbon and bromide. Data recorded in *Water Quality in the State Water Project, 2004 and 2005* (DWR 2009) indicated that MCLs for salinity, sulfate, chloride, and nitrate in treated drinking water were not exceeded. Water quality data for general chemistry and metals recorded in the study are summarized in Table 2-8.

Table 2-8
O'Neill Forebay Outlet Water Quality Summary, 2004 to 2005

Parameter	Concentration (mg/L, unless otherwise noted)		
	Median	Low	High
General Chemistry			
Alkalinity (as CaCO3)	73	44	85
Boron	0.2	0.1	0.4
Bromide	0.17	0.07	0.37
Chloride	61	24	120
Conductivity (µS/cm)	409	221	615
Dissolved Organic Carbon (as C)	3.0	2.4	7.9
Hardness (as CaCO3)	99	55	143
pH (pH units)	7.0	6.4	8.3
Sulfate	39	18	77
Total Dissolved Solids	242	124	348
Total Organic Carbon (as C)	3.2	2.3	8.0
Total Suspended Solids	4	<1	11
Turbidity (NTU)	5	2	23
Volatile Suspended Solids	2	<1	4
Metals			
Aluminum	—	<0.01	0.115
Antimony	—	<0.001	<0.001
Arsenic	0.002	0.002	0.003
Barium	—	<0.05	<0.05
Beryllium	—	<0.001	<0.001

Table 2-8
O'Neill Forebay Outlet Water Quality Summary, 2004 to 2005

Parameter	Concentration (mg/L, unless otherwise noted)		
	Median	Low	High
Cadmium	—	<0.001	<0.001
Calcium	20	12	31
Chromium +3	0.002	0.001	0.004
Copper	0.002	0.001	0.005
Fluoride	<0.1	<0.1	0.1
Iron	0.01	<0.001	0.114
Lead	—	<0.001	<0.001
Magnesium	12	6	16
Manganese	0.006	0.005	0.013
Mercury	—	<0.0002	<0.0002
Nickel	0.001	0.001	0.003
Selenium	—	<0.001	0.002
Sodium	44	21	76
Zinc	—	<0.005	<0.005
Nutrients			
Total Kjeldahl Nitrogen (as N)	0.3	0.2	1.0
Nitrate + Nitrate (as N)	0.6	0.18	1.5
Ammonia (as N)	0.02	0.01	0.12
Total Phosphorus	0.10	0.07	0.21
Ortho-Phosphate (as P)	0.08	0.06	0.12

Source: DWR 2009.
Data were collected at O'Neill Forebay Outlet (Check 13) Monitoring Station KA007089.

Table 2-9 is a list of the conclusions and recommendations that are described in the *Sanitary Survey Update Report 2001* that would reduce the potential threat of drinking water quality degradation in O'Neill Forebay.

Table 2-9
Conclusions and Recommendations of the *Sanitary Survey Update 2001*, O'Neill Forebay

Conclusion	Recommendation
The Delta Mendota Canal generally has higher salinity than the California Aqueduct upstream of O'Neill Forebay. In the future, more operational flexibility may be required at O'Neill Forebay to respond to variable water quality conditions.	Develop capability to forecast salinity and identify joint-use operations that could reduce the salinity of the SWP.
Fecal coliform bacteria are routinely detected in the north and south swim beaches during low-use periods.	MTBE and pathogen monitoring data should continue to be collected in O'Neill Forebay.

Source: DWR 2001.
Note: Recommendations from this study are general and do not commit Reclamation or CSP to the recommended actions. MTBE is no longer used as a fuel additive in California.

Los Banos Creek Reservoir Regular water quality monitoring is not conducted at Los Banos Creek Reservoir. The water quality data discussed below are based on discrete samples taken during the investigation of the Los Banos Grandes facilities for the *Los Banos Grandes Facilities Draft EIR* (DWR 1990).

DWR conducted discrete water quality sampling at and near Los Banos Creek Reservoir between 1984 and 1990 as part of a study considering the use of Los Banos Grandes Facilities as an offstream storage reservoir (DWR 1990). Water quality analyses of these data consisted of minerals, minor elements, nutrients, and asbestos. Routine samples were collected from Los Banos Creek at its confluence with Salt Springs, which is about 1.5 miles west of Los Banos Dam and 0.25 mile north of the reservoir. Water quality data are provided in Table 2-10. According to the DWR Publications office, this is the most recent water quality data available for Los Banos Creek Reservoir.

With the exception of Salt Springs, which is not a freshwater supply, the majority of surface water samples that were collected met state and federal drinking water standards (DWR 1990). No pesticides, herbicides, or synthetic organic compounds were detected.

Table 2-10
Summary of Surface Water Quality—Los Banos Creek Reservoir

Parameter	Concentration (mg/L, unless otherwise noted)		
	Los Banos Creek (near Reservoir Dam)	Los Banos Creek Reservoir	Salt Springs
Sodium	86	50	6,310
Hardness	284	206	6,450
Calcium	52	37	436
Magnesium	37	27	1,302
Potassium	2.7	3.3	11.2
Alkalinity	268	178	357
Sulfate	79	74	14,012
Chloride	81	39	3,580
Fluoride	0.4	0.2	2.1
Boron	1.9	0.6	17
Dissolved Solids	569	372	27,986
pH	8.2	8.3	7.9
Arsenic	0.01	0.01	0.00
Barium	<0.5	<0.5	<0.5
Cadmium	<0.005	<0.005	<0.005

Table 2-10
Summary of Surface Water Quality—Los Banos Creek Reservoir

Parameter	Concentration (mg/L, unless otherwise noted)		
	Los Banos Creek (near Reservoir Dam)	Los Banos Creek Reservoir	Salt Springs
Chromium	<0.005	<0.005	<0.005
Copper	<0.005	0.01	0.02
Iron	0.04	0.027	0.02
Lead	<0.005	<0.005	<0.005
Manganese	0.03	0.09	0.37
Mercury	<0.001	<0.001	<0.001
Selenium	<0.001	0.002	0.052
Zinc	0.01	0.01	0.043
Asbestos	28.5	85	55
Turbidity (NTU)	6	3	6
Total Ammonia + Organic Nitrogen	0.5	0.8	1.9
Dissolved Nitrate + Nitrite	0.07	0.03	0.92
Dissolved Ammonia	0.01	0.08	0.06
Dissolved Orthophosphate	0.03	0.05	0.02
Total Phosphorus	0.05	0.07	0.06

Source: DWR 1990.

2.4.3.2 Organic Chemicals

DWR tests and analyzes organic chemical levels in samples from O'Neill Forebay (though not at San Luis or Los Banos Creek Reservoirs) in March, June, and September of each year using USEPA method chemical scans. In preparation for the *Water Quality in the State Water Project, 2004 and 2005*, published by the DWR in 2009, the following chemicals were screened for five times each during 2004 and 2005 (screening was not conducted in March 2004 at O'Neill Forebay): carbamate pesticides; chlorinated organic pesticides; chlorinated phenoxy herbicides; sulfur pesticides; glyphosate; phosphorus/nitrogen pesticides; and volatile organic compounds (purgeable organics) including benzene, toluene, ethylbenzene, and xylenes (collectively known as BTEX) and MTBE (Table 2-11). Of over 150 organic chemicals screened for five times each at O'Neill Forebay during 2004 and 2005, five individual chemicals were found to be at or above detection levels: 2,4-D; chlorpyrifos; diuron; metolachlor; and simazine. However, levels of all chemicals scanned for, including those five that were at or above detection levels, were below USEPA and/or California Department of

Public Health established primary MCLs where MCLs exist. Chlorpyrifos, diuron, and metolachlor have no established MCLs.

Table 2-11
Select Organic Compounds Screened For at O'Neill Forebay[1,2]

Carbamate Pesticides
Chlorinated Organic Pesticides
Chlorinated Phenoxy Herbicides
Sulfur Pesticides
Glyphosate
Phosphorus/Nitrogen Pesticides
Volatile Organic Compounds (Purgeable Organics) including Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX); and Methyl tertiary butyl ether (MTBE)

Source: DWR 2009.

[1] All organic compounds screened for were below primary Maximum Contaminant Levels (MCLs).

[2] USEPA method chemical scans.

Starting December 31, 2003, the sale of gasoline with an MTBE concentration greater than 0.6 percent in volume was prohibited in California. By July 1, 2007, gasoline with MTBE greater than 0.05 percent in volume was prohibited from sale, supply, production or movement (CARB 2003), eliminating it as an additive in all gasoline sold in California. According to a 1997 study conducted by the DWR Division of Operations and Maintenance, MTBE did not appear to be a serious water quality concern at San Luis Reservoir and O'Neill Forebay, despite boating activities (Janic 1999 as cited in DWR 2001). Of 34 samples taken for MTBE at San Luis Reservoir SRA (at three depths) at Gianelli Pumping-Generating Plant, the Pacheco intake, Dinosaur Point boat ramp, and Basalt Use Area boat ramp, only one at Dinosaur Point boat ramp measured 0.002 mg/L, below the primary MCL of 0.005 mg/L but above the secondary MCL of 0.0013 mg/L. All of the remaining 33 samples were below 0.002 mg/L (DWR 2001). Secondary MCLs do not address public health standards but rather taste, odor, or appearance characteristics of treated drinking water. MTBE was not screened for in samples taken at the SRA as part of the *Water Quality in the State Water Project, 2004 and 2005*, published by the DWR in 2009.

2.4.3.3 Boat Fuel Discharges

Some personal watercraft and fishing boats with small outboard motors are equipped with carbureted two-stroke engines. These engines are referred to as nonconformant engines because they do not conform to California Air Resources Board (CARB) and USEPA emissions standards. As much as 30 percent of the fuel used by nonconformant engines is discharged unburned into the receiving water (California EPA 1999). The use of personal watercraft and other conventional carbureted two-stroke engines has resulted in measurable water quality degradation in some of the nation's lakes and reservoirs. Nonconformant engines intake a mixture of air, gasoline, and oil into the combustion chamber while exhaust gases are expelled from the combustion chamber. Since the intake and exhaust processes occur at the same time, some of the unburned fuel mixture escapes with the exhaust. This expulsion of unburned fuel is the reason for the

elevated levels of hydrocarbon emissions from carbureted two-stroke engines. Fuel components discharged in receiving water typically include benzene, toluene, ethylbenzene, and xylenes (BTEX).

Personal watercraft manufacturers introduced the direct-injection and four-stroke engines to the consumer market late in the 1998 model year. Most manufacturers in the U.S. market now offer a full range of direct-injection and four-stroke outboard and personal watercraft engines. A typical marine engine designed to meet new federal regulations releases approximately 90 percent fewer pollutants than earlier engines (CARB 2008). These new engines (referred to as conformant engines) also have concurrent intake and exhaust processes; however, unlike the carbureted two-stroke engines, the intake charge is air only (no fuel is mixed into the intake charge). The fuel is injected directly into the combustion chamber only after the exhaust process has finished, and no unburned fuel escapes with the exhaust. All marine outboard and personal watercraft manufacturers are required to meet USEPA emission standards that went into effect in 2010. This is of particular importance because the engines and vehicles covered by the rule are significant sources of air pollution. They account for about 26 percent of mobile source volatile organic compound (VOC) emissions and 23 percent of mobile source carbon monoxide (CO) emissions. In 2030, with the new controls, VOC pollutants from marine engines will be reduced by 70 percent for marine engines, and CO will be reduced by 19 percent (USEPA 2008b).

An unknown number of boats in Plan Area water bodies have older, nonconformant two-stroke engines. Fuel components discharged into water by nonconformant two-stroke engines (typically including BTEX) were all below detection levels for primary MCLs in O'Neill Forebay (DWR 2009). Currently, there are no restrictions on using watercraft with two-stroke engines in the Plan Area.

2.5 Air Quality

This section describes the area's applicable air quality regulations, the local climate, and the monitored air data from area monitoring stations.

2.5.1 Regulatory Setting

The Plan Area is subject to major air quality planning programs required by the Federal Clean Air Act of 1970, its amendments of 1990, and the California Clean Air Act of 1988. Both the federal and state statutes provide for ambient air quality standards to protect public health, timetables for progressing toward achieving and maintaining ambient standards, and the development of plans to guide the air quality improvement efforts of state and local agencies.

2.5.1.1 Federal Requirements

The Clean Air Act (42 United States Code [USC] 7401 and Amendments of 1970):

> protects and enhances the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to state and local governments for aid in their development and execution of air pollution control programs; and to encourage and assist the development and operation of regional air pollution control programs.

The Clean Air Act requires the USEPA to publish national primary standards to protect public health and more stringent national secondary standards to protect public welfare (40 CFR 50). States and local governments are responsible for the prevention and control of air pollution. States, which are divided into air quality control regions, are required to submit State Implementation Plans (SIPs) for USEPA approval (40 CFR 51). SIPs provide strategies for implementation, maintenance, and enforcement of national primary and secondary ambient air quality standards for each air quality control region.

Other provisions of the Act include: standards of performance for new stationary sources, motor vehicle emission and fuel standards, national emission standards for hazardous air pollutants, a study of particulate emissions from motor vehicles, and a study of the cumulative effect of all substances and activities that may affect the stratosphere, especially ozone in the stratosphere.

The USEPA oversees state and local implementation of Federal Clean Air Act requirements. In addition, the USEPA sets emission standards for many mobile sources, such as new on-road motor vehicles, including transport trucks that are sold outside of California. The USEPA also sets emission standards for various classes of new off-road mobile sources, including locomotives that are sold throughout the country.

Hydrocarbons and nitrogen oxides (NO_x) are precursors to ozone (smog) formation, and recreational watercraft can contribute substantial emissions of ozone precursors. The USEPA's "Final Rule for New Spark-Ignition Marine Engines" (EPA 1996) adopted exhaust emission regulations for hydrocarbons and NO_x from outboard and personal watercraft marine engines. The 1996 USEPA regulations were phased in between 1998 and 2006, with the standard becoming more stringent as the phase-in period progressed.

The USEPA adopted the "Final Rule: Control of Emissions from Nonroad Spark-Ignition Engines and Equipment" (EPA 2008a), which regulates air emission standards for hydrocarbons, NO_x, and CO. The regulations apply to 2010 and newer outboard and personal watercraft engines (EPA 2009). The new USEPA 2008 regulations estimate that by 2030, the volatile organic compounds (VOC) emissions for marine engines will be reduced by 70 percent and CO emissions will be reduced by 19 percent. The USEPA 2008 regulations are also expected to

achieve more than a 60 percent reduction in exhaust emission standards for hydrocarbon and NO_x emissions (EPA 2008b).

The 2008 USEPA emission standards for hydrocarbons and NO_x are consistent with the 2008 CARB hydrocarbons and NO_x exhaust emission standards (originally adopted in 1998). The USEPA has also adopted CO emission standards for recreational marine and personal watercraft engines (EPA 2008b).

2.5.1.2 State and Local Requirements

Under California law, the responsibility to carry out air pollution control programs is split between the CARB and local or regional air pollution control agencies. The CARB shares the regulation of mobile sources with the USEPA.

The Plan Area is on the western edge of the San Joaquin Valley Air Basin (SJVAB), which includes Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties, and portions of Kern County. The Plan Area is located entirely in Merced County and falls in the San Joaquin Valley Air Pollution Control District (SJVAPCD). The SJVAPCD has the authority to require permits for stationary sources, impose emission standards, set fuel or material specifications, and establish rules and operational limits to reduce air emissions.

One of the SJVAPCD rules, the Indirect Source Review rule, is intended to reduce exhaust emissions of NO_x and particulate matter 10 microns or less in diameter (PM_{10}) from new development projects within the air basin. It is not certain whether this rule applies to any of the potential activities that could take place under the Plan. In general, construction activities emitting exhaust NO_x or PM_{10} emissions of 2 tons per year or more would be subject to this rule. New development typically contributes to air pollution in the San Joaquin Valley by increasing the number of vehicles in the area as well as the vehicle miles traveled. Projects subject to the Indirect Source Review rule must submit an Air Impact Assessment application with commitments to reduce construction exhaust NO_x and PM_{10} emissions by 20 percent and 45 percent, respectively, when compared with the average exhaust emissions of the California construction fleet. The application should also show commitments to reduce NO_x operational baseline emissions by 33.3 percent over a 10-year period and PM_{10} operational baseline emissions by 50 percent over a 10-year period.

SJVAPCD Regulation VIII, Fugitive PM_{10} Prohibitions, Rule 8021 limits fugitive dust (PM_{10}) emissions during construction activities by placing limits on visible dust plumes. The purpose of Regulation VIII, Rule 8021 is to limit the ambient concentrations of PM_{10} from construction activities.

In 1998, CARB adopted hydrocarbon and NO_x emission standards for marine outboard and personal watercraft engines. The standards were implemented in three stages: 2001 exhaust emission standards for 2001–2003 engines, 2004 exhaust emission standards for 2004–2007 engines, and 2008 exhaust emission standards for 2008 and later engines. CARB requires each new engine to have a label that displays one to three stars. The number of stars indicates the exhaust

emission standards with which the engine complies. One-star engines comply with 2001 exhaust emission standards, while three-star engines comply with 2008 exhaust emission standards (CARB 2008). In 2008, CARB proposed CO emission standards for marine outboard and personal watercraft engines that are currently under review and have not been adopted yet. The proposed CO emission standards are consistent with the USEPA 2008 CO emission standards (see "Federal Requirements," above). The state CO emission standards are required of 2009 and newer marine outboard and personal watercraft engines (CARB 2008).

In March 2010, CARB proposed new regulations to control evaporative emissions from spark-ignition marine vessels, to be implemented starting in 2014. For model year 2012 or later marine vessels with an engine rating less than 30 kilowatts (kW), CARB has proposed that all state-level evaporative emission standards and test procedures match, or are compatible with, federal standards set by the USEPA. The same standards would be applied to model year 2012 and 2013 marine vessels with an engine rating greater than 30 kW. For model year 2014 and later marine vessels with an engine rating greater than 30 kW, CARB has proposed more stringent standards than the USEPA standards. For 2016 and later marine vessels with an engine rating greater than 30 kW, CARB has proposed to lower the emission standards for fuel hose permeation (emissions from marine vessels that occur from the leakage of the fuel through rubber fuel hoses; CARB 2010c).

The California Code of Regulations (Title 13, Division 3, Chapter 9, Article 3) imposes emission standards for off highway vehicles (OHVs) and engines produced on or after January 1, 1997. OHVs that do not meet the emissions standards are eligible for OHV Red Sticker registration and may operate only during certain riding seasons and facilities as regulated by the California Air Resources Board. Emission-compliant OHVs are eligible for OHV Green Sticker registration and can be operated year-round at any OHV facility.

In addition, CARB has proposed Low Emission Vehicle (LEV III) standards to be phased in from 2014 to 2022. The LEV II standard should have been fully phased in with model year 2010 for light-duty vehicles. The proposed LEV III emission standards would introduce new combined VOC and NO_x emissions standards.

2.5.1.3 General Conformity

The Clean Air Act requires that nonattainment and maintenance areas (with respect to the National Ambient Air Quality Standards) prepare State Implementation Plans to achieve the standards. Federal actions need to demonstrate conformity to any State Implementation Plans of the regional air basin. The General Conformity Rule (GCR) (Title 40 CFR Part 51.853) requires that the responsible federal agency of an undertaking make a determination of conformity with the State Implementation Plan. Each action must be reviewed to determine whether it (1) qualifies for an exemption listed in the GCR, (2) results in emissions that are below GCR de minimis emissions thresholds, or (3) would produce emissions above the GCR de minimis thresholds applicable to the specific area, requiring a detailed air quality conformity analysis. The GCR de minimis levels are based on the nonattainment classification of the air basin. The

SJVAB is a federal ozone nonattainment area, classified as extreme. The SJVAB is also a federal $PM_{2.5}$ nonattainment area and a federal PM_{10} maintenance area. As such, the GCR de minimis thresholds for the Plan Area are as follows:

- Ozone (O_3): 10 tons per year
- VOC (an ozone precursor): 10 tons per year
- NO_x (an ozone precursor): 10 tons per year
- CO: Not applicable because the project area is in attainment of federal CO standards
- PM_{10}: 100 tons per year for maintenance areas
- $PM_{2.5}$: 100 tons per year for all nonattainment areas.
- SO_2: Not applicable because the project area is in attainment of federal SO_2 standards.

2.5.1.4 National and State Ambient Air Quality Standards

National and state ambient air quality standards have been established for six ambient air pollutants, commonly referred to as "criteria pollutants." The state standards were established in 1969. The USEPA established the federal standards after the passage of the Clean Air Act of 1970. These pollutants include CO, O_3, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead, PM_{10}, and particulate matter 2.5 microns or less in diameter ($PM_{2.5}$). The ambient air quality standards intended to protect the public health and welfare, especially of those most susceptible to respiratory distress, such as asthmatics, the very young, the elderly, people weak from other illnesses or diseases, or persons who engage in heavy work or exercise. These standards specify the concentration of pollutants the public can be exposed to without experiencing adverse health effects. National and state standards are reviewed and updated periodically based on new health studies. California ambient standards tend to be at least as protective as federal ambient standards and are often more stringent.

Based on these standards, regional areas such as the San Joaquin Valley Basin are given an air quality status "label" by the federal and state regulatory agencies for planning purposes. Areas with monitored pollutant concentrations that are lower than ambient air quality standards are designated as "attainment areas" on a pollutant-by-pollutant basis. When monitored concentrations exceed ambient standards, areas are designated as "nonattainment areas." An area that recently exceeded ambient standards but is now in attainment is designated as a "maintenance area." An area is designated "unclassified" if air quality data are inadequate to assign it an attainment or nonattainment designation. Nonattainment areas are further classified based on the severity and persistence of the air quality problem as "moderate," "severe," "serious," or "extreme."

2.5.1.5 Regulations for Climate Change and Greenhouse Gases

Federal Greenhouse Gas Regulations

Endangerment and Cause or Contribute Findings for Greenhouse Gases: On December 7, 2009, the USEPA signed two distinct findings regarding GHGs under section 202(a) of the Clean Air Act:

- Endangerment Finding: The USEPA found that the current and projected concentrations of the six key well-mixed GHGs--carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6)--in the atmosphere threaten the public health and welfare of current and future generations.
- Cause or Contribute Finding: The USEPA found that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.

These findings do not themselves impose any requirements on industry or other entities. However, this action is a prerequisite to finalizing the USEPA's GHG emission standards for light-duty vehicles, which USEPA proposed in a joint proposal including the Department of Transportation's proposed Corporate Average Fuel Economy (CAFE) standards on September 15, 2009.

Light-Duty Vehicle Regulations: On April 1, 2010, USEPA and the National Highway Traffic Safety Association (NHTSA) announced a joint final rule establishing a national program under which automobile manufacturers would be able to build a single light-duty national fleet that satisfies all requirements under both the national program and the standards of California and other states, while ensuring that consumers still have a full range of vehicle choices. The final combined USEPA and NHTSA standards that make up the first phase of this national program apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. They require these vehicles to meet an estimated combined average emissions level of 250 grams of carbon dioxide per mile, equivalent to 35.5 miles per gallon (mpg) if the automobile industry were to meet this carbon dioxide level solely through fuel economy improvements. Together, these standards will cut GHG emissions by an estimated 960 million metric tons and 1.8 billion barrels of oil over the lifetime of the vehicles sold under the program (model years 2012-2016). The agencies are now in the process of developing a rulemaking to set standards for light-duty vehicles with model years 2017-2025 (USEPA 2011a).

California Greenhouse Gas Regulations

Assembly Bill (AB) 32 and Scoping Plan: In September 2006, Governor Arnold Schwarzenegger signed Assembly Bill 32, the California Climate Solutions Act of 2006, which requires that statewide GHG emissions be reduced to 1990 levels by 2020. The CARB released a proposed Scoping Plan on October 15, 2008 and CARB approved it on December 12, 2008. The Scoping Plan contains the main

strategies to achieve reductions in GHG emissions in California to 1990 levels, which means cutting approximately 30 percent from business-as-usual emissions levels projected for 2020, or about 15 percent from today's levels.

Senate Bill 375 (SB 375): The bill enhances California's ability to reach its AB 32 goals by promoting good planning with the goal of more sustainable communities. SB 375 requires CARB to develop regional GHG emission reduction targets for passenger vehicles. CARB is to establish targets for 2020 and 2035 for each region covered by one of California's 18 metropolitan planning organizations (MPOs).

CARB appointed the Regional Targets Advisory Committee (RTAC), as required under SB 375, on January 23, 2009. The RTAC's charge was to advise CARB on the factors to be considered and methodologies to be used for establishing regional targets. The RTAC provided its recommendation to CARB on September 29, 2009. CARB adopted the final targets on September 23, 2010. CARB must update the regional targets every eight years (or four years if it so chooses) consistent with each MPO update of its RTP.

AB 1493 (Pavley Standards): In September 2004 CARB approved regulations to reduce GHG emissions from new motor vehicles. In September 2009 CARB adopted amendments to these regulations. These regulations are part of AB 1493 (also known as the Pavley Standards) and were designed to achieve the maximum feasible and cost effective reduction in GHG emissions from motor vehicles. The regulations apply to new passenger vehicles and light duty trucks beginning with the 2009 model year. When fully phased in, the near term (2009-2012) standards will result in about a 22 percent reduction as compared to the 2002 fleet, and the mid-term (2013-2016) standards will result in about a 30 percent reduction.

CARB elected to incorporate the GHG emission standards into the current Low-Emission Vehicle (LEV) program, along with the other light and medium-duty automotive emission standards. Accordingly, there is a CO_2-equivalent fleet average emission requirement for the passenger car/light-duty truck 1category, and another for the light-duty truck 2 category, just as the LEV program currently has fleet average Non-methane organic gas (NMOG) emission requirements for both categories of vehicles. This approach was taken to ensure that manufactures can meet the standards while continuing to provide the full range of vehicles available today.

San Joaquin Valley Air Pollution Control District Greenhouse Gas Regulations For CEQA and NEPA purposes, there is currently no numeric threshold of significance for GHG emissions. CEQA requires lead agencies (such as APCDs) to establish specific procedures for administering their responsibilities under CEQA, including evaluation of the GHG impacts of a project. Therefore, the SJVAPCD developed guidance in cases where it is serving as the lead agency. Subsequently, the SJVAPCD adopted the *Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA* in December 2009. The guidance relies on the use of performance based standards, otherwise known as Best Performance Standards (BPS) to assess significance of

project specific GHG emissions on global climate change during the environmental review process, as required by CEQA. According to SJVAPCD guidelines, if BPS are adopted for a project, the GHG cumulative impacts can be considered less than significant. As of January 2012, the BPS that have been approved apply primarily to stationary sources. For projects that involve mobile sources such as this Plan, demonstration of a 29 percent reduction in GHG emissions, from business-as-usual, or compliance with an approved GHG plan or mitigation program is required to determine that a project would have a less than cumulatively significant impact.

2.5.2 Ambient Air Quality

The SJVAB and the SJVAPCD are in the San Joaquin Valley, an inter-mountain valley bound to the east by the Sierra Nevada, to the west by the Coastal Mountain Range, and to the south by the Tehachapi Mountains. The SJVAB is predominately agriculturally oriented, with some industrial activities in the cities of Bakersfield, Lathrop, Kingsburg, Madera, Riverbank, Corcoran, Stockton, Fresno, Tracy, Elk Hills, and Avenal. Of the land, 31 percent is publicly owned, of which 29 percent is managed by the federal government, and 2 percent is managed by the state.

Airflow patterns within the SJVAB change throughout the year. Summer conditions are hot and dry, with airflow dominated by a semipermanent subtropical high-pressure zone causing winds to be light and variable. Summer inversion layers are also common, further decreasing dispersion throughout the basin during summer months. Winds in some portions of the Plan Area are known to be much stronger. Between April and August, wind velocities in portions of the Plan Area are 10 miles per hour or above over 65 percent of the time. No data are available regarding the effects of local winds on air quality in the immediate vicinity of the Plan Area.

The SJVAB experiences mild winters dominated by frontal systems and troughs originating in the northern Pacific Ocean. Winter rains are followed by atmospheric instabilities and increased vertical mixing of the atmosphere, which leads to improved air quality during winter months. Fronts and troughs are frequently pushed north by high-pressure systems, which causes decreased winds and poorer dispersion. Airflow and dispersion are greatest during spring and fall months with increased winds. Spring and fall temperature differences between coastal and valley air cause wind direction to change frequently while also increasing wind velocity. The strongest winds in the region occur from April through August, with velocities as high as 30 to 40 miles per hour.

The concentration of air pollutants in the SJVAB varies from day to day depending on the ability of the atmosphere to disperse pollutants. Dispersion is largely influenced by seasonal changes in airflow and by the surrounding topography, namely the mountain ranges surrounding the SJVAB. Air quality in Merced County exceeds the standards for ozone and PM_{10} (both of which are designated criteria pollutants) several days each year. Despite the area's extremely low emissions, it is subject to pollutants transported from areas of

higher population density, higher vehicle traffic, and industrial activity. Major sources of PM_{10}, carbon monoxide, nitrogen oxides, reactive organic gases, and other air pollutants exist in the metro areas of Stockton, Modesto, Merced, Fresno, Visalia, and Bakersfield. Northerly winds also transport pollutants from the greater Sacramento area and the San Francisco Bay Area. Poor dispersion and mixing allow some accumulation of pollutants in the vicinity of the Plan Area. However, air quality in Merced County has been improving over the past decade as shown by decreased concentrations of ozone, PM_{10}, carbon monoxide, and nitrogen dioxide. Nonattainment of standards usually occurs during summer months when airflow and dispersion are lowest.

The SJVAB, which contains the Plan Area and is regulated by SJVAPCD, attains the federal and state standards (or is unclassified) for lead, CO, SO_2, and NO_2. The SJVAB is a nonattainment area for the state standards of O_3 (1-hour and 8-hour), PM_{10}, and $PM_{2.5}$. The SJVAB is also nonattainment for the federal 8-hour O_3 standard (the federal 1-hour O_3 standard was revoked in 2005) and $PM_{2.5}$ standards. In September 2008, the USEPA re-designated the region as attainment for the federal PM_{10} standard, and the region is now considered a maintenance area for the federal PM_{10} standards. In November 2009, the USEPA designated the SJVAB as nonattainment for the federal $PM_{2.5}$ standard. National and state ambient air quality standards, as well as the attainment status for Merced County and the SJVAB, are listed in Table 2-12.

Table 2-12
State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]	National Standards[2]		Merced State Status	Merced National Status
		Concentrations[3]	Primary[3,4]	Secondary[3, 5]		
Ozone	8-hour 1-hour	0.07 ppm 0.09 ppm	0.075 ppm --	Same as Primary --	Nonattainment Nonattainment/Severe	Nonattainment/Extreme --
Carbon Monoxide	8-hour 1-hour	9.0 ppm 20.0 ppm	9 ppm 35 ppm	None	Attainment/ Unclassified	Attainment/ Unclassified
Nitrogen Dioxide	Annual Arithmetic Mean 1-hour	0.03 ppm 0.18 ppm	0.053 ppm 0.100 ppm[6]	Same as Primary None	Attainment	Attainment/ Unclassified
Sulfur Dioxide	 24-hour 3-hour 1-hour	 0.04 ppm -- 0.25 ppm	 -- -- 0.075[7]	 -- 0.5 ppm --	Attainment	Attainment/ Unclassified
Fine Particulate Matter (PM_{10})	Annual Arithmetic Mean 24-hour	20 μg/m^3 50 μg/m^3	-- 150 μg/m^3	Same as Primary Same as Primary	Nonattainment	Attainment
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean 24-hour	12 μg/m^3 --	15 μg/m^3 35 μg/m^3	Same as Primary Same as Primary	Nonattainment	Nonattainment

Sources: California Air Resource Board, http://www.arb.ca.gov; San Joaquin Valley Air Pollution Control District, http://www.valleyair.org/aqinfo/attainment.htm#Federal%20Standards, accessed January 2012.

μg/m3 = micrograms per cubic meter ppm = parts per million

[1] California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1- and 24-hour), nitrogen dioxide, suspended particulate matter—PM_{10}, PM_{25}, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[2] National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m^3 is equal to or less than one. For PM_{25}, the 24-hour standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact USEPA for further clarification and current federal policies.

[3] Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] National Primary Standards: The levels of air quality deemed necessary by the federal government, with an adequate margin of safety, to protect the public health.

[5] National Secondary Standards: The levels of air quality deemed necessary by the federal government to protect the public welfare from any known or anticipated adverse effects to a pollutant.

[6] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

[7] On June 2, 2010, the USEPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

Adverse health effects associated with criteria pollutants of public health concern are summarized in Table 2-13. Table 2-14 provides a summary of criteria air pollutant monitoring results in Merced County for the period 2007 through 2010.

Table 2-13
Health Effects Summary of Air Pollutants of Public Health Concern

Air Pollutant	Adverse Effects
Ozone	Aggravation of respiratory and cardiovascular diseases
	Reduced lung function
	Increased cough and chest discomfort
Carbon Monoxide	Aggravation of some heart diseases
	Reduced tolerance for exercise
	Impairment of mental function
	Birth defects; death at high levels of exposure
Fine Particulate Matter (PM_{10} and $PM_{2.5}$)	Reduced lung function
	Aggravation of respiratory and cardiovascular diseases
	Increases in mortality rate
	Reduced lung function growth in children

Source: BAAQMD 2011.

Table 2-14
Summary of Criteria Air Pollutant Monitoring

Pollutant	2007	2008	2009	2010
Ozone 2007 to 2009 at S. Coffee Avenue Station, Merced County				
Peak 1-hour concentration (ppm)	0.105	0.131	0.094	0.117
Days above federal standard	0	3	0	0
Days above state standard	5	14	0	7
Peak 8-hour concentration (ppm)	0.096	0.120	0.083	0.096
Days above federal standard	18	33	15	14
Days above state standard	25	54	35	31
NO_2 2007 to 2009 at S. Coffee Avenue Station, Merced County				
Peak 1-hour concentration (ppm)	0.050	0.060	0.056	0.050
Days above state standard	0	0	0	0
Annual average (ppm)	0.009	0.009	0.008	0.007
PM_{10} 2007 to 2009 at 2334 M Street Station, Merced County				
Peak 24-hour concentration (micrograms per cubic meter)	69.0	76.8	65.1	93.4
Days above state standard (measured)	6	14	5	3
State annual average (micrograms per cubic meter)	29.7	34.5	26.9	25.5

Source: CARB ADAM 2007, 2008, 2009, and 2010, Online Air Quality Data Summaries.
Note: Data for carbon monoxide, $PM_{2.5}$, and sulfur dioxide in the Plan Area were not available.

Criteria emissions in the Plan Area were estimated using the CARB EMFAC 2007 for motor vehicles and Offroad 2007 models motorized vessels and OHVs. Estimated emissions are shown in Table 2-15, below. The estimates were developed using vehicle trip and boat launch data for fiscal year 2007–2008, the

most recent period for which peak vehicle daily trip data are available, and OHV use data for fiscal year 2011–2012.

Table 2-15
Existing Criteria Pollutant Emissions in the Plan Area

Type	CO	VOC	NO_x	PM_{10}	$PM_{2.5}$	SO_2
Vehicle Emission Factors (lb/mi)	0.0135	0.0013	0.0012	8.423E-05	5.23E-05	9.00E-06
Vehicle Emissions (tons/year)	6.437	0.631	0.585	0.040	0.025	0.004
Boat Emission Factors (ton/boat)	0.00037	1.97E-04	1.80E-05	2.59E-05	2.59E-05	4.48E-08
Evaporative Boat Factors (tons/boat)		2.71E-05				
Boat Emissions (tons/day)	0.00971	0.00591	0.00047	0.00068	0.00068	0.00000
Boat Emissions (tons/year)	3.55	2.16	0.17	0.25	0.25	0.00
OHV Exhaust Emission Factors (tons/OHV)	1.57E-04	5.77E-05	1.66E-06	8.11E-07	8.11E-07	8.35E-07
OHV Evaporative Emission Factors (tons/OHV)		1.91E-05				
OHV Emissions (tons/day)	0.000870	0.000426	0.000009	0.000005	0.000005	0.000005
OHV Emissions (tons/year)	0.32	0.16	0.003	0.002	0.002	0.002
Total Emissions (tons/year)	**10.299**	**2.946**	**0.761**	**0.291**	**0.276**	**0.006**
SJVAPCD Thresholds (tons/year)	**NA**	**10**	**10**	**15**	**15**	**NA**
GCR De Minimis Thresholds (tons/yr)	**Attainment**	**10**	**10**	**100**	**100**	**Attainment**

NA = No threshold exists

Notes:

1. OHV emissions are based on the 2011-2012 fiscal year.

As shown in Table 2-15, total emissions from the Plan Area are well below the SJVAPCD thresholds (where thresholds exist), and in attainment of or well below the GCR de minimis thresholds for the criteria pollutants listed in Table 2-12. Emissions for ozone are presented as NO_x and VOC, as ozone is produced by the photochemical reaction of those pollutants.

2.5.3 Greenhouse Gas Emissions

GHG emissions from existing vehicle use were estimated using EMFAC 2007, and GHG emissions for motorized vessels and OHVs were estimated using

Offroad 2007. Estimated emissions are presented in Table 2-16. Carbon dioxide equivalents (CO_2e) is a quantity that describes, for a given mixture and amount of GHGs (which might consist of pollutants other than carbon dioxide [CO_2]), the amount of CO_2 that would have the same global warming potential (GWP), when measured over a specified timescale (generally, 100 years). The CO_2e for a gas is obtained by multiplying the mass and the GWP of the gas. GWPs for the non-CO_2 pollutants ofCH_4 and N_2O were obtained from the California Climate Action Registry (CCAR) General Reporting Protocol (GRP) version 3.1. GWPs are values used to compare the abilities of different GHGs to trap heat in the atmosphere. GWPs are based on the heat-absorbing ability of each gas relative to that of CO_2 (whose GWP is 1), as well as the decay rate of each gas (the amount removed from the atmosphere over a given number of years). The estimates were developed using vehicle trip and boat launch data for fiscal year 2007–2008, the most recent period for which peak vehicle daily trip data are available, and OHV use data for fiscal year 2011–2012.

Table 2-16
Existing GHG Emissions

Parameter	Pollutant			
	CO_2	CH_4	N_2O	CO_2e
Vehicle Emission Factors (lb/mi)	0.91	1.05E-04	0.06	20.61
Vehicle Emissions (tons/yr)	435.34	0.05	30.29	9825.12
Boat Emission Factors (ton/boat)	2.83E-03	1.23E-05	7.92E-07	3.33E-03
Boat Emissions (tons/day)	0.07	3.23E-04	2.09E-05	0.09
Boat Emissions (tons/year)	27.23	0.12	0.01	32.08
OHV Exhaust Emission Factors (tons/OHV)	4.69E-04	3.56E-06	9.14E-07	8.27E-04
OHV Emissions (tons/day)	0.002603	0.000020	0.000005	0.004591
OHV Emissions (tons/year)	0.95	0.01	0.002	1.68
Total Emissions (tons/year)	463.53	0.18	30.30	9,858.87
Total Emissions (metric tons/year)	420.50	0.16	27.48	8,943.82

Notes:

1. The data shown were calculated using the 2010 CARB GHG inventory for the state, which only covered up to 2008.
2. OHV emissions are based on the 2011-2012 fiscal year.

2.6 Biological Resources

2.6.1 Introduction

Significant biological resources are resources that are important to the essential character of the area, important regionally or statewide, or documented as significant on recognized protection or preservation lists (DPR 2002). These resources include sensitive natural communities characterized by plant assemblages with unique species of plants and wildlife; species that are restricted in distribution, supported by distinctive soil conditions, or considered locally rare; and species that potentially support other special-status species.

The designation of a special-status species is determined by municipal, county, state, and/or federal regulations. These species often have declining populations, are locally endemic, and/or have limited or restricted distribution within their known range. The specific designations of special-status species are as follows:

- Endangered or threatened under the federal Endangered Species Act (ESA) and/or the California Endangered Species Act (CESA);
- Species of Special Concern identified by DFW;
- Fully protected species under California Fish and Game Code Sections 3511, 4700, 5050 and 5515;
- Birds of Conservation Concern as listed by the U.S. Fish and Wildlife Service (USFWS);
- Migratory birds protected under the Migratory Bird Treaty Act;
- Fisheries of economic importance under the Magnuson-Stevens Fisheries Conservation and Management Act;
- Plants on the California Native Plant Society's (CNPS) List 1B (plants rare, threatened, or endangered in California and elsewhere) or List 2 (plants rare, threatened, or endangered in California but more common elsewhere). For the purposes of this report, special-status species will not include CNPS List 3 or 4 plants; and
- Western Bat Working Group

The introduction and perpetuation of invasive and exotic plant species are also regulated under state and federal law. These species have the ability to alter vegetation communities and threaten plant species, animal species, and vegetation communities.

2.6.1.1 Regulatory Setting

Significant biological resources are provided protection through various state and federal regulations. Consultation with regulatory agencies is required during the planning process of a project so that the appropriate level of protection is provided to a species, through methods that include, but are not limited to, avoidance of habitat disturbance, minimization of disturbance, and mitigation of disturbance. Agency consultation is discussed further in Chapter 6. A list of the pertinent regulations is included below.

Federal Regulations

Federal Endangered Species Act. The ESA of 1973 provides protection for animal and plant species that are in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened). The USFWS and the National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NMFS) have regulatory authority over projects pursuant to the ESA that may affect the continued existence of a federally listed (threatened or endangered) species. Section 9 of the ESA prohibits the take of federally listed species. Take is defined under the ESA, in part, as killing, harming, or harassment of such species. Under federal regulations, take is further defined to include habitat modification or degradation where it actually results in death or injury to wildlife by

substantially impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Section 7 of the ESA outlines procedures for federal interagency cooperation and participation in the conservation and recovery of federally listed species and designated critical habitat. Section 7(a)(2) requires federal agencies to consult with other federal agencies with regulatory authority to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or to destroy or adversely modify designated critical habitat. Critical habitat identifies specific areas that have the physical and biological features that are essential to the conservation of a listed species, and that may require special management considerations or protection.

For projects where a federal nexus is not involved and take of a listed species may occur, the project proponent may seek to obtain an incidental take permit under Section 10(a) of the ESA. Section 10(a) of the ESA allows the USFWS to permit the incidental take of listed species if such take is accompanied by a Habitat Conservation Plan (HCP) that includes components to minimize and mitigate impacts associated with the take.

Migratory Bird Treaty Act. Pursuant to this international treaty between the United States and Canada, Mexico, Russia and Japan, it is unlawful to pursue, hunt, take, capture and/or kill a migratory bird. This includes the removal of all active nests during the breeding season.

Bald and Golden Eagle Protection Act. Under this act, take of a bald or golden eagle without a permit from the Secretary of the Interior is illegal. This includes impacts to known nests when eagles are not present.

Executive Order 13112 (Invasive Species). This Executive Order curtails the introduction of invasive species by restricting federal agencies from authorizing a project that the agency suspects would introduce or spread an invasive species.

Clean Water Act, Section 404. USACE regulates the placement of fill into Waters of the U.S. under Section 404 of the Clean Water Act. Waters of the U.S. include lakes, rivers, streams, and their tributaries and wetlands. Wetlands are defined under Section 404 as areas that are inundated or saturated by surface or ground water at a frequency and duration that are sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Activities that require a permit under Section 404 include, but are not limited to, placing fill or riprap, grading, mechanized land clearing, and dredging. Any activity that results in the deposit of dredge or fill material within the “Ordinary High Water Mark” of Waters of the U.S. usually requires a permit from the USACE, even if the area is dry at the time the activity takes place. A variety of processes are available for obtaining Section 404 authorization from the USACE, ranging from the Nationwide Permit Process to the Individual Permit Process.

USACE Section 404(b) guidelines specify a three-step process for meeting a national policy of no net 1oss of wetlands: (1) avoidance—finding another alternative that does not involve wetlands damage, (2) minimization—minimizing the wetlands impact of the project design, and then, only after the first two conditions have been met, and (3) mitigation—compensating for the unavoidable wetlands damage.

Executive Order 11990 (Protection of Wetlands 1977). Executive Order 11990 requires a construction agency to "… avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." Executive agencies, in carrying out their land management responsibilities, are to take action that will minimize the destruction, loss, or degradation of wetlands, and take action to preserve and enhance the natural and beneficial values of wetlands. Each agency shall avoid undertaking or assisting in wetland construction projects unless the head of the agency determines that there is no practicable alternative to such construction and that the proposed action includes measures to minimize harm.

State Regulatory Issues

California Endangered Species Act. Pursuant to the CESA, a permit from the DFW is required for projects that could result in take of state-listed threatened or endangered species. Section 2080 of the CESA prohibits take of state-listed species. The take of state-listed species incidental to otherwise lawful activities requires a permit, pursuant to Section 2081(b) of the CESA. The state has the authority to issue an incidental take permit under Section 2081 of the Fish and Game Code, or to coordinate with the USFWS during the Section 10(a) process to make the federal permit also apply to state-listed species.

Fully Protected Species. The DFW has jurisdiction over fully protected species of birds, mammals, amphibians, reptiles and fish pursuant to California Fish and Game Code Sections 3511, 4700, 5050, and 5515. Possession or take of fully protected species is prohibited, and DFW will not issue a take license or permit for these species.

Section 1600 of the California Fish and Game Code. All diversions, obstructions, or changes to the natural flow of a bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources is subject to regulation by the DFW, pursuant to Section 1601 of the California Fish and Game Code. Section 1601 makes it unlawful for any governmental agency, state or local, and any public utility to substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake without first notifying the DFW of such activity. The regulatory definition of a stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation. The DFW's jurisdiction within altered or artificial

waterways is based on the value of those waterways to fish and wildlife. A DFW Lake and Streambed Alteration Agreement must be obtained for any project that would result in an impact to a river, lake, or stream that would adversely affect any fish or wildlife resource.

Section 671 of the California Fish and Game Code. Section 671 of the California Fish and Game Code regulates the importation, transportation, and possession of live restricted animals. Under this regulation, all members of the genus *Dreissena* (including zebra mussels or quagga mussels) are restricted species that have been identified as "detrimental animals" because they pose a threat to native wildlife, to the agriculture interests of the state, and/or to public health and safety.

Section 2302 of the California Fish and Game Code. Any district, agency or authority that owns or manages a reservoir where public recreational, boating or fishing activities are permitted is required to (1) assess the vulnerability of the reservoir to infestation by dreissenid mussels; and (2) develop and implement a program to prevent the introduction of dreissenid mussels that includes public education, monitoring, and management of the recreational activities, along with other actions deemed appropriate by the owner or manager.

Section 3503 of the California Fish and Game Code. Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds-of-prey in the Orders Falconiformes or Strigiformes." These orders include hawks, owls, eagles, and falcons. DFW considers the loss of eggs of these species or disturbance or destruction of an active nest a violation of this code. This statute does not provide for the issuance of any type of incidental take permit. Section 3503 prohibits unlawful take, possession, or needless destruction of the nest or eggs of any bird. DFW also has jurisdiction over unlawful take of migratory nongame birds (California Fish and Game Code Section 3513).

Native Plant Protection Act. This act requires all state agencies to promote programs that protect endangered or rare native plants.

Conservation-Related Regulations Near the Plan Area

The Grasslands Ecological Area (GEA) is located east of the Plan Area on the opposite side of I-5. This non-jurisdictional area is composed of federal refuges, state wildlife refuges, state parks and recreation areas, and private lands. The GEA was established by the USFWS as an area where public easements for wetland conservation could be purchased. Within the GEA lies the largest known contiguous wetland in Central California. A portion of this area, northeast of O'Neill Forebay Wildlife Area, was designated in 2005 as a "Wetland of International Importance" under the Convention on Wetlands of International Importance (Ramsar Convention) (California Watchable Wildlife 2008).

Pacheco State Park, to the west of San Luis Reservoir, adopted a General Plan in 2006 for long-term planning and management for the park. The General Plan includes guidelines for protecting the park's unique natural resources, such as

windswept oaks on grassy rolling hills, riparian and oak woodland, savanna, chaparral, scrub, grasslands, and mesic herbaceous (wetland) plant communities.

Portions of Santa Nella on the eastern border of the Plan Area have a Habitat Conservation Plan (HCP) in place for the San Joaquin kit fox. Along the western border of the Plan Area, another HCP is under development by the County of Santa Clara and will include the San Joaquin kit fox among its covered species. The San Joaquin Valley National Cemetery, which is just northwest of San Luis Creek Use Area, does not have an HCP for the San Joaquin kit fox but has switched from rodenticide to trapping to prevent harm to kit foxes.

2.6.1.2 Setting and Climate

San Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir lie between the Coast Range and the San Joaquin Valley. San Luis Reservoir and O'Neill Forebay are the largest bodies of water within an approximately 40-mile area in Merced County. Los Banos Creek Reservoir is in the foothills several miles to the southeast. To the west of the Plan Area is Pacheco State Park, which contains 6,900 acres of rolling foothills of former ranchland, primarily of oak savanna. The Plan Area contains the O'Neill Forebay Wildlife Area to the east-northeast and the San Luis Wildlife Area to the west.

The Upper and Lower Cottonwood Wildlife Areas are just to the north of San Luis Reservoir and the Jasper-Sears mitigation parcel is just to the south. All are outside of the Plan Area and managed by DFW. Farther to the north and east in the San Joaquin Valley is the San Luis National Wildlife Refuge Complex, which consists of 45,000 acres of wetlands, grasslands, and riparian habitat that is a stopping point in the middle of the Pacific Flyway, providing rest and forage for migrating birds (USFWS 2008).

The O'Neill Forebay Wildlife Area is on the eastern side of O'Neill Forebay and located in the low foothills abutting the San Joaquin Valley. The eastern parts of the Plan Area, including O'Neill Forebay, are relatively flat and are influenced by San Joaquin Valley weather patterns. The Plan Area is often windy, especially in the summer, which exacerbates water stress of the vegetation.

The San Luis Wildlife Area is on the northwestern shore of the San Luis Reservoir. It has steep canyons and north-facing slopes which drain small tributaries (some may be seasonal) from the nearby mountains to the reservoir and provides habitat for species that grow in moister areas. Small tributaries also drain into the smaller Los Banos Creek Reservoir. San Luis Reservoir sits in a complex pattern of elevation and rainfall in the eastern foothills running north-northeast/south-southwest (habitat gradients tend to run parallel or perpendicular to this line). The climate in the western part of the Plan Area is Mediterranean, with summer droughts and high air temperatures, and the mountains to the north of the reservoir are wetter than the south.

Steep gradients of elevation and rainfall create microclimates associated with rare and endemic species. For example, some special-status plants occur where

foothills meet the floodplain, and some special-status amphibians, reptiles, and plants are associated with seasonal pools and streams. The orientation of the various ecological communities delineated by rainfall and elevation aid in the understanding of the distribution and likely occurrence of special-status species in the Plan Area.

2.6.1.3 Vegetation

California is divided into three floristic provinces that are further divided into regions, subregions, and districts where applicable. According to the Jepson Manual (2008), these geographic units are based on physiographical and biological considerations. The Plan Area is within the California Floristic Province (CFP), which is an area designated as a Biological Hotspot by Conservation International (Conservation International 2007). It is considered such because it has a Mediterranean climate, contains high levels of plant endemism and endemic animals, and is the largest avian breeding ground in the United States. Within the CFP, the Plan Area is at the intersection of two subregions and a district (the San Joaquin Valley and San Francisco Bay Area subregions and the Inner South Coast Ranges District within the South Coast Ranges District), which are in two floristic regions (Great Central Valley and Central Western California). The northern part of San Luis Reservoir falls into the San Francisco Bay Area Subregion, which encompasses a diversity of community types. South of Pacheco Pass is the Inner South Coast Ranges District, which supports a mosaic primarily of summer-dry blue oak/foothill pine woodland and chaparral (although no chaparral is present in the Plan Area). To the east, which includes part of O'Neill Forebay and potentially parts of Los Banos Creek Reservoir, is the San Joaquin Valley Subregion of the Great Central Valley Region, which is characterized by islands of valley oak savanna (Jepson 2008).

The vegetation of the Plan Area and the DFW-managed wildlife areas consists of riparian woodland, blue oak woodland and savanna, coast live oak woodland, ornamental trees, California sagebrush scrub, grasslands, mesic herbaceous (wetland), iodine bush scrub (alkali sink scrub), and ruderal (nonnative and weedy) plant communities. Different species dominate the grassland in different areas. The occurrence of a particular species as a dominant may be the result of particular edaphic, climatic, and moisture conditions. Most of the dominants are non-native species, but purple needlegrass (*Nasella pulchra*), a native species, occurs throughout the Plan Area in various densities. It occasionally grows as a dominant on the slopes of San Luis and Los Banos reservoirs. The other dominants include ripgut brome, hare barley (*Hordeum murinum* ssp. *leporinum*), wild oats (Avena sp.), and Italian ryegrass (*Lolium multiflorum*). Various species of tarweeds also occur in various densities ranging from low to high in the grassland. They also occur as dominant or subdominant species of small areas. The species of tarweeds are Fitch's spikeweed, common spikeweed (*Hemizonia pungens*), and San Joaquin tarweed (*Holocarpha obconica*). Big tarweed (*Blepharizonia plumosa* ssp. *viscida*) occasionally occurs in the grassland, and vinegar weed (*Trichostemma lanceolatum*) often occurs as a subdominant in the grassland.

Some portions of the grassland are dominated by native species of grass. Often these native areas are correlated with sloping areas and shallow soil. Natives such as pine bluegrass often grow beside the California sagebrush scrub on the slopes of Los Banos Reservoir. Creeping wildrye, a native species, can dominate moist areas.

Native grasslands also represent a declining vegetation type, in part due to severe competition from nonnative species of grass. Patches of purple needlegrass and pine bluegrass (*Poa secunda*) occur on relatively small areas of the Plan Area. Creeping wildrye (*Leymus triticoides*) occurs on relatively deep moist soils, often near wetlands. In the majority of the Plan Area, vegetation communities appear stable and exhibit few signs of transitioning to a more mature successional stage. For example, no evidence exists of colonization of the grassland areas by shrubs or trees that would indicate that the vegetation will change to a more woody vegetation in the near future. Similarly, the California sagebrush scrub does not appear to be colonized by propagules of trees.

The riparian woodland and mesic herbaceous types occur at the edge of the reservoirs and along watercourses. The San Luis Wildlife Area also contains blue oak woodland, blue oak savanna, coast live oak woodland, and California sycamore riparian woodland. The California sagebrush scrub occurs on hillsides above and to the west of Los Banos Creek Reservoir. The iodine bush scrub occurs at Salt Spring, a tributary to Los Banos Creek Reservoir. Where appropriate, the naming system used in A Manual of California Vegetation was incorporated into the names of the vegetation types in this report (Sawyer and Keeler-Wolf 1995).

As long as the slopes above Los Banos Creek Reservoir and Los Banos Creek do not erode, the vegetation will most likely remain as a mosaic of grassland and scrub. However, areas at the edges of O'Neill Forebay and Los Banos Creek Reservoir appear to be slowly changing to riparian vegetation. Two early successional species, sandbar willow and mulefat, are expected to be replaced by red willow (*Salix laevigata*), black willow, Fremont cottonwood, and western sycamore (*Platanus racemosa*) at the shore of O'Neill Forebay, and Fremont cottonwood and black willow are expected to continue to colonize the shore of Los Banos Creek Reservoir. At the shore of San Luis Reservoir, riparian vegetation will always be in an early successional stage because either the extreme fluctuation of the water level inundates the vegetation for too long a period, or the vegetation does not receive enough water during the dry season.

2.6.2 Biological Resources in the Plan Area

2.6.2.1 Methods

Species The EIR component of this EIS/EIR was originally issued in April 2005 and has been updated. The data sources used in the 2005 EIR include:

- A search of the California Natural Diversity Database (CNDDB)and CNPS databases for the nine USGS 7.5-minute quadrangle maps including

and surrounding the San Luis Reservoir SRA (Crevison Peak, Pacheco Pass, Mariposa Peak, Howard Ranch, San Luis Dam, Los Banos Valley, Ingomar, Volta, and Ortigalita Peak NW);
- A review of existing scientific literature; and
- Reconnaissance-level field surveys by EDAW in October 2002 and June 2003 for 25 target special-status species habitat or vegetation types (EDAW 2005; also see Appendix B), using species lists compiled from Edminster (1996) and Robert Edminster's plant species list for nearby Pacheco State Park.

The reconnaissance-level surveys were completed in 2003 and did not include focal ground surveys.

The following data sources were used to update the biological resources discussion:

- Search of CNDDB observations of occurrences of listed species (2012), Sacramento USFWS Official Species list and CNPS Inventory of Rare and Endangered Plants (2011) for the nine USGS 7.5-minute quadrangles listed above for the San Luis Reservoir SRA, in addition to the bordering quadrangles (Mustang Peak, Pacheco Peak, and Three Sisters).
- Consultation with staff of resource agencies and organizations familiar with local biological resources, including from CSP and the Endangered Species Recovery Program (ESRP).

The potential for a species to occur in the Plan Area was determined by whether it had been observed within a 10-mile radius of the Plan Area, observed in USGS topographic quad maps as described above, or observed by CSP officials or surveys in the Plan Area, such as the vegetation survey and the San Joaquin kit fox survey by the ESRP, and whether preferred habitat types for a listed species occur within the Plan Area (see Table 2-17). The species maps show a 5-mile buffer around the Plan Area. With the exception of western spadefoot (*Spea hammondii*), the same animal species observed in the 10-mile buffer were also observed in the 5-mile buffer. Therefore, the species occurrence maps only show a 5-mile buffer around the Plan Area. The species with potential to occur are discussed in further detail in Sections 2.6.2.2 through 2.6.5.

Wetlands Wetlands are defined by USACE according to specific criteria, as provided in the Wetlands Delineation Manual (USACE 1987), and requires that all three wetland criteria (soils, hydrology, and vegetation) be met for an area to be classified as a wetland. To determine the presence or absence of wetlands within the Plan Area, a variety of sources were utilized: USFWS National Wetlands Inventory (NWI) maps (USFWS 2011), the Holland vernal pool complex maps (Map 6b, Holland 2009), site visits conducted by EDAW biologists in 2002 and 2003 (EDAW 2005; also see Appendix B), and review of the topography and vegetation of the area (National Agriculture Imagery Program 2009 with USFWS 2011, Holland 2009, and CNDDB 2012 imagery).

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
amphibian	*Ambystoma californiense*	California tiger salamander	Vernal pools and stock ponds in grasslands	Potential to occur. There is a CNDDB observation approximately 1.2 miles southwest of Los Banos Creek Reservoir.	FT/ST	None	None
amphibian	*Rana boylii*	foothill yellow-legged frog	Generally restricted to shallow, flowing streams with some cobble-sized substrate	Known to occur. Reported to the CNDDB as occurring upstream from Los Banos Creek Reservoir in Los Banos Creek. Last CNDDB observation was in 1988.	None/None	SSC	None
amphibian	*Rana draytonii*	California red-legged frog	Stock ponds and other natural and artificial permanent and seasonal aquatic habitats	Known to occur in the Plan Area. Juveniles were observed in the western part of the Plan Area (2006) and south of San Luis Reservoir (2000), including the San Luis Wildlife Area, which appeared to be an over-summer site for adults (2002, 2006). Not expected to breed in the Plan Area due to the absence of stock ponds and other permanent aquatic habitat. May serve as seasonal habitat for young dispersing frogs and an over-summer site for adults.	FT/ None	SSC	None
amphibian	*Spea hammondii*	western spadefoot	Vernal pools and other seasonal ponds	Potential to occur. CNDDB occurrence recorded south of Los Banos Creek Reservoir.	None/None	SSC	None
bird	*Agelaius tricolor*	tricolored blackbird	Freshwater marsh, riparian habitat, and agricultural fields	Known to occur. Observed during 2003 field surveys. Emergent marsh habitat at Los Banos Creek Reservoir may be suitable nesting habitat. Known to nest at the O'Neill Forebay Wildlife Area.	None/None	SSC	None
bird	*Aquila chrysaetos*	golden eagle	Grasslands, open woodlands	Potential to occur. Suitable nesting and foraging habitat present.	None/None	FP	--

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
bird	*Athene cunicularia*	burrowing owl	Open grasslands (including those dominated by nonnatives and by those with ground squirrel activity, since they are known to use ground squirrel burrows) and agricultural fields	Known to occur. Observations are mostly southwest of San Luis Reservoir and north of Los Banos Creek Reservoir. Also observed northeast of San Luis Reservoir along the California Aqueduct. Road kill on Basalt Road on January 10, 2004. Status unknown, but likely to occur in small numbers during winter and the nesting season. Burrowing owls were observed on the DWR parcel (fall 2004), just west of the SRA boundary.	None/None	SSC	None
bird	*Branta hutchinsii leucopareia*	cackling (=Aleutian Canada) goose	Winters on lakes and inland prairie; forages on natural pasture or that cultivated to grain; loafs on lakes, reservoirs, ponds	Potential to occur. Species could winter on large water bodies in the Plan Area and forage on surrounding grasslands.	FD/ None	None	None
bird	*Buteo regalis*	ferruginous hawk	Grasslands and agricultural fields	Known to occur. Recorded along southeast edge of San Luis Reservoir and in grasslands between San Luis Reservoir and Los Banos Creek Reservoir.	None/None	None	None
bird	*Buteo swainsoni*	Swainson's hawk	Grasslands, riparian woodland, and agricultural fields	Known to occur. Observed during 2003 field surveys. Known to nest in the area including recent CNDDB records from the O'Neill Forebay Wildlife Area (2001) and Los Banos Valley (1985).	None / ST	None	None
bird	*Charadrius montanus*	mountain plover	Grasslands and agricultural fields on flat terrain	Know to occur. Species could overwinter in the Plan Area.	None/None	SSC, BCC	None
bird	*Circus cyaneus*	northern harrier	Grasslands, marshes, and agricultural fields	Known to occur. Observed during 2002 field surveys. Nesting status not determined, but suitable nesting habitat is present.	None/None	SSC	None
bird	*Coturnicops noveboracensis*	yellow rail	Freshwater marsh	Potential habitat exists on the shores of the reservoirs. Known in area from single sighting before 1950 (1911).	None/None	SSC	None

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
bird	*Elanus leucurus*	White-tailed Kite	Grasslands and agricultural fields; nonmigratory; nests in dense tree canopies	Known to occur. Observed in family groups (and likely nests in the area) in the riparian trees at the base of San Luis Dam over multiple years (2000-2004).	None/None	FP	None
bird	*Eremophil aalpestris actia*	California horned lark	Grasslands and agricultural fields	Known to occur. Observed during 2002 surveys. Nesting status unknown, but suitable habitat is present.	None/None	None	None
bird	*Falco mexicanus*	prairie falcon	Grasslands and other open habitats with nearby cliff for nesting sites	Known to occur at Los Banos Creek Reservoir (observed during 2002 field surveys). Suitable nesting located on cliff upstream and above Los Banos Creek Reservoir.	None/None	WL,BCC	None
bird	*Haliaeetus leucocephalus*	bald eagle	Usually found in grasslands and open woodlands near large bodies of water	Potential to occur. May winter in small numbers at Los Banos Creek Reservoir, San Luis Reservoir, and O'Neill Forebay. Not expected to nest in the Plan Area.	FDSE	None	None
bird	*Lanius ludovicianus*	Loggerhead shrike	Grasslands and agricultural fields	Known to occur. Observed during 2002 surveys. Nesting status unknown, but suitable habitat is present.	None/None	SSC	None
bird	*Sternula antillarum browni*	California least tern	Nests on open sandy beaches typically along the Pacific Ocean shore but also the mouths of freshwater rivers emptying into the Pacific Ocean (USFWS 1985a)	Unlikely to occur because of lack of suitable habitat. Listed in USFWS Quad search.	FE / SE	SFP	USBC:WL, ABC: GL
fish	*Hypomesus transpacificus*	delta smelt	Interface between fresh and salt water in the central Sacramento-San Joaquin Delta	Unlikely to occur. Could be transported to San Luis Reservoir from export water from the Sacramento-San Joaquin Delta transported via canal, but because of lack of connectivity to ocean water for adult life stage, unlikely that a stable population would survive.	FT / ST	--	AFS:TH, IUCN: EN

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
fish	*Lavinia symmetricus*	San Joaquin Roach	Small, warm intermittent streams	Unlikely to occur due to absence of suitable habitat.	None/None	SSC, Class 3	None
fish	*Oncorhyncus mykiss*	Central Valley Steelhead	Migrates up freshwater rivers in the Sacramento-San Joaquin Delta	Unlikely to occur. Could be transported to San Luis Reservoir from export water from the Sacramento-San Joaquin Delta transported via canal but unlikely to survive transport.	FT (NMFS) / None	None	None
fish	*Oncorhyncus mykiss*	South Central California Steelhead	Migrates up freshwater rivers in the Sacramento-San Joaquin Delta	Unlikely to occur. Could be transported to San Luis Reservoir from export water from the Sacramento-San Joaquin Delta transported via canal but unlikely to survive transport.	FT (NMFS)/ None	SSC	--
invertebrate	*Desmocerus californicus dimorphus*	valley elderberry longhorn beetle	Elderberry shrubs	Potential to occur. CNDDB record west of Los Banos Creek Reservoir. No elderberry shrubs found during 2002 field surveys.	FT / None	None	None
invertebrate	*Branchinecta conservatio*	Conservancy fairy shrimp	Found in large, turbid pools in the northern two-thirds of the Central Valley; inhabit astatic pools located in swales formed by old, braided alluvium, filled by winter/spring rains, last until June.	No potential habitat is present unless vernal pools or depressions are found.	FE / None	None	None
invertebrate	*Branchinecta lynchi*	vernal pool fairy shrimp	Vernal pools or vernal pool-like habitats	No potential habitat is present unless vernal pools or depressions are found. Listed in USFWS Quad search; unlikely to occur.	FT/ None	None	IUCN:VU

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
invertebrate	*Branchinecta longiantenna*	longhorn fairy shrimp	Pools located within a matrix of alkali sink and alkali scrub plant communities, sandstone outcrop pools, and alkaline grassland vernal pools (USFWS 2005b)	No potential habitat is present unless vernal pools or depressions are found. Listed in USFWS Quad search; unlikely to occur.	FE / None	None	IUCN:EN
invertebrate	*Lepidurus packardi*	vernal pool tadpole shrimp	Inhabits vernal pools and swales in the Sacramento Valley containing clear to highly turbid water	No potential habitat is present unless vernal pools or depressions are found.	FE / None	None	None
mammal	*Ammospermophilus nelsoni*	Nelson's antelope squirrel	Chenopod scrub	Unlikely to occur due to lack of habitat. Known in area from single sighting in 1938. 2005 Range map shows range is ~25 miles to the south of the Plan Area.	None /ST	None	None
mammal	*Antrozous pallidus*	pallid bat	Chaparral; deserts, grasslands, shrublands, woodlands, and forests. Most common in open, dry habitats with rocky areas for roosting.	Potential habitat is present. Known in area from single sighting in 1937.	None/None	SSC	None
mammal	*Dipodomys ingens*	giant kangaroo rat	Chenopod scrub; fine sediments or sand	Unlikely to occur due to lack of suitable habitat. Known in area from single sighting in 1932; considered potentially extirpated.	FE / SE	None	None

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
mammal	*Dipodomys nitratoides*	Fresno kangaroo rat	Occurs in alkaline clay-based soils subject to seasonal inundation, with more friable soil mounds above seasonal flood level for burrows. The current population distribution is restricted and the population size is small. Current populations occur only in Kings County.	Potential habitat exists; however, Plan Area is outside of the normal range of the species.	FE / SE	None	None
mammal	*Eumops perotis californicus*	western mastiff bat	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral, etc.	Potential to occur. There are known sightings within 1.5 miles of Los Banos Creek Reservoir.	None/None	SSC	WBWG: H
mammal	*Lasiurus blossevillii*	Western red bat	Inhabits broad-leafed woodlands in riparian areas. High Priority Species in Eco Region 5 by the Western Bat Working Group.	Potential habitat present. Closest known sighting was at George J. Hatfield State Recreation Area over 20 miles northeast of Plan Area.	None/None	SSC	WBWG: H
mammal	*Myotis yumanensis*	Yuma myotis bat	Lower montane coniferous forest	Unlikely to occur due to lack of coniferous forest in Plan Area; however, may utilize reservoir as a water source from coniferous forests outside the Plan Area.	None/None	None	WBWG: L
mammal	*Perognathusi nornatus inornatus*	San Joaquin pocket mouse	Coastal scrub, grasslands, and blue oak woodlands (arid, shrubby areas [not open spaces])	Potential to occur. CNDDB records shown occurrences near the Plan Area, and potential habitat is present. Observed close to the Plan Area just north of Los Banos Creek Reservoir, and several observations recorded west of Los Banos Creek Reservoir.	None/None	-- None	BLM: S

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
mammal	*Taxidea taxus*	American badger	Coastal scrub; most abundant in drier open stages of most shrub, forest, and herbaceous habitats with friable soils	Known to occur. Observed in the Plan Area near San Luis Reservoir Dam (CNDDB #344), as well as to the north and west of San Luis Reservoir.	None/None	SSC	None
mammal	*Vulpes macrotis mutica*	San Joaquin kit fox	Grasslands and open scrub	Known to occur in small numbers. Few documented occurrences in recent years, suggesting an unstable and possibly declining population.	FE / ST	None	None
reptile	*Actinemys marmorata*	western pond turtle	Ponds, marshes, streams, and irrigation ditches	Known to occur. Reported to the CNDDB from Los Banos Creek Reservoir and dam in 1985. O'Neill Forebay also appears to be suitable habitat.	None/None	SSC	None
reptile	*Anniella pulchra pulchra*	Silver legless lizard	In the Central Valley, species prefers chaparral, requires leaf litter for foraging and cover	Potential habitat present. Closest known sighting over 30 miles northeast of the Plan Area.	None/None	SSC	None
reptile	*Gambelia sila*	blunt-nosed leopard lizard	Sparsely vegetated plains, alkali flats, low foothills, washes, and arroyos	Potential habitat may occur at the eastern edge of the Plan Area. Current range is restricted to areas farther south (a 1993 observation was a few miles south of Los Banos Creek Reservoir). The CNDDB includes two occurrences from the 1930s: one in the vicinity of the San Luis Dam and the other between the reservoirs.	FE / SE	None	None
reptile	*Masticophis flagellum ruddocki*	San Joaquin whipsnake	Grasslands	Status unknown but expected to occur. The CNDDB includes numerous occurrences within 5 miles of Los Banos Creek Reservoir.	None/None	SSC	None

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
reptile	*Phrynosoma blainvillii*	Coast (California) horned lizard	Occurs in valley-foothill hardwood, conifer, and riparian habitats, as well as pine-cypress, juniper, and annual grass habitats. Basks on low boulders or rocks and burrows into soil or under objects for cover and hibernation.	Potential habitat present. Closest known occurrence over 10 miles away.	None/None	SSC	None
reptile	*Thamnophis gigas*	giant garter snake	Marsh and swamp; freshwater marsh and low gradient streams (drainage canals and irrigation ditches)	Potential habitat is present in marsh habitats in the reservoir. Known in area from single sighting before 1950 (1918).	FT / ST	None	None
habitat community	--	Sycamore Alluvial Woodland	--	Known to occur. California Sycamore Woodland observed in reconnaissance-level surveys in the San Luis Wildlife Area. May also occur in the western edge of Los Banos Creek Reservoir.	None/None	None	1B.2
habitat community	--	Valley Sink Scrub	--	Recorded occurrence near Los Banos Creek Reservoir, but not identified in reconnaissance-level surveys.	None/None	None	1B.2
habitat community	--	Alkali Seep	--	Unlikely to occur in the Plan Area because not found in reconnaissance-level surveys.	None/None	None	1B.2
habitat community	--	Cismontane Alkali Marsh	Standing water or saturated soil present during most or all of year. High evaporation and low input of fresh water render these marshes somewhat salty and alkaline, especially during the summer	Unlikely to occur in the Plan Area, because typically found on former lakebeds such as the San Joaquin Valley outside the Plan Area.	None/None	None	1B.2

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
habitat community	--	Great Valley Cottonwood Riparian Forest	--	Unlikely to occur, because not found in reconnaissance-level surveys.	None/None	None	1B.2
habitat community	--	Iodine Brush Scrub	--	Known to occur.			G4/S3
habitat community	--	Purple Needle Grass Grassland	--	Known to occur.			G4/S3
plant	*Astragalustener* var. *tener*	alkali milk-vetch	Playas, grassland – adobe clay soils; vernal pools – alkaline soils; Mar-Jun; elev. 1-60 meters	Unlikely to occur: No potential habitat is present unless vernal pools or depressions are found in grasslands. Nearest known occurrences are in the San Joaquin Valley.	None/None	None	1B.2
plant	*Atriplex cordulata*	heartscale	Chenopod scrub, meadows and seeps, grassland – sandy, saline, or alkaline soils; Apr-Oct; elev. 1-375 meters	Potential habitat is present in iodine bush scrub along Salt Spring. Nearest known occurrences are in the San Joaquin Valley. Known in area from single sighting before 1950 (1937).	None/None	None	1B.2
plant	*Atriplex depressa*	brittlescale	Sandy alkaline soils in annual grassland	Potential habitat may occur in grasslands; however, focal surveys would be required to determine if suitable habitat is present.	None/None	None	1B.2
plant	*Atriplex joaquiniana*	San Joaquin saltbush	Chenopod scrub, meadows and seeps, playas, grassland – alkaline soils; Apr-Oct; elev. 1-320 meters	Potential habitat is present in iodine bush. Nearest known occurrences are in the San Joaquin Valley.	None/None	None	1B.2
plant	*Atriplex vallicola*	Lost Hills crownscale	Chenopod scrub, grassland, vernal pools – alkaline soils; Apr-Aug; elev. 50-635 meters	Unlikely to occur: No potential habitat is present unless alkali depressions are found in iodine bush scrub. Nearest known occurrence is ca. 5 miles south of Los Banos Creek Reservoir.	None/None	None	1B.2

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
plant	*Balsamorhiza macrolepis* var. *macrolepis*	big-scale balsamroot	Chaparral, cismontane woodland, grassland – sometimes on serpentinite and basalt rock outcrops. Mar-Jun; elev. 90-1,400 meters	Potential habitat is present on basalt rock outcrops within study area. Nearest known occurrence in Pacheco State Park on slopes above San Luis Reservoir.	None/None	None	1B.2
plant	*California macrophylla*	round-leaved filaree	Cismontane woodland, grassland – clay soils; Mar-May; elev. 15-1,200 meters	Potential habitat is present in the grasslands. Nearest known occurrence is in Pacheco State Park.	None/None	None	1B.1
plant	*Campanula exigua*	chaparral harebell	Chaparral; rocky sites, usually on serpentine in chaparral; elev. 300-1,250 meters	Unlikely to occur due to lack of suitable habitat. Known in area from single sighting before 1950 (1940).	None/None	None	1B.2
plant	*Caulanthus coulteri* var. *lemmonii*	Lemmon's jewelflower	Pinon and juniper woodlands	Unlikely to occur due to lack of suitable habitat.	None/None	None	1B.2
plant	*Cordylanthus mollis* ssp. *hispidus*	hispid bird's-beak	Meadows and seeps, playas, grassland – alkaline soils; Jun-Sep; elev. 1-155 meters	Potential habitat is present in iodine bush scrub along Salt Spring. Nearest known occurrences are ca. 5 miles south of Los Banos Creek Reservoir.	None/None	None	1B.1
plant	*Delphinium californicum* ssp. *interius*	Hospital Canyon larkspur	Chaparral – openings, cismontane woodland, (mesic); Apr-Jun; elev. 230-1,095 meters	Potential habitat is present in oak woodland. Nearest known occurrence is ca. 4 miles north of San Luis Reservoir.	None/None	None	1B.2
plant	*Delphinium recurvatum*	recurved larkspur	Chenopod scrub, cismontane woodland, grassland – alkaline soils; Mar-May; elev. 3-750 meters	Potential habitat is present in iodine bush scrub along Salt Spring. Nearest known occurrences at Salt Creek 3 miles south of Los Banos Creek Reservoir.	None/None	None	1B.2
plant	*Dudleya setchellii*	Santa Clara Valley liveforever	Cismontane woodland, grassland – serpentinite, rocky; Apr-Jun; elev. 60-455 meters	Unlikely to occur: No potential habitat is present. Species is present on serpentine substrates possibly in western portion of Pacheco State Park.	FE / None	None	1B.1

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
plant	*Eryngium racemosum*	Delta button-celery	Drainages and depressions with vernally mesic clay soils; Jun-Sep; elev. 3-30 meters	Unlikely to occur: No potential habitat is present. Nearest occurrences in the San Joaquin Valley to the east.	None/None	None	1B.1
plant	*Centromadia parryi*s sp. *congdonii*	Congdon's tarplant	Grassland – alkaline; May-Nov; elev. 1-230 meters	Potential habitat is present. Nearest known occurrence is in Pacheco State Park.	None/None	None	1B.2
plant	*Hesperolinon* sp. nov. *"serpentinum"*	Napa western flax	Chaparral – serpentinite; May-Jul; elev. 50-800 meters	Unlikely to occur: No potential habitat is present. Nearest known occurrence in serpentine substrates ca. 6 miles northwest of San Luis Reservoir.	None/None	None	1B.1
plant	*Lasthenia glabrata* ssp. *coulteri*	Coulter's goldfields	Coast salt marshes, playas, valley and foothill grassland, vernal pools. Usually found on alkaline soils in playas, sinks and grasslands.	No potential habitat is present unless vernal pools or depressions are found. Closest known occurrence is over 20 miles away (4 miles south of SR 140 and SR 165 intersection)	None/None	None	1B.1
plant	*Lepidium jaredii* ssp. *album*	Panoche pepper-grass	White or grey clay lenses on steep slopes; incidental in alluvial fans and washes, clay and gypsum-rich soils. Valley and foothill grassland.	No potential habitat is present unless vernal pools or depressions are found. Closest known occurrence is approximately 30 miles away. (Exact location unknown but near Little Panoche Creek in Fresno County).	None/None	None	1B.2
plant	*Malacothamnus arcuatus*	arcuate bush-mallow	Chaparral	Unlikely to occur due to lack of suitable habitat. Known in area from single sighting before 1950 (1936).	None/None	None	1B.2

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
plant	*Malacothamnus hallii*	Hall's bush-mallow	Chaparral, coastal scrub, grassland; May-Sep; elev. 10-760 meters	Potential habitat is present in sage scrub and mesic grassland. Nearest known occurrence is near Pacheco Pass and ca. 6 miles west-southwest of Los Banos Creek Reservoir.	None/None	None	1B.2
plant	*Microseris paludosa*	marsh microseris	Closed-cone coniferous forest, cismontane woodland, coastal scrub, grassland; Apr-Jun; elev. 5-300 meters	Potential habitat is present in oak woodland, sage scrub and grassland. Nearest known is ca. 13 miles SW in vicinity of Little Quien Sabe Valley.	None/None	None	1B.2
plant	*Navarretiag owenii*	Lime Ridge navarretia	Chaparral	Unlikely to occur due to lack of suitable habitat.	None/None	None	1B.1
plant	*Navarretia nigelliformi* ssp. *radians*	shining navarretia	Cismontane woodland, grassland, vernal pools; May-Jul; elev. 90-1,000 meters	Low potential to occur. Surveys have not been conducted to determine if potential habitat is present. Within the known range of the species (Jepson 1993). Nearest known occurrence is in Los Banos Valley in vicinity of Billy Wright Road.	None/None	None	1B.2
plant	*Navarretia prostrata*	prostrate vernal pool navarretia	Coastal scrub, grassland – alkaline soils; vernal pools – mesic habitats; Apr-Jul; elev. 15-700 meters	Low potential to occur. Surveys have not been conducted to determine if potential habitat is present. Within the known range of the species (Jepson 1993). Nearest known occurrences is in the San Joaquin Valley.	None/None	None	1B.1
plant	*Potamogeton filiformis*	slender-leaved pondweed	Marshes and swamps – assorted shallow freshwater habitats; May-Jul; elev. 300-2150 meters	Potential habitat in reservoirs and ponds. Nearest known occurrence is in the San Joaquin Valley north of Volta, CA. Known in area from single sighting before 1950 (1948).	None/None	None	2.2

Table 2-17
CNDDB Observations of Special-Status Species in a 10-Mile Radius of the Plan Area

Group	Species Name	Common Name	Habitat	Species Likelihood of Occurring	Status		
					Federal/ State Status	Other Status	CNPS And Other Lists
plant	*Sagittaria sanfordii*	Sanford's arrowhead	Marshes and swamps – shallow freshwater habitats; May-Oct; elev. 0-610 meters	Potential habitat in reservoirs and ponds. Nearest known occurrence is in the San Joaquin Valley. Known in area from single sighting before 1950 (1948).	None/None	None	1B.2
plant	*Senecio aphanactis*	chaparral ragwort	Cismontane woodland, coastal scrub, drying alkaline flats; elev. 20-575 meters	Potential habitat in sage scrub and oak woodland. Known in area from single sighting before 1950 (1938).	None/None	None	2.2
plant	*Streptanthus insignis* ssp. *lyonii*	Arburua Ranch jewel-flower	Coastal scrub, sometimes on serpentinite; Mar-May; elev. 230-855 meters	Potential habitat in sage scrub and possibly adjacent oak woodlands. Nearest known occurrence is in Los Banos Valley on slopes along South Fork of Los Banos Creek.	None/None	None	1B.2
plant	*Trichocoronis wrightii* var. *wrightii*	Wright's trichocoronis	Meadows and seeps, marshes and swamps, riparian forest, vernal pools – alkaline soil; drying mud; May-Sep; elev. 5-435 meters	Potentially in drying mud at edges of wet areas, including reservoirs. Nearest known occurrences are in the San Joaquin Valley near Los Banos. Known in area from single sighting before 1950 (1948).	None/None	None	2.1

Source: DFG June 2012

Key to abbreviations:

DFG – California Department of Fish and Game
- CE – State-listed, Endangered
- CT – State-listed, Threatened
- SSC – California Species of Special Concern
- FP – Fully Protected
- Class 3 – Watch List classification for fish
- WL – Watch List
- ABC – American Bird Conservancy
- GL – Green List
- American Fisheries Society
- TH – Threatened

CNPS – California Native Plant Society

List 1A – Species considered extinct in California

List 1B – Rare and endangered in California and elsewhere

List 2 – Species considered rare and endangered in California but more common elsewhere
- 0.1 – Seriously threatened
- 0.2 – Fairly threatened in California
- 0.3 – Not very threatened in California

State Ranking
- S3- Vulnerable in California due to restricted Range

Global Ranking
- G4 – Apparently Secure (Uncommon but not rare)

IUCN – International Union for Conservation of Nature – The World Conservation Red List

EN – Endangered

VU – Vulnerable

USBC – United States Bird Conservancy

WL – Watch List

USFWS – United States Fish and Wildlife Service
- FE – Federally listed, Endangered
- FT – Federally listed, Threatened
- NMFS – National Marine Fisheries Service
- T– Federally listed as Threatened

WBWG – Western Bat Working Group
- L – Low priority
- H – High priority

BLM – Bureau of Land Management
- S – Sensitive

According to the NWI maps, potential freshwater emergent, freshwater forest/shrub, and freshwater wetlands are present within and adjacent to the Plan Area (Map 6a). Vernal pool complexes have been identified adjacent to the northwest corner of O'Neill Forebay and to the south of Los Banos Creek Reservoir (Map 6b, Holland 2009).

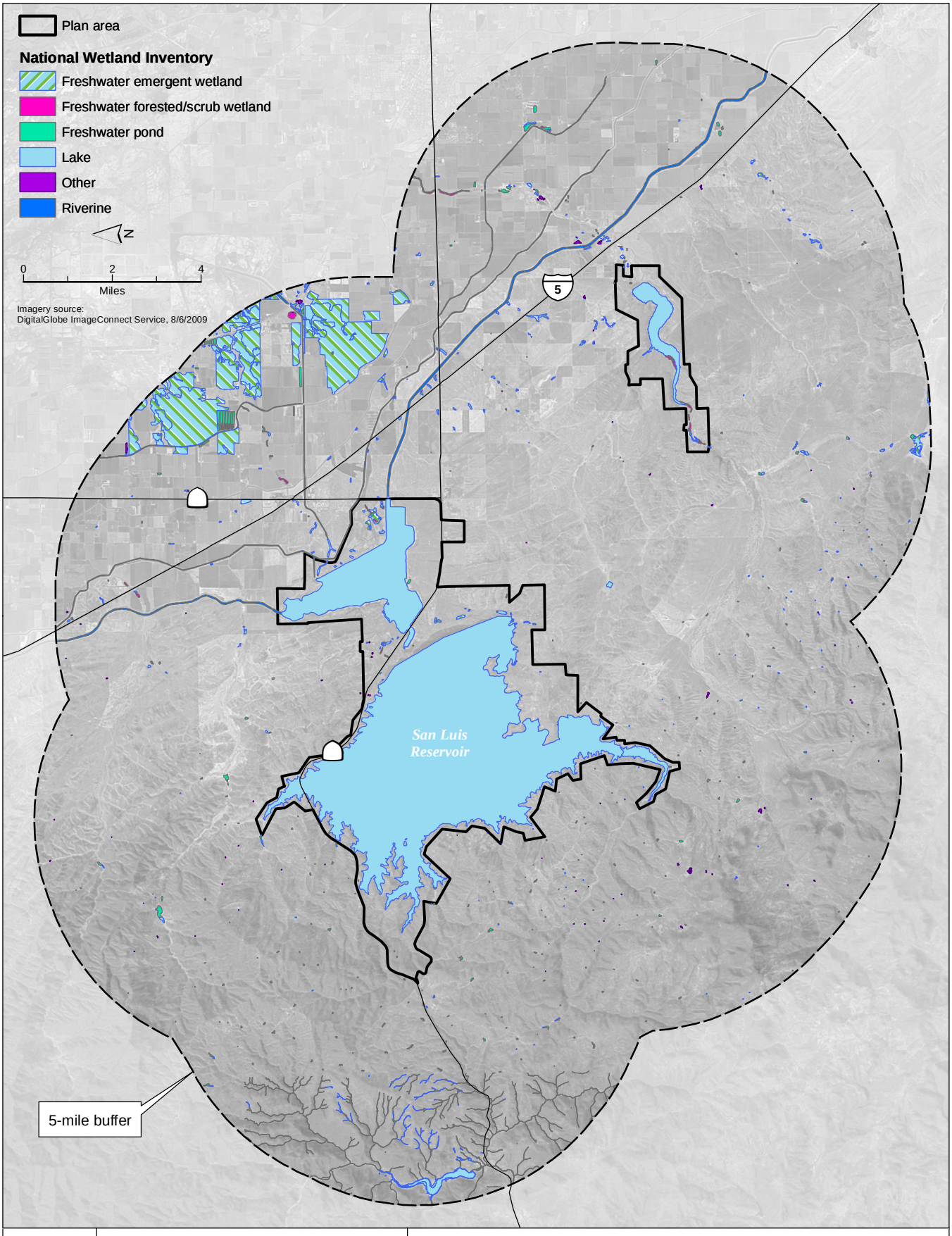
The NWI maps are prepared primarily from aerial photographs with limited field survey. These maps are assumed to closely approximate wetland types and the general location. They do not show all wetlands that are currently present within in given area. Instead, the NWI maps are designed so that if a site is depicted as containing a wetland, it is highly likely that a wetland is there. However, a site may also contain unmapped wetlands (especially those that are very small), wetlands that are drier in some seasons, or wetlands that are difficult to interpret from aerial photographs, such as evergreen-forested wetlands or substantially drained wetlands. Similar to the NWI maps, the Holland maps are based on 40-acre mapping units and may not show smaller, individual vernal pools present within an area (Holland 2009).

The presence of wetlands in an area as depicted on the NWI and Holland maps is considered a preliminary site assessment. The final determination regarding the presence or absence of a wetland would need to be delineated using USACE guidelines.

2.6.2.2 Summary of Findings

Seventy-five special-status species and seven habitat communities were identified based on a review of the information described in Table 2-17 above. Based on the availability of suitable habitat, 50 special-status species were determined to have the potential to occur in the Plan Area (four amphibians, 14 birds, one invertebrate, eight mammals, six reptiles, three habitat communities, and 18 plants). The distribution of CNDDB observations of amphibians, birds, fish, invertebrates, mammals, reptiles, habitat communities, and plants in a 5-mile radius of the Plan Area is provided in Maps 6c through 6i.

- California tiger salamander (*Ambystoma californiense*) – federally and state listed as threatened
- California red-legged frog (*Rana draytonii*) – federally listed as threatened
- Swainson's hawk (*Buteo swainsoni*) – state listed as threatened
- Bald eagle (*Haliaeetus leucocephalus*) – state listed as endangered
- Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) – federally listed as threatened
- San Joaquin kit fox (*Vulpes macrotis mutica*) – federally listed as endangered and state listed as threatened
- Blunt-nosed leopard lizard (*Gambelia sila*) – federally listed as endangered
- Giant garter snake (*Thamnophis gigas*) – federally and state listed as threatened



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Map 6a
National Wetland Inventory

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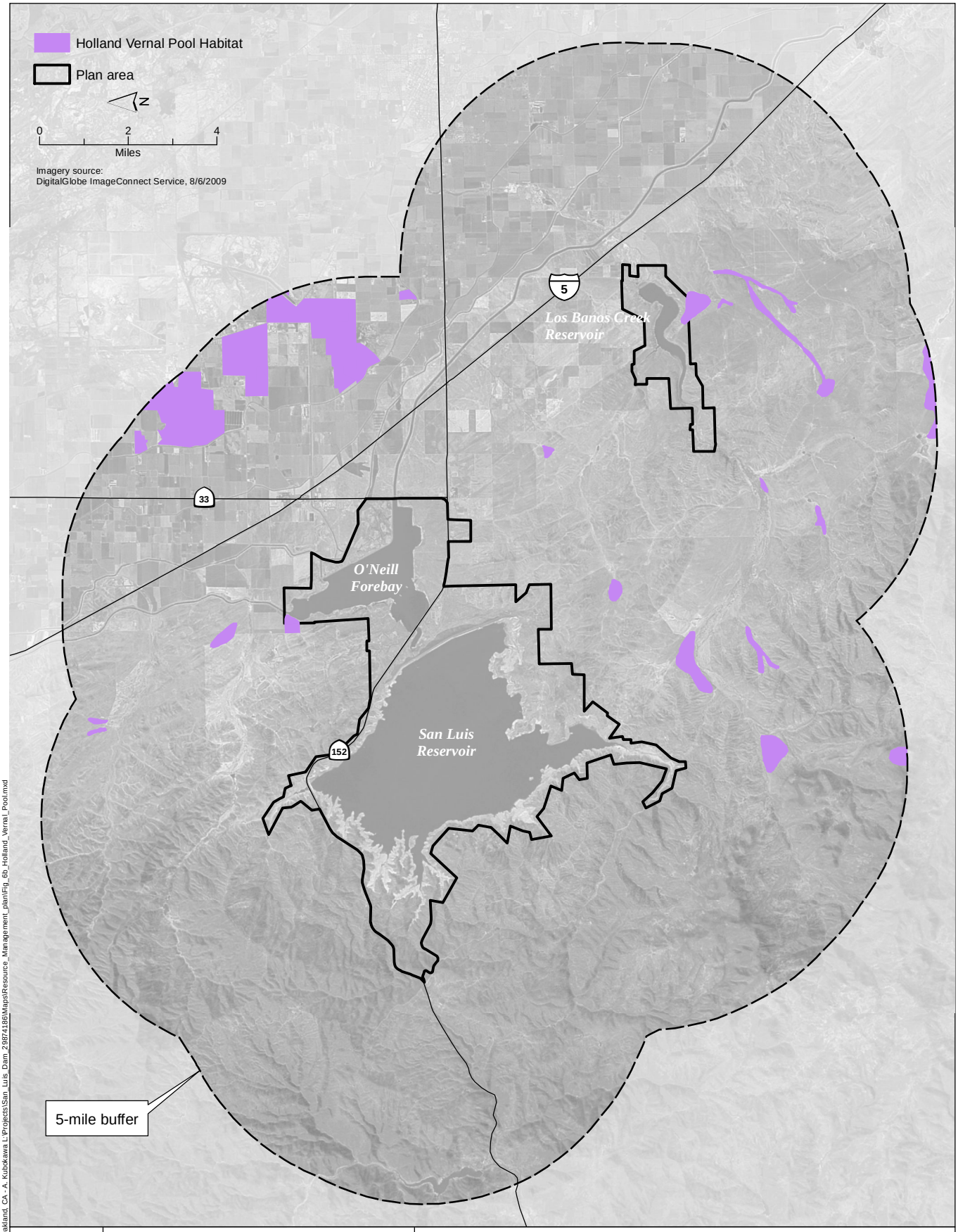

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Map 6b
Holland Vernal Pool Habitat

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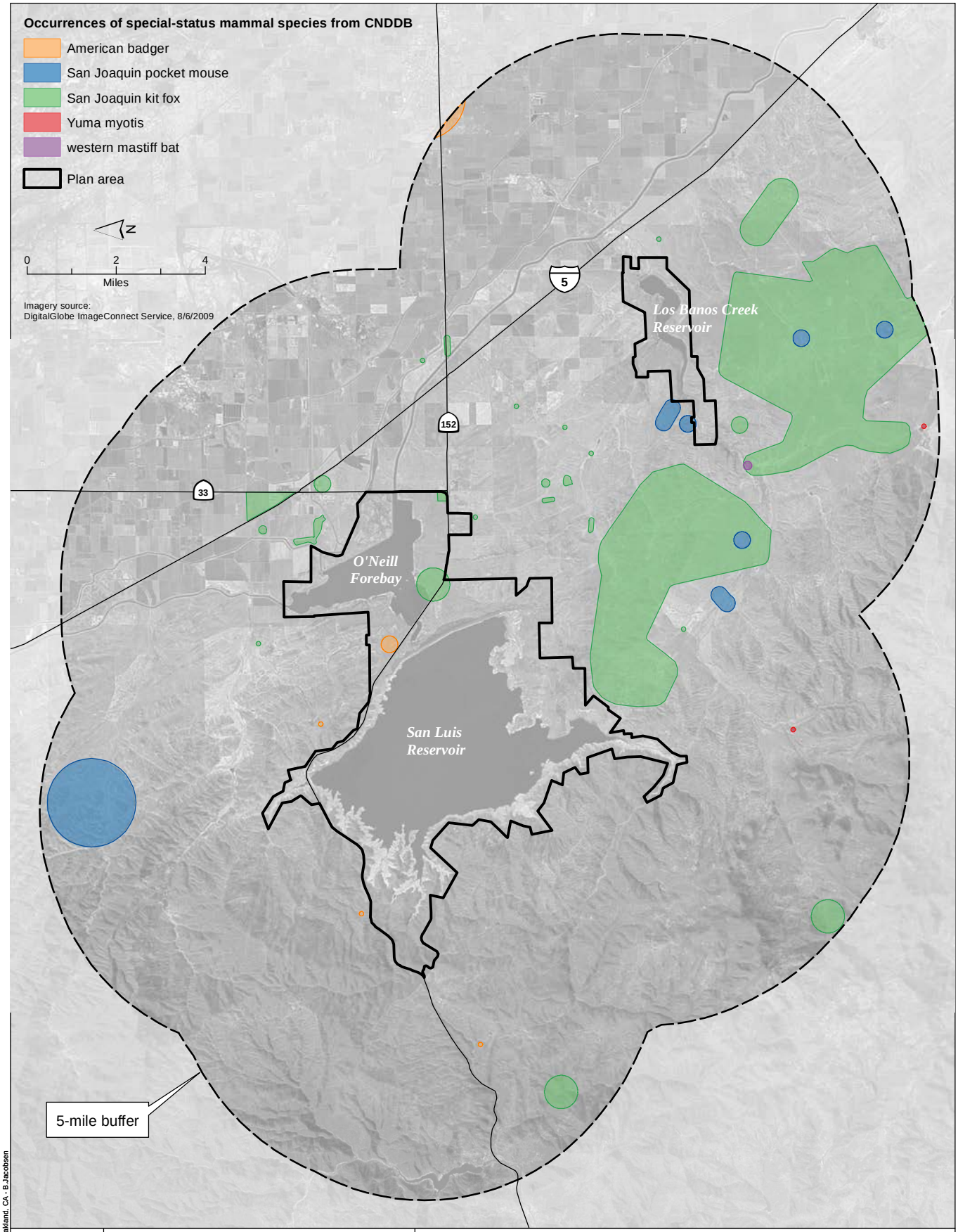

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Map 6c
Mammals

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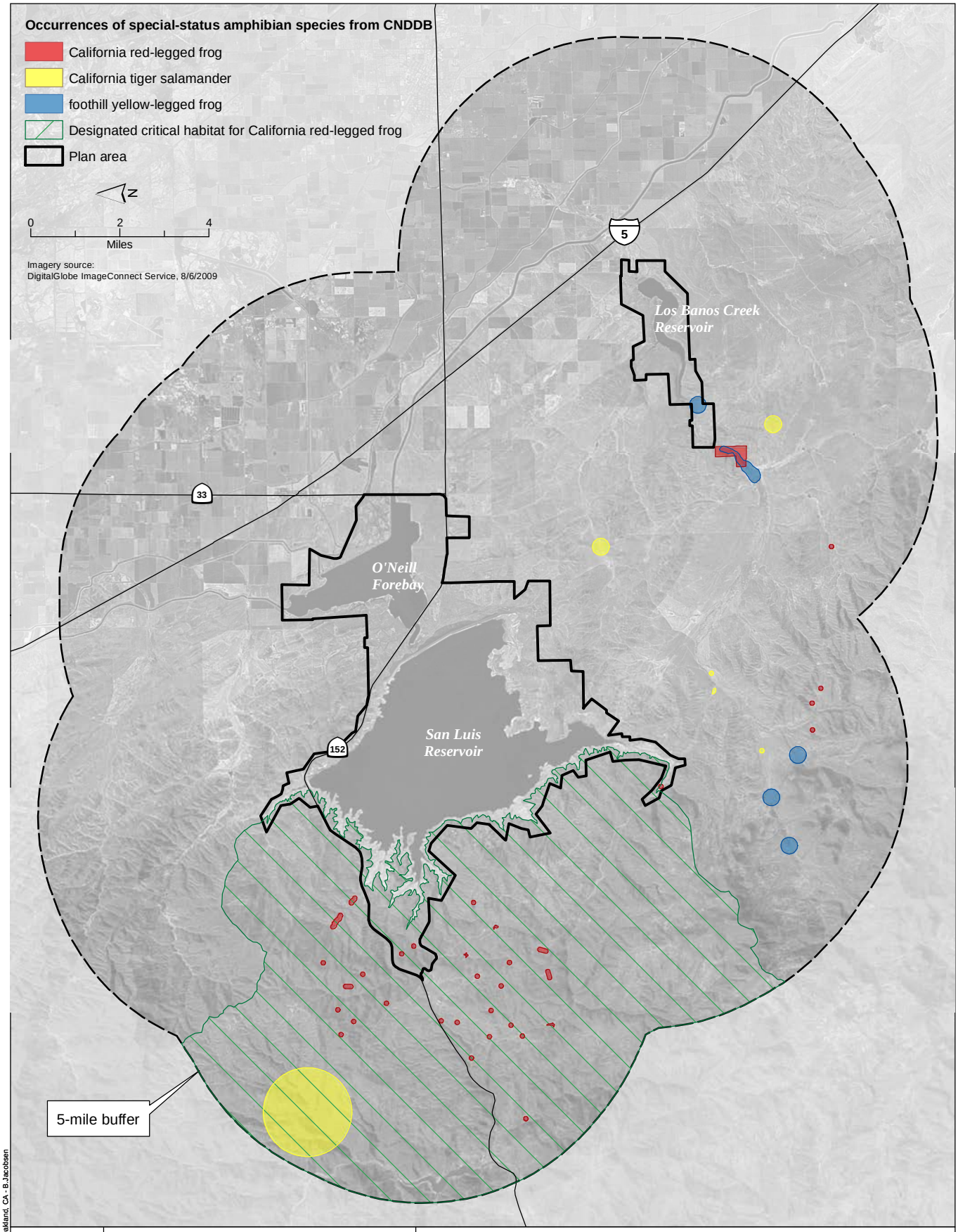

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Map 6d
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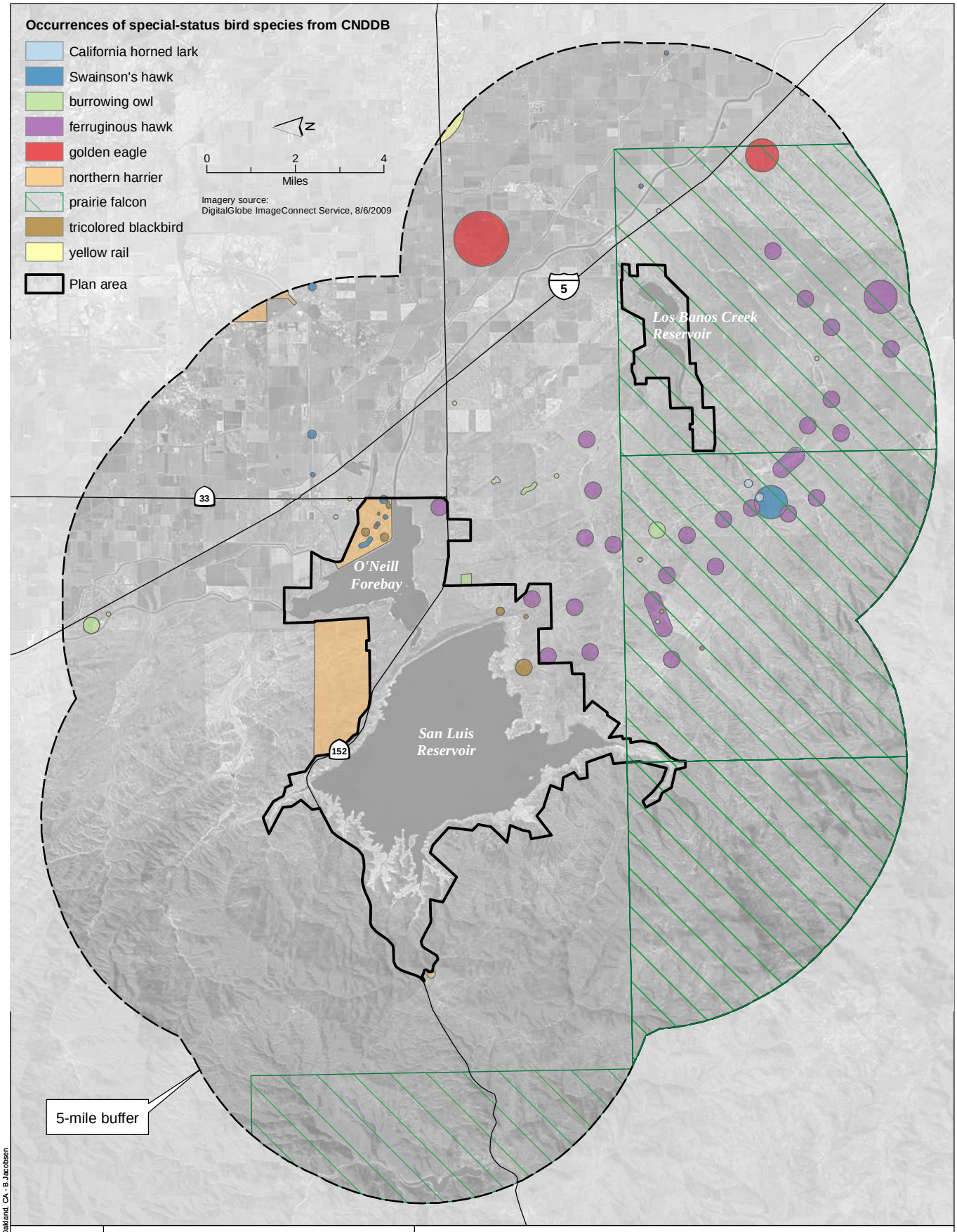

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Map 6e
Birds

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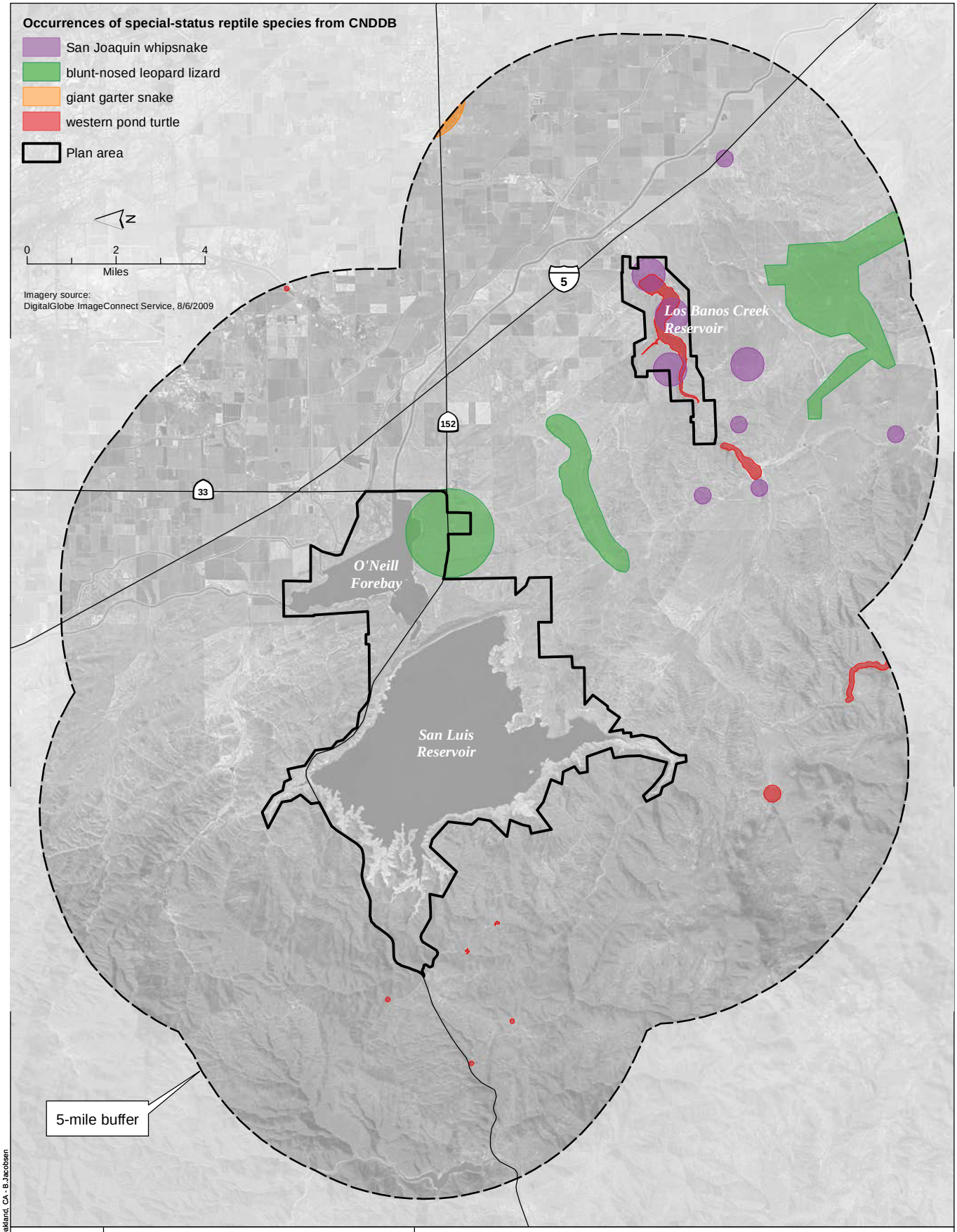

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Map 6f
Reptiles

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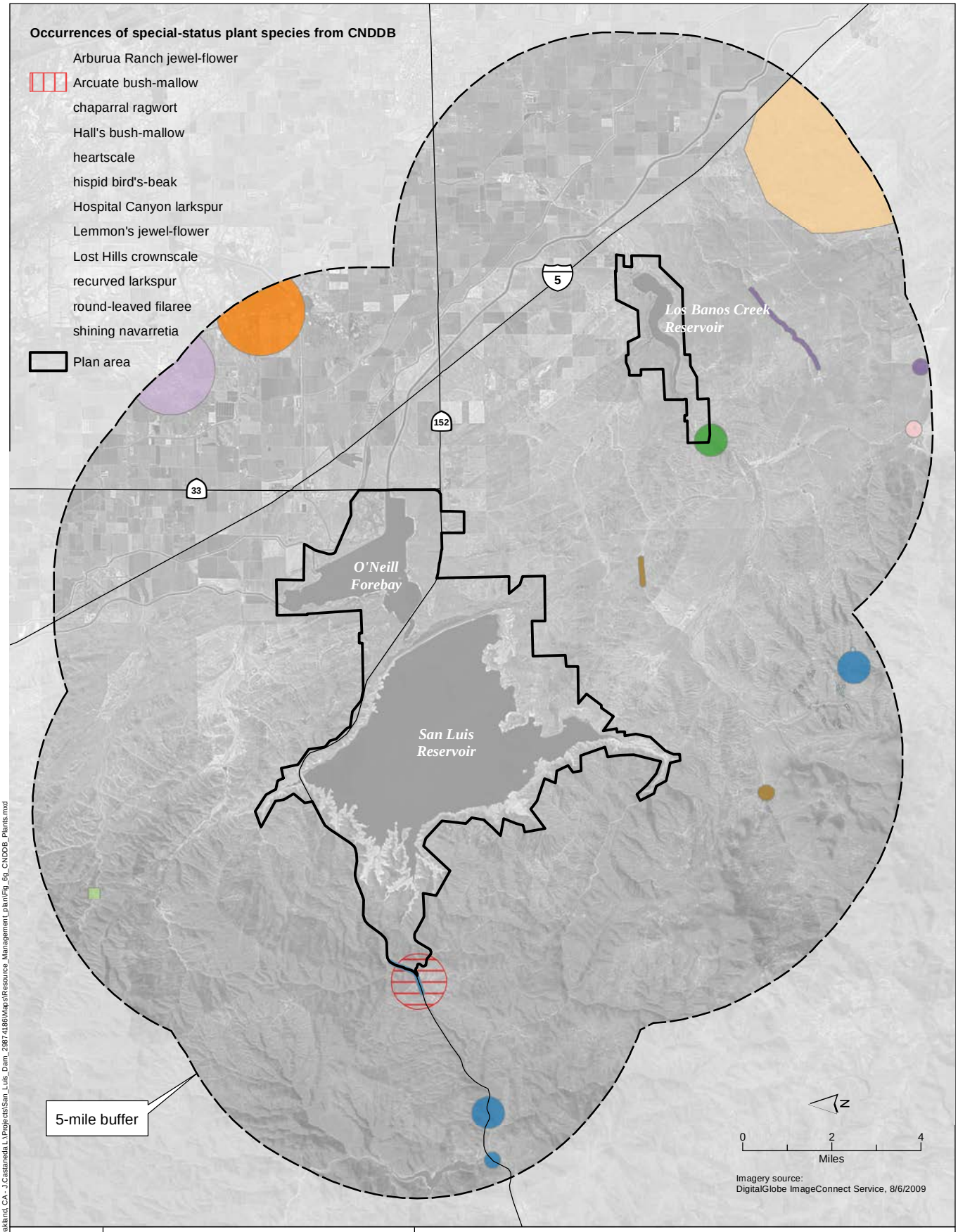

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San Luis Reservoir Resource Management Plan

Map 6g
Plants

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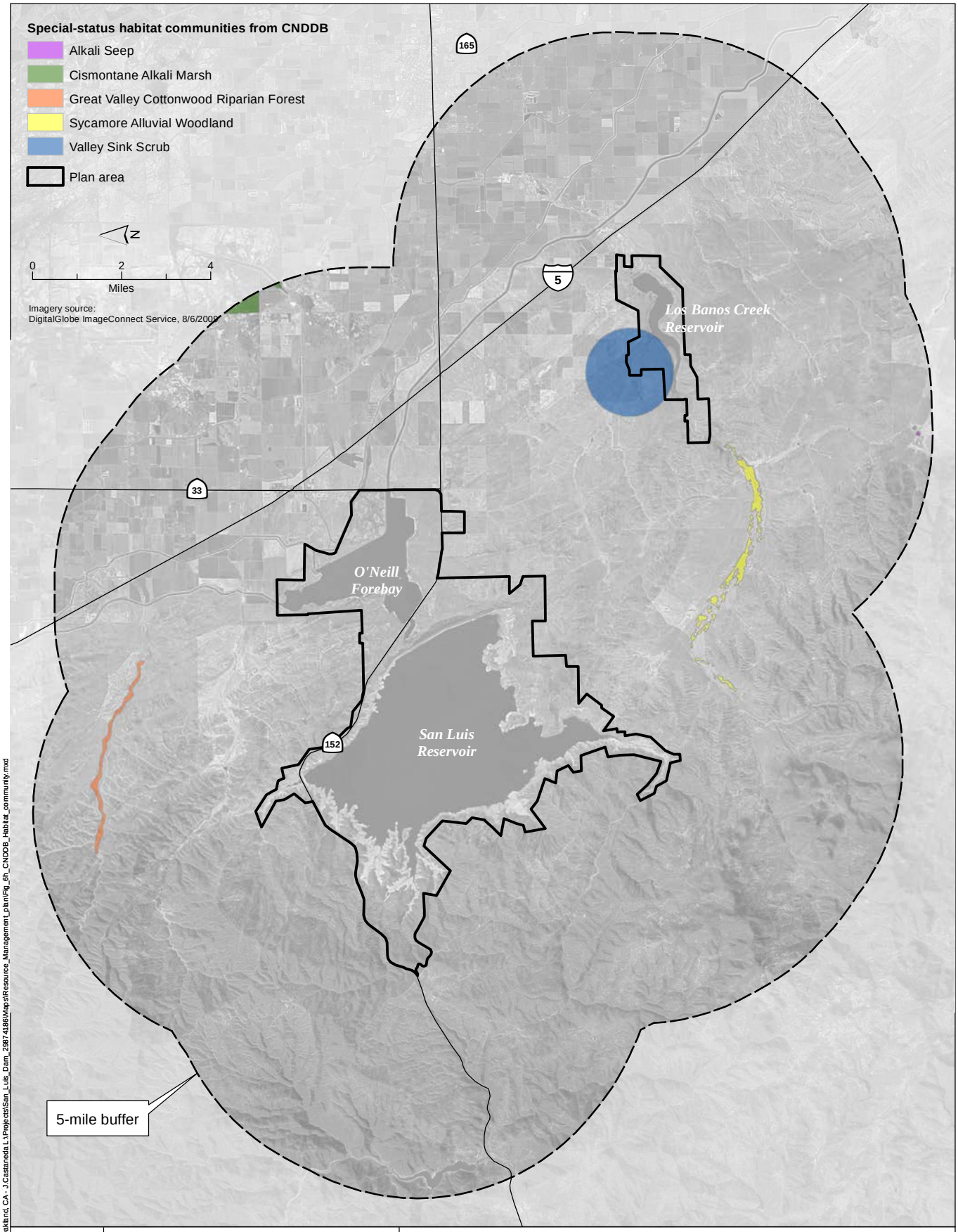

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San Luis Reservoir Resource Management Plan

Map 6h
Habitat Communities

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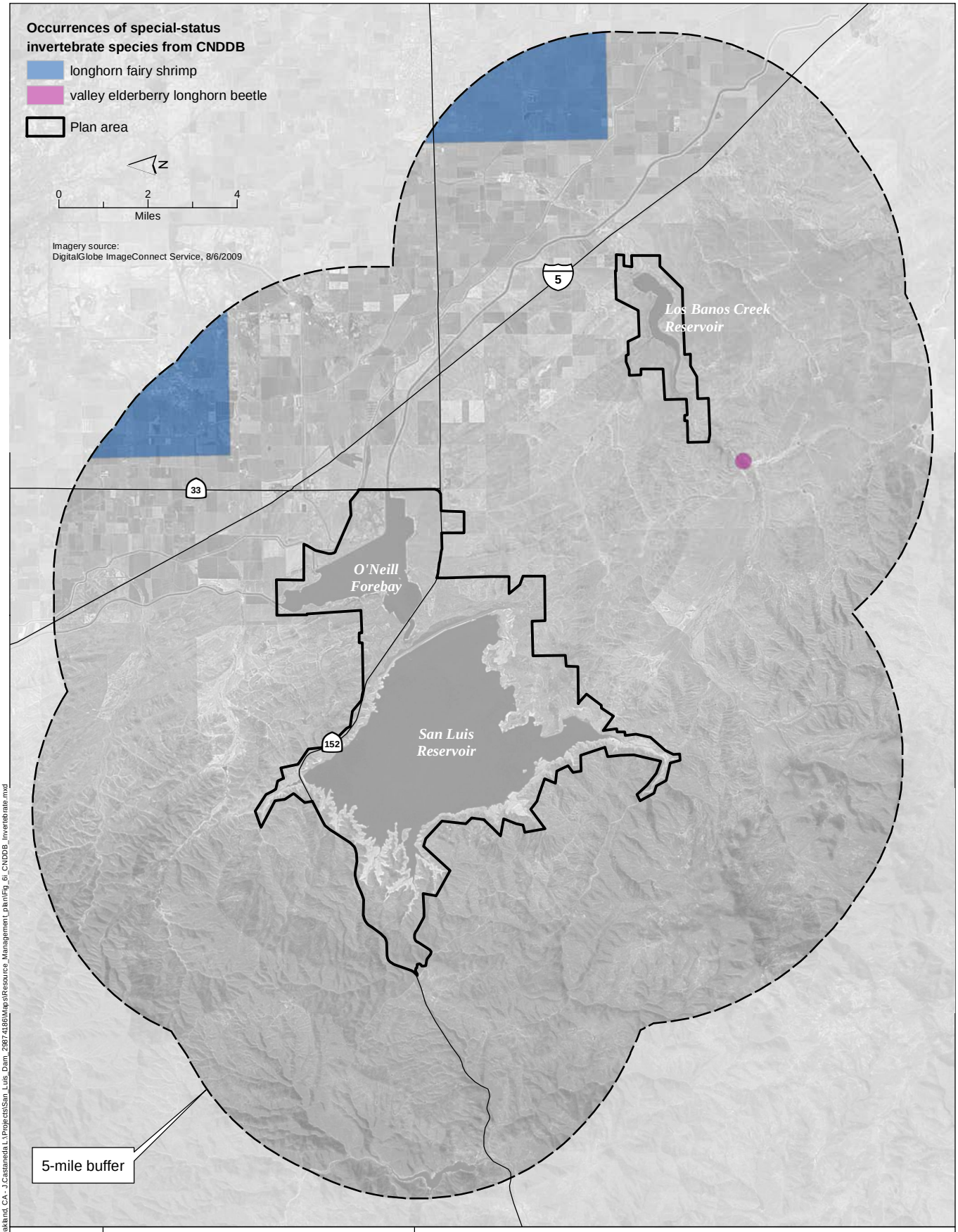

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San Luis Reservoir Resource Management Plan

Map 6i
Invertebrates

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Two fully protected raptor species, the white-tailed kite and golden eagle, are known to occur within the Plan Area. Similarly, the northern harrier, tricolored blackbird, loggerhead shrike, and California horned lark are also present. The mountain plover and prairie falcon, listed by the USFWS as Birds of Conservation Concern (BCC), have the potential to be present. Although the single sighting of a yellow rail within the Plan Area occurred prior to 1950, potential habitat is located along the shores of the reservoir. The current status of the burrowing owl and ferruginous hawk within the Plan Area is unknown; however, there is potential for them to occur as well. In addition, the cackling goose and bald eagle, recently delisted under the ESA, occur in the Plan Area and are included in Table 2-17.

The following DFW species of special concern are either known to occur or have potential suitable habitat in the Plan Area:

- Foothill yellow-legged frog (*Rana boylii*)
- Western spadefoot (*Spea hammondii*)
- Pallid bat (*Antrozous pallidus*)
- Western mastiff bat (*Eumops perotis californicus*)
- Western red bat (*Lasiurus blossevillii*)
- American badger (*Taxidea taxus*)
- Western pond turtle (*Actinemys marmorata*)
- Silver legless lizard (*Anniella pulchra pulchra*)
- San Joaquin whipsnake (*Masticophis flagellum ruddocki*)
- Coast (California) horned lizard (*Phrynosoma blainvillii*)

Although not listed as a species of special concern, the San Joaquin pocket mouse is known to occur within the Plan Area.

The USFWS species list for the Plan Area included the longhorn fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, and Conservancy fairy shrimp. Surveys have not been done to determine if potential habitat is present within the Plan Area. However, according to the Holland Vernal Pool and Nationwide Inventory wetland maps (Holland 2009; NWI 2011), there are potential wetlands within the project area. Additionally, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon, there are known extant populations for the first three species in Merced County (USFWS 2005b).

Similarly, the delta smelt, two salmonid runs (Central Valley steelhead evolutionarily significant unit [ESU] and South Central California steelhead ESU) and the California least tern are also included on the USFWS species list. These species are not expected to be present due to a lack of suitable habitat. Additionally, the foothill yellow-legged frog, San Joaquin roach, Nelson's antelope squirrel, giant kangaroo rat, and *Yuma myotis* bat are not expected to be present for the same reason.

During the initial assessment of biological resources, four habitat communities were identified. Three additional habitat communities were identified during

reconnaissance-level surveys. Of the seven habitat communities, four habitat communities have the potential to be present within the Plan Area (see Map 6h). Those four habitat communities are sycamore alluvial woodland, valley sink scrub, iodine brush scrub, and purple needle grass.

The following plant species have the potential to be present:

- Listed with a CNPS status of 1B.1 and 1B.2:
  - Alkali milk-vetch (*Astragalus tener* var. *tener*)
  - Heartscale (*Atriplex cordulata*)
  - Brittlescale (*Atriplex depressa*)
  - San Joaquin saltbush (*Atriplex joaquiniana)*
  - Big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*)
  - Round-leaved filaree (*California macrophylla*)
  - Hispid bird's-beak (*Cordylanthus mollis* ssp. *hispidus*)
  - Hospital Canyon larkspur (*Delphinium californicum* ssp. *interius*)
  - Recurved larkspur (*Delphinium recurvatum*)
  - Congdon's tarplant (*Centromadia parryis* sp. *congdonii*)
  - Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*)
  - Panoche pepper-grass (Lepidium jaredii ssp. album)
  - Hall's bush-mallow (*Malacothamnus hallii*)
  - Marsh microseris (*Microseris paludosa*)
  - Shining navarretia (*Navarretia nigelliformi* ssp. *radians*)
  - Prostrate vernal pool navarretia (*Navarretia prostrata)*
  - Sanford's arrowhead (*Sagittaria sanfordii*)
  - Arburua Ranch jewel-flower (*Streptanthus insignis* ssp. *lyonii*)
- Listed with a CNPS status of 2.1 or 2.2:
  - Slender-leaved pondweed (*Potamogeton filiformis*)
  - Chaparral ragwort (*Senecio aphanactis*)
  - Wright's trichocoronis (*Trichocoronis wrightii* var. *wrightii*)

Although sightings of chaparral harebell and arcuate bush-mallow were recorded within the Plan Area prior to 1950, these species are not expected to be present within the Plan Area due to a lack of suitable habitat. The Lemon's jewel flower, Santa Clara Valley liveforever, Delta button-celery, Napa western flax, and lime ridge navarretia are also not expected to be present for the same reason.

2.6.3 Special-Status Wildlife

2.6.3.1 Endangered or Threatened Species

California Red-Legged Frog The California red-legged frog (CRLF) is federally listed as threatened and a California species of special concern. This subspecies of red-legged frog occurs from sea level to elevations near 5,000 feet. It has been extirpated from 70 percent of its former range and now is found primarily in coastal drainages of central California, from southern Marin County to northern Baja California. Potential threats to the species include elimination or degradation

of habitat from land development, land use activities and habitat invasion by nonnative aquatic species (USFWS 2002).

The California red-legged frog requires a variety of habitat elements, with aquatic breeding areas typically located within a matrix of riparian and upland dispersal habitats. Breeding sites of the California red-legged frog include freshwater habitats, such as pools and backwaters within streams and creeks, ponds, marshes, springs, and lagoons. Additionally, California red-legged frogs frequently breed in artificial impoundments such as stock ponds both permanent and seasonal (USFWS 2002).

Based on the scarcity of suitable habitat, this species is currently not expected to breed within the Plan Area, but is expected to occur occasionally in the upland and aquatic environments of the Plan Area. Los Banos Creek Reservoir, San Luis Reservoir, and O'Neill Forebay are all considered unsuitable breeding habitats due to abundant populations of nonnative fish that prey on the species. Although suitable breeding habitats do not exist in the Plan Area, California red-legged frogs are known to occur as CNDDB records show occurrences within the western extent of the Plan Area (Map 6d). In addition, breeding populations have been found near the Plan Area, and red-legged frogs can disperse up to 1 mile from their breeding habitat through upland habitat (USFWS 2002). California red-legged frogs are abundant in many of the stock ponds at Pacheco State Park (Fitzpatrick 2002). From 2005 to 2010, 26 observations of California red-legged frogs have been reported to the CNDDB in the project vicinity, primarily to the northwest and southwest of San Luis Reservoir. Red-legged frogs have also been found in 12 of the 13 large stock ponds at Upper Cottonwood Wildlife Area across SR 152 from the Plan Area; the only pond where they were absent supported a large population of nonnative crayfish. California red-legged frogs were also reported to the CNDDB from the vicinity of Los Banos Creek in 1985. Therefore, despite the lack of suitable breeding ponds, red-legged frogs are expected to occur at least occasionally in both the upland and aquatic environments of the Plan Area.

The western portion of San Luis Reservoir, including the San Luis Wildlife Area and the Dinosaur Point Use Area, is within an area designated as critical habitat for the red-legged frog (USFWS 2010a; see Map 6d). According to the primary constituent elements associated with the critical habitat designation, critical habitat for the red-legged frog includes only aquatic and upland areas where suitable breeding and nonbreeding habitats are interspersed throughout the landscape and are interconnected by unfragmented dispersal habitat .

California Tiger Salamander The California tiger salamander (CTS) is listed as a threatened species under the ESA and CESA. This large terrestrial salamander is generally restricted to grasslands below 2,000 feet. California tiger salamanders move from subterranean refuge sites (e.g., small mammal burrows) to breeding sites (e.g., vernal pools, seasonal ponds, etc.) following relatively warm winter and spring rains (October through May). Tiger salamanders can successfully breed in artificial impoundments such as stock ponds if the ponds do

not contain fish. Because tiger salamanders have been known to travel long distances to reach suitable breeding ponds, the DFW considers upland habitat within 1 kilometer (0.62 mile) of potential breeding locations as potential habitat for California tiger salamanders (DFG 1997). A minimum of 10 weeks is required to complete development through metamorphosis (Jennings and Hayes 1994).

While breeding by tiger salamanders has been documented in permanent ponds, if predatory fish or bullfrogs occur in the pond, breeding will mostly likely be unsuccessful (Jennings and Hayes 1994). The presence of western newts in ponds also indicates that the ponds may not be suitable sites for tiger salamander breeding. However, herpetologists attribute this to evidence that suggests that western newts and California tiger salamanders generally prefer different breeding and upland habitat, not that one species precludes the presence of the other (Barry 2002). Tiger salamanders are restricted to valley and foothill grasslands; western newts tend to occupy creeks and ponds in open canyons with nearby wooded areas. California newts have not been reported at the Plan Area, but they are common in several of the permanent stock ponds at Pacheco State Park.

The Plan Area does not contain critical habitat for the California tiger salamander. Studies have shown that juvenile CTS can migrate up to 1 mile from breeding areas (Austin and Shaffer 1992; Mullen in USFWS 2000). Surveys for tiger salamanders have not been conducted at the Plan Area. Tiger salamanders were documented at several locations in the vicinity of the Plan Area in the 1980s and 1990 (DFG 2012); however, no observations were recorded in the CNDDB from 1994 to 2010. Suitable breeding habitat for the California tiger salamander is limited at the Plan Area, and focused surveys and a more detailed habitat evaluation would be required to determine the salamander's presence in or use of the Plan Area.

Swainson's Hawk and Bald Eagle The bald eagle is state-listed as endangered, and the Swainson's hawk is state-listed as threatened. In the Central Valley of California, Swainson's hawks nest in riparian woodland and in isolated trees near suitable foraging habitat, which includes grasslands and field crops. In California, Swainson's hawks usually arrive at nesting sites in March and April. In the fall, they depart California for wintering locations in Mexico and South America. A Swainson's hawk was observed perched on a fencepost at Medeiros Use Area during the June 2003 field survey. A Swainson's hawk was also observed soaring above the O'Neill Forebay Wildlife Area in June 2003. Nesting was documented at the wildlife area in 2001 and in Los Banos Valley in 1985 (DFG 2012). Suitable nesting habitat for Swainson's hawk is present at the Plan Area.

In California, bald eagles are found in a variety of habitats in winter, with the largest concentrations found in areas with large bodies of water that support abundant prey such as fish or waterfowl. Bald eagles have occasionally been seen during winter at O'Neill Forebay (Milam 2002). They could also occur in small numbers at San Luis and Los Banos Creek reservoirs. Bald eagles are not

currently known or expected to nest in the vicinity of the Plan Area. The CNDDB does not include any reports of bald eagles from the Plan Area.

Valley Elderberry Longhorn Beetle The valley elderberry longhorn beetle is listed as threatened under the ESA. The beetle is dependent on its host plant, elderberry (*Sambucus* ssp.), which is a common component of the remaining riparian forest of the Central Valley. The amount and distribution of suitable habitat for the valley elderberry longhorn beetle has been reduced by the extensive destruction of California's Central Valley riparian forest that has occurred during the last 150 years due to agricultural and urban development (USFWS 1980). Loss of nonriparian habitat where elderberry occurs (e.g., savanna and grassland adjacent to riparian habitat, oak woodland, mixed chaparral-woodland), and where the beetle has been recorded, suggests further reduction of the beetle's range and increased fragmentation of its upland habitat (Barr 1991).

The status of the valley elderberry longhorn beetle at the Plan Area is unknown. Elderberry shrubs were not found in the Plan Area during 2002 surveys, but these surveys were not conducted at a level of intensity to determine if they are absent. The CNDDB includes a valley elderberry longhorn beetle occurrence near Plan Area, approximately 1 mile from Los Banos Creek Reservoir. In 1987, two valley elderberry longhorn beetles were collected along Los Banos Creek, approximately 6 miles southeast of San Luis Reservoir. If elderberry shrubs are found at the Plan Area, it is possible that they could support valley elderberry longhorn beetles.

San Joaquin Kit Fox The San Joaquin kit fox is a state-listed threatened and federally listed endangered species and therefore receives protection under both CESA and ESA. Prior to 1930, kit foxes inhabited most of the San Joaquin Valley from southern Kern County to northern San Joaquin County. The current range is thought to cover less than half of the original area, with the largest portion of the range remaining in the southern and western parts of the San Joaquin Valley (USFWS 1998). The decline of the kit fox has been attributed to the conversion of natural habitat to agricultural and urban uses, including oil development. The loss of native habitat has resulted in much of the kit fox range becoming fragmented, which is considered a serious threat to their survival (USFWS 1998). Other factors that have been identified as threats to remaining kit fox populations include the following: rodenticide use; disease (e.g., rabies potentially transmitted by urban pests, such as raccoons); competition with larger canids (e.g., coyotes, domestic dogs); competition for food sources and dens from red fox; flooding; drought and associated loss of food sources; reduction in population size of kangaroo rats, a common kit fox food source; and factors related to California's increasing human population (e.g., vehicular mortality) (USFWS 1998).

The USFWS has not designated critical habitat for the San Joaquin kit fox.

Current Distribution Currently, north of Kern County, kit foxes primarily occur in a narrow north-south band bordered by I-5 and the Coast Range. A persistent but low-density kit fox population is found on lands just south of Santa Nella,

which may be augmented from dispersers from the Panoche Valley kit fox population to the south. Between April 2005 and August 2007, track plate, spotlight, and camera trap surveys were conducted from north of Santa Nella to the Simon-Newman Ranch area in northwestern Merced County. Results, along with historical data, indicate that kit foxes are only intermittently present north of Santa Nella and may largely consist of individuals dispersing from the southern populations. Prey availability (kangaroo rat abundance) and habitat suitability (land use, vegetation cover, and terrain ruggedness) degrades to the north, which may explain the low kit fox presence in the north (Constable et al. 2009).

Kit foxes in the Plan Area will be discussed as related to maintenance of the source population south of Santa Nella, and as related to corridors connecting the southern population with the areas north of Santa Nella.

Self-Sustaining Population Near Plan Area San Joaquin kit foxes were documented in the vicinity of the Plan Area on numerous occasions during the 1970s through the 1990s (see Map 6c for spatial distribution of kit fox observations recorded in the CNDDB). Three observations of kit foxes were made in 2005 on Billy Wright Road, which is between San Luis Reservoir and Los Banos Creek Reservoir. No observations in the vicinity have been recorded in the CNDDB between December 2005 and June 2012. During the extensive ESRP survey that took place between 2005 and 2007, only two unequivocal kit fox signs were observed north of SR 152: one set of tracks and one scat observation. South of SR 152, six kit foxes were detected along Bonturri Ranch, two were detected during spotlight surveys along Billy Wright Road, and two dens were observed on a private ranch south of Los Banos Creek Reservoir (Constable et al. 2009).

The findings of the rigorous April 2005 to August 2007 survey by the ESRP and the lack of natural breeding dens documented in the Plan Area indicate that a breeding kit fox population is unlikely to be present. However, seven artificial kit fox dens were installed at San Luis Reservoir SRA as mitigation for wind warning light upgrades. The northernmost detected resident self-sustaining kit fox population is just to the south of the Plan Area and may include the area between San Luis Reservoir/O'Neill Forebay and Los Banos Creek Reservoir. Kit foxes have been observed in the vicinity of the Plan Area primarily south of San Luis Reservoir (Basalt Use Area), between San Luis Reservoir and O'Neill Forebay, south and east of O'Neill Forebay, and northwest of Los Banos Creek Reservoir (Constable et al. 2009). Preservation of habitat supporting this population is considered the highest priority in kit fox conservation in the area (Cypher 2008).

Migration Corridor in the Plan Area The 1998 USFWS *Recovery Plan for Upland Species of the San Joaquin Valley* includes "protect[ing] existing kit fox habitat in the northern, northeastern segments of their geographic range and existing connections between habitat in those areas and habitat farther south." This is primarily based on the ecological concept that, since kit foxes require large habitats and their populations fluctuate over the short term with local extinctions, maintenance of multiple populations is required to maintain the species (USFWS 1998).

The amount of high-quality habitat for kit fox decreases to the north of Santa Nella, which may explain low kit fox numbers (ESRP 2008). An analysis evaluating likely use of space ("least-cost path analysis") indicates that the area between San Luis Reservoir and O'Neill Forebay and the area to the east of O'Neill Forebay may be corridors for San Joaquin kit fox dispersal (Constable et al. 2009). However, during the 2005 to 2007 surveys, kit fox were not detected by the camera traps along these potential corridors. In addition, the least-cost path analysis is based on evaluating the cost of crossing an area and does not necessarily account for the suitability or potential for inhabitation of the corridor, which in this area is low. Kit fox observations and suitable habitat suggest that a small number of kit foxes are present in the Plan Area, at least for short durations, and that the Plan Area may serve as a corridor for kit foxes dispersing from source populations in the south (ESRP 2008). The available biological data do not strongly support the hypothesis that corridors through San Luis Reservoir/O'Neill Forebay will sustain the species, because the data suggest that the corridors may feed sink populations (breeding groups that do not produce enough offspring to maintain the population) north of Santa Nella. Therefore, the ESRP suggests that conservation efforts in western Merced County be focused on the northernmost known self-sustaining population, between SR 152 to the north, Little Panoche Reservoir to the south, I-5 to the east, and rugged terrain (greater than 15 percent slope) to the west. The ESRP does not specifically define the western limit, but Constable et al. (2009) includes mapping that identifies the locations of high-suitability habitat for the species in the Plan Area vicinity. Those locations generally correlate with the large areas of green on Map 6c, which lie south of the Plan Area boundaries.

San Joaquin Kit Fox Conservation Efforts in the Local Vicinity The community of Santa Nella has created a Habitat Conservation Program (HCP) to protect suitable habitat for the San Joaquin kit fox in the area immediately east of the O'Neill Forebay, at the Arnaudo Brothers, Wathen-Castanos, and River East holdings sites within and adjacent to the Santa Nella Community Specific Plan area (Harvey 2004). The Santa Nella Community Specific Plan includes goals of preserving and managing movement corridors between the northern and southern kit fox populations, as well as permanently preserving habitat occupied by kit foxes and considered important to maintaining kit fox source populations (Harvey 2004). In 2000, Merced County initiated creation of an HCP for the portion of the county east of SR 99; however, no HCP was adopted, nor is one in development (Nicholson 2010).

Although the San Joaquin Valley National Cemetery, approximately 1 mile northwest of O'Neill Forebay, does not have an HCP for the San Joaquin kit fox, the cemetery switched from rodenticide to trapping in 2007 to prevent harm to kit foxes from rodenticides. The San Joaquin Valley National Cemetery land was included in the ESRP camera trap kit fox survey (Bennett 2010).

Rodenticide is not currently used in the Plan Area.

Blunt-Nosed Leopard Lizard The blunt-nosed leopard lizard is listed as endangered under ESA and CESA. The blunt-nosed leopard lizard is a large lizard with a broad, triangular-shaped head, a truncated snout, a rounded body, well-developed limbs, granular scales, and a rounded tail that is longer than the body. The color is grayish to brown, with cream-colored crossbands and large dark spots. Adults are active during the breeding season between April and July, and typically lay between two and six eggs in mid-June or July. Juveniles hatch from late July to August, and sometimes into September. They remain active typically through October (Montanucci 1965; Stebbins 2003). While dormant during nonbreeding seasons and at night, the blunt-nosed leopard lizard inhabits small mammal burrows of species such as California ground squirrels and kangaroo rats (*Dipodomys* spp.); however, in areas of low mammal burrow density they can construct their own shallow burrows (USFWS 1998).

The blunt-nosed leopard lizard is restricted in range to portions of the San Joaquin Valley, at elevations from the Central Valley floor up to 2,600 feet in the surrounding foothills (Germano and Williams 1992; Stebbins 2003; USFWS 1985b). It occurs in alkali sink scrub, saltbush (*Atriplex* sp.) scrub, Ephedra scrub, and sparse grasslands, often in areas with alkaline or saline soils (Montanucci 1965; Stebbins 2003). Washes and dirt road corridors may be important in otherwise poor habitat (e.g., thick grass habitat) (Warrick et al. 1998). In general, this species is absent from areas of steep slope, dense vegetation, and seasonal flooding (Montanucci 1965). The species may occur within the following California Wildlife Habitat Relationships (CWHR) wildlife habitat types: alkali desert scrub, annual grassland, and barren.

Threats include habitat disturbance, destruction, and fragmentation from agriculture, water diversion, urbanization and the introduction of non-native grasses. The blunt-nosed leopard lizard is included in the *Recovery Plan for Upland Species of the San Joaquin Valley* (USFWS 1998). A five-year review completed in February 2010 recommended that no change be made to the blunt-nosed leopard lizard's listing status (USFWS 2010b).

The blunt-nosed leopard lizard is known to occur within 5 miles of the Plan Area. The CNDDB includes a sighting from 1931 that was 1 mile southeast of San Luis Reservoir. In 2003, the blunt-nosed leopard lizard was observed south of Los Banos Creek Reservoir. The known home range for the blunt-nosed leopard lizard varies by gender (0.25 to 2.7 acres for males and 0.52 to 4.2 acres for females; USFWS 1998).Therefore, this species is presumed extant in the Plan Area.

Giant Garter Snake The giant garter snake has been listed as threatened under the ESA since it was initially listed in 1993. It is one of the largest garter snakes and it can reach lengths in excess of 5 feet. Females tend to be slightly longer and stouter than males.

Endemic to wetlands in the Sacramento and San Joaquin valleys, the giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals

and rice fields. Giant garter snakes feed on small fishes, tadpoles, and frogs (Hansen 1980). Habitat requisites consist of: (1) adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter (Hansen 1980). Giant garter snakes are typically absent from larger rivers and other water bodies that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Hansen 1980). Riparian woodlands do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1980).

The giant garter snake inhabits small mammal burrows and other soil crevices above prevailing flood elevations throughout its winter dormancy period (i.e., November to mid-March). Giant garter snakes typically select burrows with sunny exposure along south-facing and west-facing slopes. Giant garter snakes also use burrows as refuge from extreme heat during their active period. The Biological Resources Division (BRD) of the USGS (Wylie et al. 1997) has documented giant garter snakes using burrows in the summer as far as 165 feet away from the marsh edge. Overwintering snakes have been documented using burrows as far as 820 feet from the edge of marsh habitat. During radio-telemetry studies conducted by the BRD, giant garter snakes typically moved little from day to day. However, total activity varied widely between individuals. Giant garter snakes have been documented moving up to 5 miles over the period of a few days (Wylie et al. 1997). The breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990).

The giant garter snake once ranged throughout the San Joaquin Valley as far south as the historic Tulare, Kern, and Buena Vista lakebeds, but it has been extirpated from many areas due to habitat conversion. The Plan Area is within the San Joaquin and South Valley Recovery Units for the giant garter snake. Within the San Joaquin Recovery Unit, existing populations are limited to the western side of the Central Valley, and within the South Valley Recovery Unit, no extant populations of the species are known to occur. The Giant Garter Snake Recovery Plan (USFWS 1999) identifies several areas of privately and publicly owned freshwater marshes where repatriation of this species is possible. However, extirpation of the southernmost populations in the San Joaquin Valley has since been confirmed, and the southernmost range of the species is currently restricted to Burrel in Fresno County (USFWS 1999). Although there are no sightings of the giant garter snake within the Plan Area (DFG 2012), this species is known to occur within 10 miles of the area.

2.6.3.2 Other Special-Status Species

Foothill Yellow-Legged Frog The foothill yellow-legged frog (*Rana boylii*), a California species of special concern, was once common in most Pacific drainages

throughout the foothills of California extending from the Oregon border south to the San Gabriel River system in Los Angeles County. The species has been recorded at elevations ranging from near sea level to more than 6,000 feet. Foothill yellow-legged frogs inhabit shallow, small to medium sized streams with cobble substrates, beneath which they deposit their eggs (Jennings and Hayes 1994).

The foothill yellow-legged frog has been recorded in the Plan Area along the western end of Los Banos Creek (Map 6d).

Western Spadefoot The western spadefoot (*Scaphiopus hammondii*) is a California species of special concern. The western spadefoot primarily inhabits grasslands, frequenting washes, floodplains of rivers, alluvial fans, playas, and alkali flats, but also ranges into foothills and mountain valleys up to 3,000 feet. The species prefers areas of open vegetation and short grasses where the soil is sandy or gravelly (Stebbins 1985). Breeding habitat consists of seasonally inundated pools or occasionally low-gradient, seasonal streams (Jennings and Hayes 1994). This amphibian occurs in the central and southern Coast Ranges, the Central Valley, and the foothills of the Sierra Nevada (Stebbins 1985).

The closest recorded CNDDB occurrence is approximately 8 miles south of Los Banos Creek Reservoir (DFG 2012). As the western spadefoot shares similar habitat requirements with the California tiger salamander, the potential presence of suitable California tiger salamander habitat in the Plan Area indicates that suitable habitat for the western spadefoot may also be present.

Bats The pallid bat and western mastiff bat are California species of special concern. The pallid bat occupies a wide variety of habitats (grassland, shrubland, and forest) but is most common in open dry habitats with rocky areas for roosting. The pallid bat occupies both day and night roosts. Day roosts are in caves, crevices, mines, and occasionally hollow trees and buildings, while night roosts are in more open sites. In addition, the pallid bat has hibernation roosts, but the locations are unknown.

Habitat for day roosts may occur in caves, crevices, and mines outside the Plan Area; however, trees in the Plan Area may provide night roosts as well as foraging territory.

The western mastiff bat is not known to use night roosts but utilizes steep cliffs for day roosts. The steep slopes to the west of Los Banos Creek Reservoir may provide day roosts, and they are the location of a CNDDB observation of the western mastiff bat. The Plan Area likely provides foraging territory but not roosts for the western mastiff bat.

North American Badger The North American badger, a California species of special concern, is a mammal that historically ranged throughout California, excluding the humid forested areas of the Pacific Northwest, in open grasslands and generally treeless regions characterized by friable soils in drier open shrub

land, open forest, and herbaceous habitats (Ahlborn 2005; Larsen 1987). Badgers typically occupy home ranges of differing areas, from 2 (winter) to 50 (autumn) to 850 (summer) acres, and utilize and/or excavate burrows for dens, escape, and predation (foraging). Although some badgers are known to excavate burrows on a nightly basis, especially during the summer months, others routinely reuse burrows (Ahlborn 2005).

The North American badger has been observed in the Plan Area between San Luis Reservoir and O'Neill Forebay. Since the majority of the Plan Area is grassland, the North American badger may occur in the Plan Area. In addition, because of the large sizes of home ranges during the summer season, badgers may occupy portions of the Plan Area grasslands during the summer.

Tricolored Blackbird The tricolored blackbird is a California species of concern. Of the world population of tricolored blackbirds, 95 percent occur in California (PRBO 2002). Surveys indicate that populations have been rapidly declining for decades. The main causes for the decline are loss of native wetland habitat for nest building, loss of associated foraging habitat, disturbance and mortality by predators and humans, destruction of colonies by agricultural practices, direct poisoning, and poisoning by selenium (Beedy et al. 1991).

For breeding, this highly gregarious species prefers freshwater marshes with dense stands of cattails and/or bulrushes, and occasionally willows, thistle, mustard, and blackberry tangles. Often, nesting colonies contain only tricolored blackbirds, with perhaps a few red-winged or yellow-headed blackbirds on the periphery. These colonies are very dense and ranged in size from about 50 nesting pairs to over 200,000 pairs (Small 1994). During fall and winter, nomadic flocks join feeding and roosting aggregations of other blackbirds at feedlots and in agricultural fields.

Approximately 1,000 tricolored blackbirds were observed at the Medeiros Use Area during the June 2003 field survey. The birds were found at numerous locations along the O'Neill Forebay shoreline. Smaller flocks were also seen foraging in the fields south of the use area. As many as 200 tricolored blackbirds were presumed to be nesting in a large depression adjacent to the forebay. The nesting site was located within a large area of emergent marsh vegetation surrounded by willows and other woody riparian vegetation. Numerous fledglings were observed being fed by adults, indicating that many of the nesting attempts were successful. It was not determined if tricolored blackbirds were using other riparian and emergent vegetation along the shoreline of the forebay to nest, but many of these areas appeared to be suitable to support at least a small number of nesting pairs. Suitable habitat was also noted at several other locations in the Plan Area.

A few tricolored blackbirds were also observed at the O'Neill Forebay Wildlife Area, which has been identified as one of the eight most important tricolored blackbird nesting locations for potential conservation action (PRBO 2002). The O'Neill Forebay Wildlife Area colony included 7,500 birds in 1993 but was

reduced to 130 nonbreeding birds by 2000. The reason for the decline has been attributed to a decline in the Himalayan blackberry, which was used as the nesting substrate, due to rising water (PRBO 2002).

Western Pond Turtle The western pond turtle is a California species of special concern. The aquatic turtle is found in a variety of habitats, including lakes, rivers, streams, and stock ponds. The turtles usually leave the aquatic site to reproduce and overwinter. They nest in upland habitat, sometimes 400 meters or more from aquatic sites.

Western pond turtles were not found in the Plan Area during 2002 field surveys conducted by EDAW but are known to occur in O'Neill Forebay. They could also persist in some of the smaller permanent aquatic habitats present at the Plan Area, such as the pond located below the Los Banos Creek Reservoir dam. The CNDDB includes a 1985 occurrence from Los Banos Creek Reservoir, and pond turtles were observed by an EDAW biologist in a stock pond immediately adjacent to San Luis Reservoir at Pacheco State Park in 2002.

San Joaquin Whipsnake The San Joaquin whipsnake is a federal species of concern and a California species of special concern. This snake occurs in open, dry, vegetative associations with little or no tree cover. It usually requires one or more mammal associates because it uses burrows for refuge and probably for egg deposition, and may sometimes depend on mammals for food. Although this snake probably has a high degree of dependence on mammals, the nature of such relationships is vague.

Diet consists of rodents, lizards and eggs, snakes (including rattlesnakes), birds and eggs, young turtles, insects, and carrion. Individuals probably have a relatively large home range, but movement data are lacking. Subterranean overwintering sites are probably located in a burrow system. Mating is thought to occur in May and egg deposition probably occurs in June or early July. Sites where eggs are deposited have not been found but are probably situated in the wall of rodent burrows. Clutch size probably ranges from 4 to 20 (Stebbins 1985). Adults may disappear seasonally as early as the first part of August, perhaps in response to a late-summer decline in food resources (DFG 2006). They hibernate in soil or sand approximately one foot below the surface, sometimes at the bases of plants. The San Joaquin whipsnakes are mainly terrestrial, but occasionally climb trees and bushes to bask, seek prey and cover (CWHR 2002).

The San Joaquin whipsnake ranges from the Delta south to the San Joaquin Valley and Coast Ranges in Kern and Santa Barbara counties. In the western San Joaquin Valley, it occurs in valley grassland and saltbush scrub associations and is known to climb bushes such as fat hen for viewing prey and potential predators. Occurrences of the San Joaquin whipsnake have been recorded around Los Banos Creek Reservoir. Although these observations were from the mid to late 1980s, this species is considered present within this area (DFG 2012).

Special-Status Raptors Special-status raptors known or expected to occur in the Plan Area vicinity include golden eagle, prairie falcon, ferruginous hawk,

burrowing owl, northern harrier, and white-tailed kite. The white-tailed kite and golden eagle are listed as fully protected by the DFW, while the ferruginous hawk is listed by the DFW as protected under California Fish and Game Code Section 3503. The burrowing owl and northern harrier are California species of concern. The prairie falcon is Watch-Listed by the DFW. With the exception of the ferruginous hawk, which are expected to occur in the Plan Area vicinity only during winter, all of these raptors could potentially use the area as nesting habitat.

Prairie falcons are typically found in open, arid habitats near cliffs suitable for nesting. Prairie falcons were observed upstream from Los Banos Creek Reservoir during 2002 field surveys. The CNDDB also includes several prairie falcon nesting occurrences in the region.

Burrowing owl, golden eagle, ferruginous hawk, and northern harrier are all known, or expected, to occur in the Plan Area vicinity. The northern harrier was observed during 2002 field surveys. Several burrowing owl occurrences in the Plan Area vicinity are recorded in the CNDDB. Golden eagles were not observed during 2002 surveys but are known to occur regularly at Pacheco State Park and San Luis Reservoir (Milam 2002). The ferruginous hawk is a regular winter visitor to the area. All four of these species favor grasslands and other open country for foraging. Suitable foraging habitat for all four species is abundant throughout the Plan Area vicinity. The area provides suitable nesting habitat for northern harriers and burrowing owls, and marginally suitable nesting habitat for golden eagles, which require steep cliffs or medium to tall trees for nesting sites.

2.6.4 Special-Status Habitat Communities and Plants

2.6.4.1 Habitat Communities

A search of the CNDDB identified four sensitive habitat communities as being present or potentially present in the Plan Area: Valley sink scrub, Alkali seep, Great Valley Cottonwood Riparian Forest, and Cismontane alkali marsh. Valley sink scrub was previously recorded near Los Banos Creek Reservoir. Although it was not identified during reconnaissance-level surveys, it has the potential to occur within the Plan Area. The three remaining habitat communities are not expected to occur in the Plan Area. Alkali seep and Great Valley cottonwood riparian forest were not found in reconnaissance-level surveys and Cismontane alkali marsh is typically found on former lakebeds such as the San Joaquin Valley outside of the Plan Area.

Three additional sensitive habitat communities were observed in the Plan Area during reconnaissance-level surveys: Sycamore alluvial woodland, iodine brush scrub and purple needle grass. No CNDDB records for these three communities exist.

2.6.4.2 Special-Status Plant Species

A search of the CNDDB and CNPS database identified 18 plants that could occur in the Plan Area (Table 2-17). Three additional species were added to Table 2-17 based on Robert Edminster's plant species list for nearby Pacheco State Park: big-

scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*), Santa Clara Valley liveforever (*Dudleya setchelii*), and Congdon's tarplant (*Hemizonia parryi* ssp. *congdonii*). The potential for the special-status species to occur within the study area was assessed based on reconnaissance-level field surveys of habitat or vegetation types conducted in 2003. (Vegetation types observed within the study area are described in Appendix B.) No state or federally listed special-status plant species are known to occur in the Plan Area.

Only gypsum-loving larkspur (*Delphinium gypsophilum* ssp. *gypsophilum*), a CNPS List 4 species, occurs within the study area, found in grassland habitats at O'Neill Forebay. List 4 species are those species that are not currently rare, threatened, or endangered but are sufficiently rare or uncommon that their status may change in the future.

2.6.5 Fisheries Resources

San Luis Reservoir is an off-stream storage facility, not originally part of a river or stream system; however, small drainages existed in the area. No documentation exists regarding whether native fish species were present in the drainages that were flooded as part of the construction of San Luis Reservoir and O'Neill Forebay. Water is pumped to the reservoir from the DMC and/or the California Aqueduct. As a result, fish have been transported into San Luis Reservoir either through water pumped from the DMC or Aqueduct or by direct introduction.

Los Banos Creek Reservoir was constructed to provide flood protection for the city of Los Banos and adjacent areas, and to protect the San Luis Canal portion of the California Aqueduct by controlling the flow of streams crossing the canal. There are no records of aquatic species in Los Banos Creek prior to dam construction. The first water works in the area were constructed in 1871 when a canal brought water from Mendota Dam to Los Banos Creek for agricultural irrigation. Currently, Los Banos Creek Reservoir supports an active warmwater largemouth bass and white crappie fishery. The DFW has periodically stocked rainbow trout, a coldwater species, in Los Banos Creek Reservoir. The trout fishery is limited primarily to the winter months due to the warmer water temperatures in the summer months.

Potentially Occurring Fish Species San Luis Reservoir and O'Neill Forebay support several species of fish that have become established within the system either by direct introduction or from the Sacramento–San Joaquin Delta System via pumping from the California Aqueduct and DMC. These species include Sacramento blackfish (*Orthodon microlepidotus*), American shad (*Alosa sapidissima*), threadfin shad (*Dorosoma petenense*), largemouth bass (*Micropterus salmoides*), kokanee salmon (*Oncorhynchus nerka*), green sunfish (*Lepomis cyanellus*), blue gill (*Lepomis macrochiru*), white sturgeon (*Acipenser transmontanus*), and white crappie (*Pomoxis annularis*). During 2001 to 2003 an active striped bass stocking program within San Luis Reservoir was funded by the California striped bass stamp program. The program has since expired.

Special-Status Fish Species Although O'Neill Forebay is connected to the San Joaquin River system, screened upstream pumps would prevent the transport of special-status species from the California Aqueduct and DMC into the forebay or San Luis Reservoir. No special-status fish have been recorded in Los Banos Creek Reservoir.

2.6.6 Invasive and Nonnative Species

A nonnative species is an organism that has not evolved in a specific geographical area but has been introduced into the area either accidentally or deliberately. These species are considered invasive when they have a detrimental impact on the area. Most nonnative species are not invasive and do not have adverse effects on natural plant and animal communities. Nevertheless, the introduction of certain nonnative plant species has resulted in the conversion of native habitats to a nonnative vegetation type, resulting in a reduction of native plants and the degradation of wildlife habitat.

2.6.6.1 Invasive Species

Quagga mussels *(Dreissena rostriformis bugensis)* and zebra mussels *(D. polymorpha)* are invasive nonnative species of freshwater mollusk that originated in Eastern Europe and are thought to have been first introduced into the Great Lakes region in the late 1980s. Since then, the species have spread, either by boat or water movement, throughout the Midwest and the eastern United States (Benson and Raikow 2011). In January 2007, quagga mussels were detected in Lake Mead and the Colorado River water system; more recently, they were found in certain lakes in Southern California (Benson et al. 2011). To prevent the spread of invasive mussels, boating restrictions have been imposed at recreation areas in several states, such as Kansas, Minnesota, Colorado and Arizona.

Invasive mussels can multiply quickly and clog waterways and pipelines, affect lake ecosystems, and create costly maintenance issues. Invasive mussels can be inadvertently transported by a number of means. Mussels can reside on anything that comes in contact with an infested waterbody, ranging from recreational watercraft to shoes and pets. Equipment exposed to infested waters—such as diving gear, nets, waders, and buckets—can also transport mussels or larvae. Water conveyance facilities such as aqueducts can transport mussels from infested to uninfested waters. Research suggests that waterbodies in most of California may be at high risk for infestation because chemical parameters such as calcium levels allow invasive mussel species to survive and reproduce (Whittier et al. 2008).

Zebra mussels were detected in San Justo Reservoir in San Benito County in January 2008. The reservoir and adjacent recreation area have been closed to the public since the presence of zebra mussels was confirmed (San Benito 2009). San Justo Reservoir is approximately 20 miles from the Plan Area.

Reclamation, in coordination with other state and federal agencies, is conducting research and field testing to prevent the spread of invasive mussels. In 2010, the Reclamation Mussel Task Force collected and analyzed 3,326 water samples from

347 water bodies located within the 17 western states for presence of quagga and zebra mussels (Reclamation 2011f). Tow-net samples from each water body were collected at multiple locations during the 2011 warm season, generally on a monthly basis, and sent to Reclamation's Denver Technical Service Center Mussel Laboratory for testing. As of July 2012, neither quagga nor zebra mussels have been observed in San Luis Reservoir, O'Neill Forebay, or Los Banos Creek Reservoir. Additional monitoring and testing will continue to be conducted.

In October 2011, CSP initiated a vessel inspection program in the Plan Area as a precautionary measure to reduce the risk of the importation of invasive mussels. The program is described in more detail in Section 2.9.1. Should the presence of quagga or zebra mussels be confirmed in the future, eradication measures would be subject to additional environmental impact analysis and documentation in compliance with NEPA.

2.6.6.2 Nonnative Species

Several plant species on the *Most Invasive Wildland Pest Plant* list, developed by the California Exotic Pest Plant Council (CalEPPC 2006, 2007), occur in the Plan Area. These species have the potential to convert native habitats to areas of nonnative vegetation. Asterisks (*) indicate plants that are also listed on the California Department of Food and Agriculture's list of noxious weeds (California Department of Food and Agriculture 2012).

- Himalayan blackberry (*Rubus discolor*);
- yellow starthistle (*Centaurea solstitialis*);* and
- red brome (*Bromus madritensis* ssp. *rubens*).

In addition, the following species were not observed in these areas but may be present:

- perennial pepperweed (*Lepidium latifolium*);*
- fennel (*Foeniculum vulgare*); and
- medusahead (*Taeniatherum caput-medusae*).

Nonnative plants that occur at these wildlife areas and are classified as *Wildland Plants of Lesser Importance* by the California Exotic Plant Protection Council (CalEPPC 1999):

- bull thistle (*Cirsium vulgare*) and
- poison hemlock (*Conium maculatum*).

Other species that are potentially present:

- tall fescue (*Festuca arundinacea*);
- Italian thistle (*Carduus pycnocephalus*);* and
- red starthistle (*Centaurea melitensis*).

At the O'Neill Forebay Wildlife Area, some nonnative species may provide valuable nesting habitat and are not likely to threaten native species. The

grassland and cultivated areas of the O'Neill Forebay Wildlife Area consist almost entirely of nonnative species. Some of these species have been planted, such as a species of *Elgaria*, a nonnative bunch grass, while others have colonized this area after farming ceased. The Himalayan blackberry may provide valuable nesting and roosting habitat for blackbirds. Poison hemlock may also provide nesting habitat for birds.

2.6.7 Tule Elk

Tule elk (*Cervus elaphus nannoides*) are one of the largest land mammals endemic to California. Though not a federal or state special-status species, tule elk are a notable wildlife feature of the Plan Area.

Although the smallest subspecies of elk, the tule elk is a large mammal, with the bulls weighing up to 500 pounds or more. They consume a wide variety of plants but prefer grasses and forbs. The massive antlers of the bull elks are shed and regrown annually. Calves are generally born in May and June.

Approximately half a million tule elk were distributed throughout the Sacramento and San Joaquin valleys and the oak-woodlands and oak-grasslands of the Coast Range at the time the early European explorers arrived (McCullough 1969). By the 1860s, the population was nearly extirpated due to market hunting, competition from introduced livestock, conversion of perennial grasslands to annual grasslands, and the change of large amounts of their habitat to agricultural land use (McCullough 1969).

In 1874, a small group of elk was found on the Miller-Lux Cattle Ranch near Los Banos (Fowler 1985). Ranch owner Henry Miller ordered a complete protection of the tule elk on his land. By the turn of the century, however, the elk were causing extensive damage to the ranch (Fowler 1985). Relocation efforts began in 1914. By 1940, various agencies had succeeded in establishing three elk herds in California (McCullough 1969). The numbers continued to increase through relocation efforts of DFW and protection of habitat.

The California Fish and Game Code was amended in 1971 to prohibit the take of any tule elk until the population exceeded 2,000 animals (Koch 1989). At the time there were about 500 animals. With increasing numbers, damage to private property continued to rise. Total protection of tule elk was removed, and in 1989 regulated hunting resumed. As of 2009, there were almost 4,000 tule elk in 22 separate herds spread throughout California.

In the early 1990s, as part of a continuing effort to expand the tule elk population throughout its historic range, DFW reintroduced tule elk to a private ranch (Wild Rose Ranch) on the southwest side of San Luis Reservoir. The population has slowly increased to the upper 200s, with over half of the elk spending most of their time in Pacheco State Park. This group generally stays west of a line between Dinosaur Point to south of Portuguese Cove. When the water level in San Luis Reservoir is low and there is green vegetation along the shoreline, these individuals will move down to the reservoir from Pacheco State Park. A group of

more than 60 elk roams below the B.F. Sisk (San Luis) Dam and eastward to I-5. Approximately 70 more elk are scattered elsewhere in and near the Plan Area (Gerstenberg 2011; Hobbs 2011).

Tule elk in the Plan Area are best observed around dawn and 2 to 3 hours before sunset, when they are most active.

2.7 Cultural Resources

2.7.1 Regulatory Setting

Cultural resources are archaeological, built environment, and traditional resources that include, but are not necessarily limited to districts, buildings, sites, structures, or objects, which may have historical, architectural, archaeological, cultural, or scientific/engineering importance. Numerous laws, regulations, and statutes, on both the federal and state levels, seek to protect and target the management of cultural resources. All activities in the Plan Area (i.e., under the aegis of Reclamation) that have a potential to affect cultural resources must comply with Section 106 of the National Historic Preservation Act (NHPA) as implemented by the regulations at 36 CFR Part 800 (Revised August 5, 2004). Historic properties are those cultural resources listed on or determined eligible for the National Register of Historic Places (NRHP). All cultural resources located within the Plan Area that have not been evaluated under the criteria of eligibility for the NRHP (36 CFR Part 63) are assumed to be eligible, and therefore historic properties, until such time as a formal determination of NRHP eligibility in completed. Agencies that have management responsibilities for/on federal lands (through agreements or contracts) are required to follow federal law and regulation on federal lands. Any undertakings on Reclamation lands must follow, without exception, Reclamation's Section 106 cultural resources directives and standards manuals LND P01, LND 02-01, and LND 07-01. The Reclamation Mid-Pacific Office (regional office) will serve as the point of contact for all cultural resource issues. This office will be responsible for directing the federal compliance processes on all undertakings on Reclamation lands.

To determine if an undertaking could affect NRHP eligible properties, all cultural resources within the area of potential effect of that undertaking must be inventoried and evaluated for inclusion in the NRHP. 36 CFR Section 800.13 provides guidelines for the treatment of post-review cultural resource discoveries.

Section 110 of the NHPA lays out the broad historic preservation responsibilities of federal agencies and is intended to ensure that historic preservation is fully integrated into the ongoing programs of all federal agencies. The intent of Section 110 is that historic properties under the jurisdiction or control of a federal agency are managed and maintained in a way that considers the preservation of their historic, archaeological, architectural, and cultural values and the avoidance of unnecessary damage to them. It also declares that the costs of preservation activities are eligible project expenditures in all undertakings conducted or assisted by a federal agency.

The Archaeological Resources and Protection Act (ARPA) of 1979 was enacted to secure the protection of archaeological resources on federal and Indian lands. ARPA describes prohibited activities regarding archaeological resources and the financial and incarceration penalties for violators. It also sets forth the regulations that describe the requirements that must be met before federal agencies can issue a permit to excavate or remove any archaeological resource on federal or Indian lands.

The Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq.) only applies to actions on federal lands and requires federal agencies and certain recipients of federal funds to document Native American human remains and cultural items within their collections, notify native groups of their holdings, and provide an opportunity for repatriation of these materials. This Act also requires planning for dealing with potential future discoveries and collections of Native American human remains and associated funerary objects, sacred objects, and objects of cultural patrimony. NAGPRA also provides for the possibility that such remains could be found on property owned or otherwise administered by federal agencies such as Reclamation.

CEQA and California Public Resources Code (PRC) Sections 5024 and 5024.5 offer guidelines regarding impacts on cultural resources. Whether of historic or prehistoric age, cultural resources are referred to as historical resources. "'Historical resource' includes, but is not limited to, any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California" (PRC §5020.1[j]).

Sections 5024 and 5024.5 of the PRC state that "each state agency shall formulate policies to preserve and maintain, when prudent and feasible, all state-owned historical resources under its jurisdiction listed in or potentially eligible for inclusion in the National Register of Historic Places or registered or eligible for registration as a state historical landmark pursuant to Section 5021 of the PRC." The PRC requires state agencies to formulate policies to preserve and maintain, when prudent and feasible, all state-owned historical resources under their jurisdiction that are listed or potentially eligible for inclusion in the NRHP. The criteria for inclusion are essentially equivalent to those for the California Register of Historical Resources (CRHR). Agencies may not undertake projects that adversely affect such resources without prior consultation with the SHPO. The CSP's policies for ensuring compliance with these requirements are included in a Memorandum of Understanding with the SHPO and are incorporated in a Department Notice (DN 2002-3 and amendments).

CEQA states that if implementation of a project would result in significant impacts on important cultural resources, then alternative plans or mitigation measures must be considered. However, only significant cultural resources need to be addressed. The State CEQA Guidelines define a significant historical resource as a resource listed or eligible for listing on the CRHR. In addition, the

State CEQA Guidelines require consideration of unique archaeological sites. If an archaeological site does not meet the criteria for inclusion on the CRHR but does meet the definition of a unique archaeological resource as outlined in CEQA (PRC §21083.2), it may be treated as a significant historical resource. Cultural resources that have not been formally evaluated for inclusion on the CRHR (or the NRHP) will be treated as significant for planning purposes until such evaluation takes place.

The preferred treatment option for both eligible and unique archaeological resources under CEQA (PRC §21083.2) is preserving such resources in place in an undisturbed state. Other acceptable methods of mitigation include excavation and curation or study in place without excavation.

The California Health and Safety Code (§7050.5) requires that excavation activities be stopped whenever human remains are uncovered and that the county coroner be called in to assess the remains. If the county coroner determines that the remains are those of Native Americans and if the remains have been identified on lands that are not federal, the Native American Heritage Commission (NAHC) must be contacted within 24 hours. When the discovery is made on federal lands, the provisions set forth in NAGPRA apply rather than the California Health and Safety Code. The NAHC will immediately notify those persons it believes to be most likely descended from the deceased Native American, and direct the lead agency to consult with the appropriate Native Americans to develop an agreement for the treatment and disposition of the remains (PRC §5097.98).

For historic structures, public agencies follow the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings (1995), or the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (1992).

As a state agency, CSP is obligated to conform to the cultural resource provisions of CEQA. However, CEQA standards are, in large part, superseded by the federal regulatory framework because the Plan Area lands are entirely on federal property (in this case, Reclamation land). Although Reclamation maintains ownership of the land, a Memorandum of Understanding (MOU) between Reclamation and CSP applies. The MOU requires that any cultural resource studies conducted within the Plan Area conform to Section 106 of the NHPA standards.

2.7.2 Cultural Setting

The Plan Area is rich in traces of its prehistoric and historic cultural heritage. Located in two valleys at the eastern base of the Diablo Range on the edge of the Central San Joaquin Valley, the landscape within and around the Plan Area was important for Native Americans and, subsequently, Euro-American settlers and entrepreneurs. The varied natural setting and accessibility to the San Joaquin Valley and the coast provided a diversity of settings and resources that have attracted a wide range of native and immigrant cultural groups for thousands of years.

Although evidence of prehistoric and historic patterns of land use have been documented in the Plan Area in at least 32 studies dating from 1960 to 2010 (Table 2-18), the San Luis Reservoir area has never been subjected to a systematic archaeological survey. Its construction period of 1963-1967 predated the enactment of the major environmental and cultural resources statutes such as NHPA (1966), NEPA (1969), CEQA (1970), and ARPA (1979) and only limited preconstruction and construction period archaeological surveys and excavations were completed.

Topography, vegetation, water sources, and proximity of the Plan Area to diverse ecosystems make it highly likely that the area was heavily utilized throughout prehistoric and historic times. Given such a landscape, it is almost certain that many undocumented archaeological sites, features, and artifacts are present within the Plan Area.

Table 2-18
Cultural Resource Studies Conducted within the Plan Area

Reservoir	Date	Authors	Study Title
O'Neill Forebay	4-1-83	Wm. Pritchard	Archaeological Testing of Three Kahwatchwah Yokuts Dwelling Structures at the San Luis Forebay Site (CA-Mer-119), Merced County, CA (in: *Papers on Merced County Prehistory, California Arch. Reports No. 2*) (CSP)
O'Neill Forebay	1-1-84	Betty Rivers	CA-Mer-119 Site Stabilization Project, San Luis Reservoir State Recreation Area (CSP)
San Luis Res.[1]	May 2003	DPR, Architectural Conservation, LLC, & Past Forward, Inc.	Gonzaga Adobe Stabilization Study Cultural Stewardship Project Pacheco State Park, Santa Clara County, California
O' Neill Forebay	10-10-03	Mike Bielicki & Warren Wulzen	Trail Along O'Neill Forebay at San Luis Creek Campground (CSP)
O'Neill Forebay	1-5-06	Warren Wulzen & Joanne Karlton	Accessibility Modifications (CSP)
O'Neill Forebay	1-16-07	Dan Millsap & Jeff Brooke	San Luis Reservoir Americans with Disabilities Act (ADA) Improvements (San Luis Creek)
O'Neill Forebay	1-18-07	Steven Nawrath, Warren Wulzen & Jeff Brooke	San Luis Creek Accessible Trail Improvements
O'Neill Forebay & San Luis Reservoir	1-24-2008	Warren Wulzen	Archaeological Survey Report, 2007-08 Deferred Maintenance Program Projects, Sewage Lift Stations and Water Treatment Facilities, San Luis Reservoir State Recreation Area, Merced County, CA
O'Neill Forebay & San Luis Reservoir	1-13-09	Warren Wulzen	Archaeological Survey Report, Basalt Trail Accessibility improvements, San Luis Reservoir State Recreation Area, Merced County, CA
San Luis Res. & O'Neill Forebay	2-28-82	Dan Foster	An Archaeological Reconnaissance of the Gonzaga Conservation Camp, Merced County, California (Cal Fire)

Table 2-18
Cultural Resource Studies Conducted within the Plan Area

Reservoir	Date	Authors	Study Title
San Luis Res.	1975	C. Nissley	Archaeological Investigations at CA-Mer-27: Phase II (CSP)
San Luis Res.	4-1-83	Wm. Olsen & Louis Payen	Excavations at CA-Mer-130: A Late Prehistoric Site in Pacheco Pass (in: *Papers on Merced County Prehistory, California Archaeological Reports No. 2*) (CSP)
San Luis Res.	7-1-77	Jeff Bingham & Peter Schulz	The Effects of Prolonged Freshwater Inundation on Cultural Resources – Preliminary Report and Recommendations (CSP)
San Luis Res.	5-1-69	Wm. Olsen & Louis Payen	Archaeology of the Grayson Site, Merced County, California *(Archaeological Report 12*) (CSP)
San Luis Res.	7-25-02	Gary Smith & W. Wulzen	Soil and Ground Water Investigation (CSP)
San Luis Res.	4-30-03	J. Collins & W. Wulzen	Basalt Parking Lot (CSP)
San Luis Res. Rec. Area	4-1-83	W.I. Follett	Fish Scales from the Los Banos Site (CA-Mer-14), Merced County, California (in: *Papers on Merced County Prehistory, California Arch. Reports No. 2*) (CSP)
San Luis Res.	1960	A. Treganza	Archaeological Investigations in the San Luis Reservoir Area, Merced County, California. Report to the California Department of Parks and Recreation, Sacramento
San Luis Res.	4-6-06	Jim Trapani & Warren Wulzen	Basalt Campground Restroom 1 &2 (CSP)
San Luis Res.	10-22-04	Mike Bielicki & Warren Wulzen	Accessibility Retrofit, Basalt Campground and Day Use Area
San Luis Res.	2-27-07; revised 10-29-08	Bissonnette	San Luis Gonzaga Ranch
San Luis Res.	January 2010	ICF International	B.F. Sisk Dam Corrective Action Project Cultural Resources
Los Banos Res.	1970	Frank Riddell	A Symposium on the Culture Sequence of the Kawatchwa Yokuts Area: The Archaeology of the Western San Joaquin Valley (7 articles) (CSP)
Los Banos Res.	3-1-94	David Scott	Archaeological Assessment of Site CA-Mer-68, Merced County, California (CSU Bakersfield)
Los Banos Res.	1986	Chavez & Associates	Cultural and Paleontological Resources Evaluation for the Los Banos-Gates Transmission Project
Los Banos Res.	1-28-93	Helen McCarthy	Survey of Ethnographic Resources and Native American Consultation for the South of the Delta Res. Project (CSP)
Los Banos Res.	8-1-90	P. Mikkelson & William Hildebrandt	Archaeological Inventory and Evaluation for the Proposed Los Banos Grandes Reservoir, Merced County, California (Far Western Anthropological Group)
Los Banos Res.	8-1-90	Donald Wren	Los Banos Grandes Offstream Storage Project: An Archaeological Reconnaissance (CSU Fresno)

Table 2-18
Cultural Resource Studies Conducted within the Plan Area

Reservoir	Date	Authors	Study Title
Los Banos Res.	10-15-79	M.I. Russo & K.C. McBride	A Phase I Cultural Resources Planning Summary and Preliminary Field Work Proposal for Three Reservoir Locations in Central California: Los Vaqueros, Los Banos, and Glenn Complex (DWR)
Los Banos Res.	8-1-72	Anonymous	Resources Inventory, Los Banos Creek Reservoir
Los Banos Res.	6-1-70	Wm. Pritchard	Archaeology of the Menjoulet Site, Merced County, California (CSP)
Los Banos Res.	8-1-66	Wm. Pritchard	The Archaeology of Lower Los Banos Creek, Merced County, California (CSP)

[1]The Gonzaga Adobe was originally located within the Plan Area at San Luis Reservoir but has been relocated to Pacheco State Park, which borders the Plan Area to the west (CSP 2004).

To place the prehistoric and historic sites of Plan Area into a broader context, they need to be examined from within a larger cultural framework. The presence of a variety of natural resources, topography, and general locations made the area an important economic center and transportation corridor for centuries. Consequently, cultural traces on the landscape reflect an equally diverse range of peoples and activities.

Prehistoric Archaeological Context The Plan Area has benefited from extensive archaeological work conducted in the vicinity. During the 1960s, in anticipation of the construction of the nearby San Luis, Los Banos, and Little Panoche reservoirs, numerous early Native American sites were recorded. Sites documented at Little Panoche, while not included in this study, are important to reference as they are located near the San Luis and Los Banos study areas and contributed greatly to the archaeological record of the area. In several cases, the more substantial sites found in these areas were the focus of intensive subsurface investigations (Nissley 1975; Olsen and Payen 1968, 1969, 1983; Pritchard 1970, 1983; Romoli and Ruby 1963). Olsen and Payen (1969) and Moratto (1984), based on some of this research, have postulated estimated dates for the prehistoric cultural sequence of the area that includes the Positas, Pacheco, and Gonzaga complexes. Varying occurrences of typologically and technologically distinct artifacts have provided archaeologists with a general sequence of cultural change over time. The causes of these changes tend to be varied, complex, and intricately interrelated, and can include factors such as climate change and shifting degrees of external cultural contact.

Paleo-Indian (ca. 12,000–7,500 BP). Although humans may have been present in North America long before this time, the best available archaeological evidence indicates that the first inhabitants in the New World arrived sometime around 12,000 years ago or earlier. Although somewhat controversial, a recent redating (Johnson et al. 2000) of the "Arlington Springs Woman," a Native American burial found on Santa Rosa Island (Orr 1962a,b), indicates that these remains may

date as early as 13,000 BP, suggesting a much earlier occupation of California than previously supposed.

Paleo-Indian groups were probably small in size, consisting of extended families that ranged within large areas based on the seasonal availability of various plant and animal species. While sites or artifacts dating to this early period have yet to be found within or in the vicinity of the Plan Area, they could be present in the area.

Positas Complex (ca. 5,300–4,600 BP). This cultural manifestation represents the earliest period for which extensive archaeological evidence has been noted in the area of San Luis Reservoir. In general, little is known of this period, and its relationship to earlier and later manifestations is somewhat unclear (Olsen and Payen 1969). However, by this time, early Native Americans appear to have adopted a somewhat more settled lifeway. The lower cultural deposits from CA-Mer-94 at San Luis Reservoir (Olsen and Payen 1969) suggest that extensive trade networks had already been established by this time. Obsidian from distant sources and beads made from marine *Olivella* shells have been recovered from sites dating to this period. Other distinctive artifacts include small stone mortars, short cylindrical pestles, milling stones, and a wide range of flaked stone tools.

Pacheco Complex (ca. 4,600 BP–1,700 BP). This period, best represented at CA-Mer-94 (Olsen and Payen 1969), has been divided into two phases based primarily on tool and shell bead forms. Pacheco B (extending until about 3,600 BP) exhibits characteristic foliate-shaped bifaces, rectangular marine *Haliotis* ornaments, and thick rectangular *Olivella* beads. Pacheco A, occurring after ca. 3,600 BP, includes a much wider variety of *Olivella* and *Haliotis* bead and ornament forms, perforated canine teeth, bone tools and whistles, and large stemmed and side-notched points. Abundant milling stones, mortars, and pestles indicate an increased reliance on gathered seed and nut foodstuffs. Evidence for trade also increases during this time, with the bone and shell industries bearing marked similarities with those noted in the Delta "Middle Horizon" and traits from western and southern assemblages (Moratto 1984:192; Olsen and Payen 1969).

Gonzaga Complex (ca. 1,700–1,000 BP). Noted from several sites in the Plan Area (CA-Mer-3 and CA-Mer-94), this cultural manifestation has been noted throughout the west side of the valley (Moratto 1984:192). Distinctive features include a mix of extended and flexed human burials, bowl mortars, squared and tapered-stem projectile points, grass saws, and characteristic *Haliotis* and *Olivella* beads and ornaments. Bone and shell artifacts closely resemble those from the Delta "Late Horizon," Phase I (Moratto 1984:192; Olsen and Payen 1969). However, relatively little is known of this period, as the only excavated occurrences have consisted of funerary sites, and the majority of the artifacts have consisted of grave goods (Breschini et al. 1983:79).

Panoche Complex (ca. 500–150 BP). Although the Panoche and Gonzaga are fairly well documented in the area and have been found at a limited number of

sites, there appears to be a hiatus of approximately 500 years between these distinctive manifestations. During this time, there is a possibility that environmental conditions in the region were unfavorable, and could not support oaks and a subsistence system focused on the gathering and processing of acorns. However, direct archaeological evidence of a dramatic decrease in acorn-bearing oaks during this period has yet to be documented, and only additional research may shed some light on the apparent abandonment of the region between approximately 1,000 and 500 BP (Olsen and Payen 1969; Moratto 1984:191–193).

While a Gonzaga/Panoche 500-year occupation hiatus may be apparent based on the excavations of sites in the Pacheco Pass area, according to Breschini and Haversat (1987), this apparent abandonment may have been somewhat limited and more local in nature. Breschini and Haversat have suggested, based in part on excavations conducted at CA-Fre-1333, that the Gonzaga complex dates should probably be extended several hundred years, considerably narrowing the gap between the Gonzaga and Panoche in the region. However, evidence for a period of abandonment in the late Panoche/early Gonzaga complexes can be discerned at CA-Fre-1333 and a concurrent dramatic change in site function from a small village to a sporadically utilized camp or shelter (Breschini and Haversat 1987:39). Although additional research would be necessary to confirm this hypothesis, such shifts in site function, population density, and intensity of land use could be related to a decrease in the density of acorn-bearing oaks in the region during this time.

The late prehistoric to early historic Panoche complex (or Late Period Phase II) has been documented at a number of western San Joaquin Valley sites (Breschini et al. 1983:79). Large circular structures occur frequently, along with flexed burials and primary and secondary cremations. Bone and shell artifacts, including *Haliotis* epidermis disk beads and side-ground and rough disk *Olivella* beads, appear similar to those noted from the Delta "Late Horizon" period. Small side-notched arrow points are found on sites dating to this period, and many features of this complex extend well into the historic period, as contacts with Euro-Americans increased in frequency and intensity (Moratto 1984; Olsen and Payen 1969).

Although Pritchard (1970) noted some proto-historic and early historic materials at CA-Mer-3, early accounts suggest that Pacheco Pass and the area around San Luis Reservoir had been largely abandoned by the local Native Americans by the early 19th century (Latta 1949; Olsen and Payen 1968). Much of this was likely due to the increased Spanish, Mexican, and, ultimately, American use of the pass as an important transportation route. Bands of cattle and horse thieves apparently made frequent use of the pass, and military expeditions also made incursions into the area in search of runaway coastal mission Indians or in search of new workers. Collectively, these pressures proved too much for the local Native American inhabitants, who soon fled the area, their flight precipitated by Euro-American settlement beginning in the 1840s and by a short-lived gold rush in the Pacheco Pass area in 1851 (Hill et al. 1996; Shumate 1977:22).

Ethnographic Setting Ethnographic and archaeological evidence indicates that, at least in later prehistoric and early historic times, Native American populations residing in the San Luis area belonged to the Yokut tribe and, more specifically, the Northern Valley Yokuts (Wallace 1978:462–470; Kroeber 1925; Olsen and Payen 1968:65–66). Although the Yokuts appear to have been the predominant group in the region, evidence suggests strong coastal influences by Costanoan (Ohlone) groups, and Olsen and Payen (1969) suggest that a Western Yokut division from the Pacheco Pass area had just as much in common with the Costanoan as it did with the Yokuts—a situation recognized by Kroeber (1925) as well. Contact between coastal and interior tribal groups would have been facilitated by the presence of routes through Pacheco Pass, providing for an easy exchange of goods and cultural traits in prehistoric and early historic times. Archaeological materials uncovered by Treganza (1960), Riddell and Olsen (1964), Olsen and Payen (1969), Pritchard (1966, 1970, 1983), and Riddell (1970), although analyzed and interpreted according to the Valley cultural and temporal scheme, may have much in common with manifestations from the west side of the Diablo Range. If this is indeed the case, the late prehistoric and early historic inhabitants of the San Luis area may have been affiliated just as much with the Ohlone as they were with the Yokuts.

Based on current interpretations of archaeological and ethnographic evidence, the conventional interpretation of the cultural associations of the Native Americans from the San Luis area is that the Yokuts were the predominant tribe. The Yokuts' Penutian language was spoken by some 40 groups using distinctive but closely related dialects. These groups inhabited three main geographic locales in central California: the Southern Valley (Tulare Lake), the Northern Valley (San Joaquin Valley), and the foothills (Sierra Nevada) (Kroeber 1925; Wallace 1978). However, the area on the western side of San Luis Reservoir has also been mapped as within the territory of the Mutsun, a tribal band of the southern Costanoan (Milliken, Shoup, and Ortiz 2009). According to some accounts, the people of the Upper San Luis Creek and Upper Los Banos Creek watersheds at the time of European contact were not Yokuts but Mutsun speaking Ummaaya (Ketchum 2013; see Appendix D, Comment L-2).

The San Luis Reservoir area, historically a broad, well-watered grassy plain, offered a diverse range of natural resources within a transition zone between the oak savanna and grassland environments. These varied ecosystems provided a wide array of floral species, such as acorns, oats, and other seeds that served as staple foods, and various grasses utilized for basketry. Faunal resources found in the area include numerous fish species, shellfish, turtles, waterfowl, deer, tule elk, pronghorn antelopes, lagomorphs, rodents, reptiles, land birds, and insect species that would have provided sustenance and sources of various materials such as hide, bone, feathers, and ligaments.

The influence of Ohlone and Ohlone-descendent groups can be seen in the San Luis area and throughout the Central Valley in the form of exotic materials not found in the region. Abalone shell is found at many archaeological sites, and accounts indicate that salt, mussels, and dried abalone were frequently traded with

interior groups (Davis 1961:23). Linguistic evidence of extensive contact between the coastal Ohlone and valley tribes can be found as well. For example, some Valley Miwok terms are the same as those found in Ohlone groups and suggest an exchange network involving not only material goods but more diverse cultural traits as well. Trade and contact between the coastal and interior groups was not simply a one-way exchange. For example, Davis (1961:23) notes that piñon nuts found their way to coastal tribes from inland sources, and clam shell beads were traded from the coastal areas to regions far inland.

Yokut groups lived in small seasonal camps geared toward hunting or the gathering and processing of acorns and a variety of grasses, or in larger settlements established near perennial water sources, including the San Joaquin River, and smaller drainages and springs. Dwellings in the larger villages consisted of circular tule-covered structures and more elaborate semi-subterranean pit houses. Ceremonial sweat houses and assembly chambers were often constructed within the more substantial villages. These larger settlements might include approximately 200 inhabitants constituting a small subtribe of the Yokuts. A headman, while not necessarily possessing absolute powers, served as an advisor to these self-contained communities (Cook 1960:249–250, Wallace 1978:466). In general, open conflict or warfare appears to have been rare, and even when confronted with often-hostile Euro-American contact, the Yokuts preferred to flee to remote canyons or tule marshes (Cook 1960:249–250, 260, 263; Gayton 1936:83; Wallace 1978:467)

Yokut material culture and technological systems were as varied as the environments in which the Yokuts resided and reflected the diversity of the available resources. Mortars and metates, both portable and bedrock, were used for the processing of acorns and other gathered seeds and nuts. Baskets were produced in a wide variety of sizes and shapes, each suited to a particular task and adorned with patterns characteristic of Yokut artistic expressions. Exotic materials such as marine shell, ocean fish, and shellfish were obtained from Ohlone contact, and obsidian was acquired from distant sources.

Although little is known regarding traditional pre-European spiritual life, early-historic-period religious and spiritual practices among the Yokut are somewhat better documented and are closely related to those of the Costanoan groups (Kroeber 1907; Levy 1978). Based on some early ethnographic research (Kroeber 1925), it appears that the Yokuts living in the San Luis Reservoir area participated in the Kuksu ritual system during the historic period. Other spiritual components of Yokut culture, such as shamanism, although not specifically described for inhabitants of the San Luis area, were almost certainly important elements contributing to the physical and spiritual stability and well-being of the people in prehistoric and early historic times.

Historic Setting The history of the Plan Area is inextricably linked with the history of Pacheco Pass itself and its prominence as an important transportation route. Both Pacheco Pass and San Luis Creek were Native American trails prior to European contact (Ketchum 2013; see Appendix D, Comment L-2). Although

Pacheco Pass was clearly a well-known and heavily utilized corridor in prehistoric times, historic-era use first occurred shortly after the Spanish coastal missions began to be established. Starting in the late 18th century, the pass and the rolling hills of Los Banos Creek watershed immediately to the southeast served as a direct route from Mission San Juan Bautista to the Central Valley. The watershed area has since become known as the "Path of the Padres," with the established trails and the perennial water of the creek (the Spanish *los baños* roughly translates to "the baths") being a major attraction. The path was most notably employed by the Franciscan mission representatives and friars from San Juan Bautista, and it was likely followed by others associated with the Spanish colonial and later Mexican governments as well.

Mission San Juan Bautista was founded in 1797 and reached its peak population in 1805, with 1,112 inhabitants. By 1840, a total of 2,781 Native Americans had been baptized there, predominantly Mutsun Costanoan (Milliken, Shoup, and Ortiz 2009).

Spurred by mining in the Sierra foothills and expanding agriculture in the Central Valley during the early American period, at least five formal roads were built through the pass, including the original pass toll road constructed by Andrew Firebaugh in the late 1850s. Merced County built a new road by Firebaugh's grade in the 1870s, and the general route of Firebaugh's highway was also followed by the state in the early 1900s, again in the 1930s, and finally with construction of SR 152 in the 1960s. Although SR 152 is the predominant route through the pass today, traces of the earlier roads can still be seen and, in some cases, are still utilized for local traffic.

The first documented European expedition into Pacheco Pass occurred when Gabriel Moraga and Father Pedro Munoz traveled through the area in 1806. This encampment likely occurred along Cottonwood Creek at the San Luis waterhole on the night of June 21, the feast day of San Luis de Gonzaga. As was tradition with Spanish explorers of the day, Moraga and Munoz named the area in the saint's honor (Hill et al. 1996). Moraga and Munoz's expedition essentially cleared the way for future development of the pass as a transportation route, and throughout the early decades of the 19th century, the pass served as an escape route for Native Americans who were attempting to leave the coastal missions or, conversely, who went through the pass to attack coastal missions. Many of these Indians, trained as vaqueros, had previously been through the region when driving herds into the Central Valley, making the area an ideal refuge. In fact, Native American familiarity with the pass clearly predated historic periods, and the pass likely served as an important transportation route between the Central Valley and the coast (Cook 1960; Kyle 2002; Shumate 1977; Pilling 1955).

One of the most important historical developments to occur in relation to the San Luis Reservoir area occurred in September 1843 when Jose Mejia and Juan Perez Pacheco petitioned the governor for rights to over 48,000 acres in and around the pass that had previously been granted to Francisco Jose Rivera in 1841. The establishment of their ranch and their occupation and development of the property

was presented as an "aid in the defense against hostile Indians." The Rancho San Luis Gonzaga was granted in November of that year and bordered the ranch (Rancho Ausaymas y San Felipe) that had been owned by Pacheco's father since 1833. Through additional grants and the purchase of additional lands in the region, the Pacheco family holdings exceeded 150,000 acres by the middle of the 19th century (CSP 1973; Hill et al., 1996).

To support the establishment of the new Rancho San Luis Gonzaga and run the agricultural and herding operations, the Pachecos saw to the construction of the area's first adobe building around 1844, near the spot where Moraga and Munoz had camped 40 years earlier. In later years, it served as a stage stop, a café, a gambling hall, and eventually a gas station and roadside stop for travelers heading through the pass (Hill et al. 1996). The original location of the adobe, and of the entire Rancho complex, was destroyed during construction of San Luis Dam and associated facilities. Paula Fatjo, a fifth-generation Pacheco descendent, attempted to have the adobe building moved to her new ranch facilities (now contained within Pacheco State Park) prior to the construction of the reservoir. During transit, large portions of the structure collapsed as a result of unseen termite damage, and all that remains today are the two end walls currently on display at the Pacheco State Park headquarters (Hill et al. 1996; Crosby et al., 2003).

Native American accounts of the mission period and 19th century on file at the Milliken Museum in Los Banos describe Los Banos Creek, the Pacheco home, and Rancho San Luis Gonzaga, as well as the experiences of Native Americans in the Plan Area vicinity. For more information, see Appendix D, Comment L-2.

During the gold rush of 1849 and following the discovery of gold in the Kern River in 1853, the San Luis Reservoir area saw a dramatic increase in the number of travelers. Another gold rush, albeit a brief and unsuccessful one, occurred in the Pacheco Pass area in 1851. With the consistent flow of would-be miners and travelers, the area became a favorite haunt for bandits and outlaws, including Joaquin Murietta and his gang, who reportedly frequented the San Luis *aguajes* (water hole) (Shumate 1977). In light of the rugged and often lawless nature of his new rancho, Francisco Pacheco moved his family away to the safety of Monterey in 1851. Shortly following this period, Pacheco leased the rancho to his son-in-law, Mariano Malarin, to operate a herding operation to supply meat to San Francisco and miners in Sierra Nevada foothill towns (Hill et al. 1996, Shumate 1977). Following the Pachecos' departure, the rancho headquarters and the adobe may have been abandoned, becoming an ideal hideout for Murietta. It was at this location in 1853 that Captain Harry Love, a deputy sheriff of Los Angeles County, and a contingent of State Rangers cornered Murietta and his gang, who were apparently on their way to the Mother Lode region to stage a large horse-theft raid. Although the raid itself was thwarted, Murietta and all of his men still managed to escape, despite eyewitness accounts that Love had most of them cornered in the Pacheco ranch adobe (Latta 1980:363, 368).

Although several preliminary moves to establish a railroad through Pacheco Pass were made during the 19th century (Adler and Wheelock 1965; Eldredge 1915), transportation through the area remained centered on trails and roadways. These routes became more formalized in 1857, when Andrew Firebaugh constructed a tavern and completed a toll road that went over the pass. A year later, the Butterfield Overland Mail stage started regular runs along this roadway but these only lasted until 1861 (Shumate 1977:4). The Pachecos' San Luis Ranch at the eastern end of the pass became a regular stop for the stage, and an inn and stables were soon constructed to service travelers. In the 1860s, Lafayette Bell purchased a tavern and stage stop at the western end of the pass, and Bell's Station was established; at the same time, there was another stage stop at the top of the pass, operated by William Hollenbeck (Shumate 1977:3). The original buildings are no longer extant and Bell's Station is now closed, but it once served as a popular stopping point at the base of Pacheco Pass (CSP 1973; Hill et al. 1996; Wulzen 2002).

Since the pass was such an important transportation route between the coast and the Central Valley, the stage stops and roadways attracted the attention not only of private entrepreneurs such as Bell, but of government concerns as well. Merced County eventually went on to purchase the toll road; and present-day Whiskey Flat Road, constructed by the County in 1878, follows portions of the original toll road alignment. In later years, the State of California developed a new highway through the pass, finally leading to further realignments and construction of present day SR 152 (Shumate 1977:3; Wulzen 2002).

Ranching continued to be the predominant economic pursuit within and in the vicinity of the Plan Area throughout the 20th century. Paula Fatjo, owner of San Luis Gonzaga, moved into the new ranch headquarters, located just to the north of the original Rancho adobe, in 1948. Over the coming years, Ms. Fatjo sold some parcels of the ranch. By the early 1960s, construction began on San Luis Reservoir, and large portions of the Fatjo ranch and properties belonging to other local residents were to be inundated. As planned, San Luis Reservoir construction was also going to destroy the 1844 ranch headquarters site and the adobe building. Ms. Fatjo reestablished her operations 12 miles to the east near the summit of Pacheco Pass (Hill et al. 1996) and moved a number of structures from the old ranch complex to this new location, including an addition she had attached to the adobe sometime after 1948. With no surviving family members, Paula Fatjo bequeathed the entire remaining acres of Rancho San Luis Gonzaga to the State in 1992. Ultimately, this gift led to the establishment of Pacheco State Park, situated immediately adjacent and to the west of San Luis Reservoir (CSP 1973; Hill et al. 1996; Wulzen 2002).

2.7.3 Documented Cultural Resources

Within the Plan Area, a total of 51 prehistoric and historic cultural resources have been documented (Table 2-19). The resources include 40 in or around the immediate vicinity of San Luis Reservoir, 10 at Los Banos Creek Reservoir, and one at O'Neill Forebay. At the time most of these sites were recorded, there were

no federal or state regulations in place designed to protect cultural resources. Despite the absence of laws at the time requiring that such studies be conducted prior to the implementation of projects such as San Luis Reservoir, archaeologists recognized the importance of the area and studied a number of sites and areas within the present-day Plan Area.

Table 2-19
Cultural Resources Documented in Plan Area

Site Number (CA-Mer-)	Date Recorded	Site Type	Comments	USGS Quad.
14	5-15-62	Prehistoric – village site	Under San Luis Dam: destroyed	San Luis Dam
15	9-5-63	Prehistoric – midden	Extant and typically above high-water line	Pacheco Pass
16	9-5-63	Prehistoric – habitation	Destroyed	San Luis Dam
17	10-10-63	Prehistoric – housepits, midden	Destroyed	San Luis Dam
18	5-27-64	Prehistoric – midden	Extant and typically above high-water line	Pacheco Pass
19	5-28-64	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
20	5-28-64	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
21	5-28-64	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
22	5-28-64	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
23	5-28-64	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
24	5-28-64	Prehistoric – BRMS, midden, housepits	Inundated at least part of the year	Pacheco Pass
26	4-15-64	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
27	6-25-65	Prehistoric – midden	Excavated by Riddell, 1965 (outside Plan Area under tunnel spoils)	Pacheco Pass
28	6-25-65	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
29	6-25-65	Prehistoric – midden	Inundated at least part of the year	San Luis Dam
30	6-25-65	Prehistoric – lithic artifacts	Inundated at least part of the year	San Luis Dam

Table 2-19
Cultural Resources Documented in Plan Area

Site Number (CA-Mer-)	Date Recorded	Site Type	Comments	USGS Quad.
31	6-25-65	Prehistoric – midden	Inundated at least part of the year	San Luis Dam
32	6-25-65	Prehistoric and historic	Extant and typically above high-water line	San Luis Dam
41	6-2-66	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
42	6-2-66	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
56	10-11-63	Prehistoric – midden	Under/adjacent to San Luis Dam – destroyed	San Luis Dam
82	6-2-66	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
83	6-2-66	Prehistoric – midden	Extant and typically above high-water line	Pacheco Pass
94	6-13-69	Prehistoric – midden	Excavated by Olsen & Payen, 1969; inundated at least part of the year	Pacheco Pass
96	9-20-68	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
99	10-11-63	Prehistoric – midden	Destroyed – located near San Luis Dam	San Luis Dam
130	6-13-69	Prehistoric – berms, midden	Excavated by Olsen & Payen, 1968	Pacheco Pass
131	6-13-69	Prehistoric – midden, housepit	Inundated at least part of the year	Pacheco Pass
132	6-13-69	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
133	6-13-69	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
134	10-11-63	Prehistoric – midden	Partially destroyed by pond	Pacheco Pass
135	10-11-63	Prehistoric – midden	Inundated at least part of the year	Pacheco Pass
136	10-11-63	Prehistoric – midden	Extant and typically above high-water line	Pacheco Pass
137	10-11-63	Prehistoric – midden, housepit	Inundated at least part of the year	Pacheco Pass
138	10-11-63	Prehistoric – midden	Extant and typically above high-water line	Pacheco Pass
139	-	Prehistoric – midden	Extant and typically above high-water line	Mariposa Peak

Table 2-19
Cultural Resources Documented in Plan Area

Site Number (CA-Mer-)	Date Recorded	Site Type	Comments	USGS Quad.
261	1-21-82	Historic – rock footings, refuse	Inundated at least part of the year	San Luis Dam
3	-	Prehistoric – village site with house pits	Inundated at least part of the year – Menjoulet site; Pritchard 1970	Ortigalita Peak NW
25	9-27-64	Prehistoric – midden	Destroyed by Los Banos Dam	Ortigalita Peak NW
33	4-30-90	Prehistoric – BRM	Extant and typically above high-water line	Ortigalita Peak NW
34	10-10-63	Prehistoric – BRM	Inundated at least part of the year	Ortigalita Peak NW
35	10-10-63	Prehistoric – midden	Inundated at least part of the year	Ortigalita Peak NW
36	10-10-63	Prehistoric – house pit	Inundated at least part of the year	Ortigalita Peak NW
37	10-10-63	Prehistoric – housepit	Inundated at least part of the year	Ortigalita Peak NW
68	7-9-93	Prehistoric – midden, housepits	Excavated by Riddell, extant	Ortigalita Peak NW
97	10-11-63	Prehistoric – village site	Inundated at least part of the year	Ortigalita Peak NW
98	10-11-63	Prehistoric – Village site	Inundated at least part of the year	Ortigalita Peak NW
277	4-30-86	prehistoric – midden, lithic scatter	Extant and typically above high-water line	Ortigalita Peak NW
38	1-21-82	Prehistoric – BRM, midden, housepits	“Indian Point” site extant and above high-water line	San Luis Creek
451H	3-26-08	Historic (Domengine Sheep Ranch) – Possible house pad, improved spring, two water tanks and three rock alignments.	Site condition is described as “poor”	San Luis Dam
P-24-001856 (no trinomial assigned)	9-10-04; revised 9-12-08	Ranch and remaining undeveloped historic ranch landscape.	Site condition is described as retaining sufficient integrity to convey a sense of time and place.	Pacheco Pass & Pacheco Peak

The primary focus of the 1960s inventories and excavations was on sites related to early Native American habitation of the San Luis area. Sites such as CA-Mer-3 and 94 proved to be highly significant due to their extensive cultural deposits.

Their intact stratigraphy, presence of diagnostic cultural materials, human remains, and datable organics on these sites contributed to the definition of several important phases of early cultural manifestations in the region.

A number of sites have never been formally recorded or investigated, including the original site of Rancho San Luis Gonzaga. Although much of this site, related to the Pacheco family's 1843 grant from the Mexican government, was destroyed by construction of San Luis Dam, considerable traces of this early operation may still exist in the area.

The Rancho San Luis Gonzaga is a Historic District/Cultural Landscape potentially eligible for listing on the CRHR/NRHP. It is located primarily in Pacheco State Park, with small portions extending into the Plan Area from the eastern and northern boundaries of Pacheco State Park. Rancho San Luis Gonzaga is one of the oldest, largest and few remaining historic stock ranch landscapes in central California, and one of the largest Mexican-U.S. land grants passed down in 150 years. Its quiet hillsides, framed by rock outcrops and ridges on the west and south, are studded with oaks, carpeted with native and naturalized Mediterranean forage plants, and lined with trails. The ranch has few visible modern intrusions, and vistas to the east, south, and west retain their historic appearance. The 1843 adobe ruins, 1962 wood frame residence, horse barn and corral, late 1800s windmills, Spanish place names, cactus gardens, mosaic tile panels, miles of wooden post and barbed wire fencing and other artifacts convey the character and feeling of the original historic landscape and evoke California's ranch history and Hispanic heritage. Rancho San Luis Gonzaga is representative of protohistoric California, Hispanic California, the State of California's formative years, and the Fatjo family's long stewardship. The Ranch retains sufficient historical integrity of location, setting, design, materials, and workmanship to convey a sense of time and place (CSP 2008a; Bissonnette 2010).

Other existing and potential historic resources within the Plan Area have also not been formally recorded. Portions of Firebaugh's 1857 toll road can be seen in several areas within the Plan Area but have not yet been documented. Other historic sites, many related to the ranching history of the area, may be found throughout the Plan Area and include quarries, road grades, ranch fences, ponds, windmills, and water tanks.

Despite the number of studies conducted within and in the vicinity of the Plan Area, and the number of cultural resources recorded, additional prehistoric and historic sites likely remain to be discovered and documented. The topography, climate, diverse natural habitats, and accessibility of the area to valley and coastal ecosystems made the San Luis Reservoir area a region uniquely suited to intensive prehistoric and historic occupation and activities. As such, and due to the fact that the Plan Area has never been subjected to an inclusive and systematic cultural resources survey, the known sites within San Luis Reservoir cannot necessarily be considered a representative sample of site locations, types, or cultural or temporal affiliations.

Apart from the recorded prehistoric and historic sites and features situated within the Plan Area, collections of materials associated with the Plan Area and vicinity are presently being curated by CSP, while early collections from the sites are curated at Reclamation's New Melones facility. These include artifacts from some of the resource survey and excavation projects mentioned above and items without origin found within and in the vicinity of the Plan Area.

2.8 Aesthetic Resources

The Plan Area offers open, scenic vistas of undeveloped land and open water. The scenic qualities are represented by the surrounding undeveloped landscape, open grassland, expansive vistas of the rolling terrain and the adjacent Diablo Range. Most shoreline areas allow for uninterrupted views of the open water from the three reservoirs. In some cases, such as at Los Banos Creek Reservoir, the views from the north and south plateaus provide a vista opportunity of the water and adjacent landscape.

The layout and configuration of the built structures in the Plan Area are clustered in succinct areas, reducing the sense of sprawl and visual clutter. Portions of the Plan Area, especially near the dams and the operations facilities, contain many built structures with an engineered character. This contributes to the understanding of those areas as water storage and distribution facilities. Recreation area signage portrays an image and identity for the Plan Area and contributes to the aesthetic experience. The Plan Area viewshed also includes wind turbines along the ridgelines of neighboring Pacheco State Park to the west.

The Merced County Year 2000 General Plan (Chapter VI: Open Space/ Conservation) and the Caltrans Officially Designated Scenic Highways list designates SR 152 west of I-5 as a state scenic highway because of its scenic vistas.

According to the Santa Clara County General Plan, 1995–2010, SR 152 is considered one of the most dramatically scenic gateways into Santa Clara County. Policy R-RC(i) 36 of the Santa Clara County General Plan is intended to protect the scenic value of several major county thoroughfares and entranceways through state scenic highway designation, including Pacheco Pass (SR 152 east of Gilroy).

2.9 Recreational Resources

2.9.1 Recreational Activities

The Plan Area is one of the most popular recreation areas associated with the CVP and is noted for boating, windsurfing, camping, picnicking, and fishing. Boating and other water-based recreation is allowed on all three water bodies in accordance with speed limits and access restrictions. Land-based recreation in the Plan Area is focused into five waterside use areas: Basalt, Dinosaur Point, San Luis Creek, Medeiros, and Los Banos Creek (Map 7). A sixth use area is the designated Off Highway Vehicle (OHV) area, which is south of, and separated

from, Medeiros Use Area by Gonzaga Road. Additionally, San Luis and O'Neill Forebay wildlife areas offer hunting and hiking opportunities.

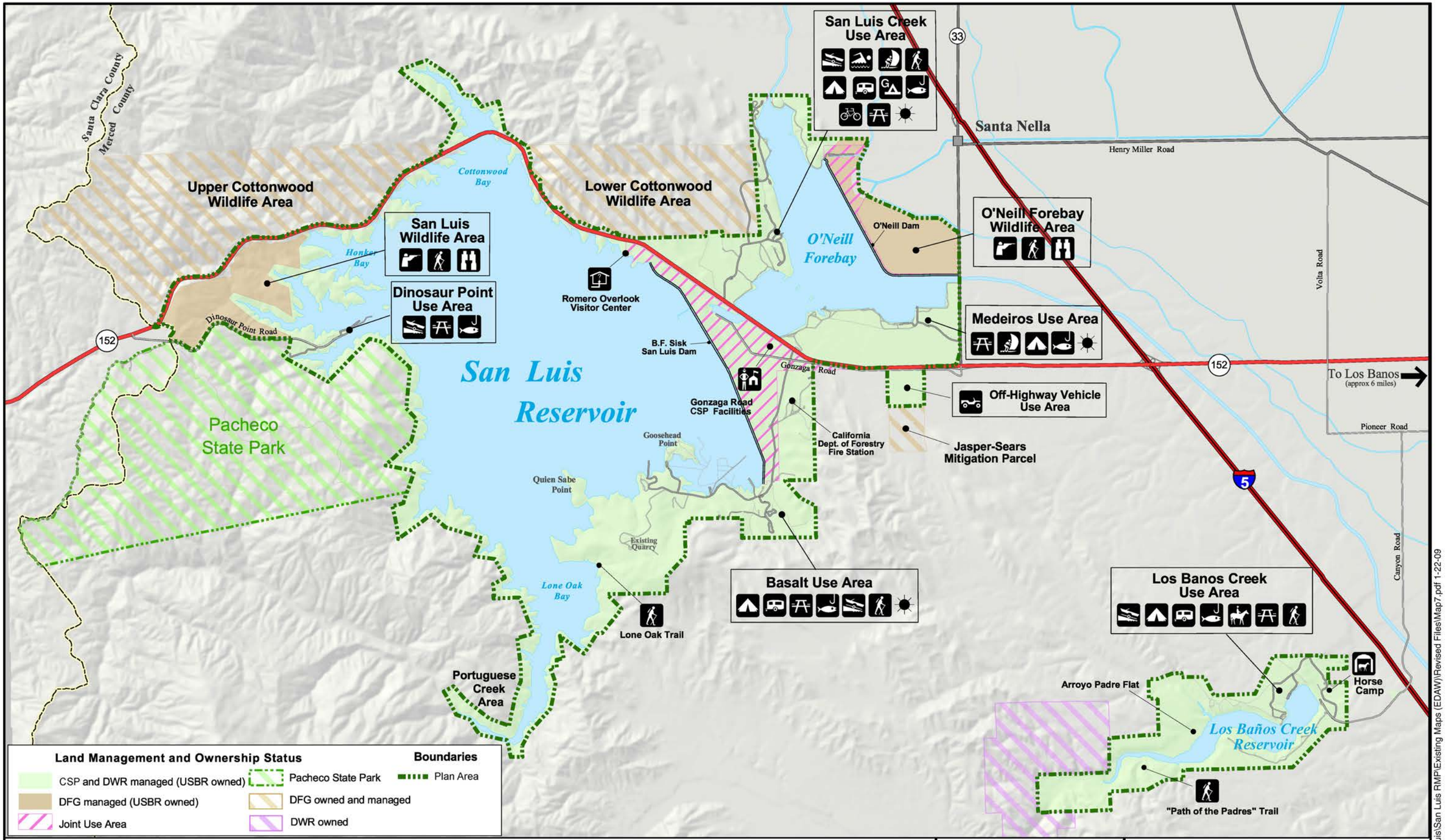
Fishing takes place in all three reservoirs. The DFW periodically stocks Los Banos Creek Reservoir with trout. CSP is not involved with the stocking of trout, and there is no known schedule for how often this occurs. Los Banos Creek Reservoir is known primarily for its fishing, although boating (in accordance with the 5 miles per hour [mph] maximum speed limit) and swimming are also popular. Bass fishing derbies are held at all three reservoirs. At O'Neill Forebay, crappie and bluegill are also caught. All fishing derbies require special event permits from both DFW and CSP. Table 2-20 details the primary activities in each of the use areas.

Table 2-20
Plan Area Primary Activities

Use Area	Primary Activities
Basalt Use Area	Fishing, camping, hiking, boating, day use
Dinosaur Point Use Area	Fishing, boating, day use
San Luis Creek Use Area	Fishing, windsurfing, swimming, boating, camping, day use, group activities
Medeiros Use Area	Fishing, windsurfing, camping, day use
OHV Use Area	OHV use
Los Banos Creek Use Area	Fishing, boating, camping, hiking, horseback riding
O'Neill Forebay Wildlife Area	Hunting, hiking, nature study
San Luis Wildlife Area	Hunting, hiking, nature study

CSP has introduced a three-year pilot program designed to prevent the introduction or spread of invasive quagga and zebra mussels into the Plan Area. These invasive mussels are responsible for devastating damage to the California water system. Once introduced, they can quickly take over a waterway, destroy natural plankton and native fish habitat, and ultimately end recreational access to a waterway. San Justo Reservoir, located approximately 20 miles southwest of the Plan Area, has been closed since 2008 due to a zebra mussel infestation (San Benito 2009).

Beginning October 1, 2011, all vessels must be inspected for quagga and zebra mussels prior to entering San Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir from any of the boat launch facilities. Boats, personal watercraft, kayaks, canoes, sailboards, inflatables, and float tubes all must undergo this mandatory inspection to ensure they are clean of any aquatic vegetation, or other aquatic organisms. The vessels must have all storage areas, ski lockers, engine areas, ballast tanks, and live wells completely drained of water. No moisture of



San Luis Reservoir State Recreation Area

MAP 7
Existing Recreation

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any kind can be in or on a vessel including on equipment, lifejackets, towels, ropes, or wetsuits. The inspection takes about seven to ten minutes.

A boat that passes the inspection will receive an inspection band to attach between the boat and trailer, which, if unbroken, will allow exemption from inspection at the next visit to San Luis Reservoir, O'Neill Forebay, or Los Banos Creek Reservoir. If a vessel fails the inspection, it will be quarantined and will not be permitted to launch anywhere in the Plan Area for seven calendar days. After seven days, the vessel must meet all the inspection criteria before it will be allowed to launch in the Plan Area. Tampering with quarantine seals or attempting to launch a vessel within the seven day quarantine period is a violation of California law and will result in a citation.

This pilot program will remain in place for three years until October 2014, at which time it may continue if funding is available. If no funding is available after 2014, a voluntary watercraft operator self-inspection program will be implemented to meet the requirements of California Fish and Game Code Section 2302. This self-inspection program is discussed further in Sections 4.4.1 and 4.4.2.

2.9.2 Use Area Recreation Facilities

The majority of visitation to the Plan Area occurs between Easter and Labor Day each year. The frequency of visitation is generally highest on Fridays, Saturdays, Sundays, and holidays. On weekends and holidays (particularly during the high use season), public use areas often reach their capacities.

Each of the main use areas provides a range of recreation facilities, as detailed below. In addition, the Romero Visitor's Center offers educational information, literature, and visitor programs, along with viewing stations equipped with telescopes. Map 7 illustrates existing recreation in the Plan Area. Day use facilities and boating are permitted from sunrise to sunset. Camping check-in is at 2 PM and check-out is at noon.

2.9.2.1 Basalt Use Area

The Basalt Use Area is located at the southeastern corner of San Luis Reservoir. The area includes 79 tent/RV campsites, including 8 that are Americans with Disabilities Act (ADA) compliant, with piped water, fire grills, picnic tables, and storage lockers. A sewer dump station, flush toilets, showers, and a fish cleaning station help make Basalt a popular use area. The Basalt Use Area also provides trail access, a campfire center, and a four-lane boat launch with an 80-foot boarding float. In 2008–2011, numerous upgrades were constructed at the Basalt Use Area campgrounds and day use picnic sites to make the area more ADA compliant, including the completion of two ADA restrooms with toilets and showers.

A 1.5-mile loop trail known as the Basalt Campground Trail begins at the campground entrance and climbs to a hilltop area with an interpretive exhibit, map, and views of San Luis Reservoir, Basalt Hill, and the San Joaquin Valley.

West of Basalt Use Area, the Lone Oak Bay Trail is a 6-mile out-and-back trail to the south side of San Luis Reservoir. The trailhead is just before the end of the park road at the boat launch and parking area, 2 miles west of Basalt Campground.

2.9.2.2 Dinosaur Point Use Area

Dinosaur Point, located on the western edge of San Luis Reservoir where Dinosaur Point Road ends, offers lake access, including a four-lane boat ramp with an 80-foot boarding float and parking for 123 vehicles, with additional parking on the boat launch ramp. Dinosaur Point also provides five shade ramadas and chemical toilets. The length and gentle but steady slope of Dinosaur Point Road provide suitable terrain for street luge, which currently only takes place as a special event and requires permission from CSP Four Rivers Sector. Other activities provided in this area include fishing and bicycling.

2.9.2.3 San Luis Creek Use Area

The San Luis Creek Use Area is west of O'Neill Forebay and is the most popular use area. The area provides two large beaches, a life guard stand, a large irrigated lawn with 148 shade ramadas with barbecues, a three-lane boat launch ramp with two 80-foot boarding floats, a fish-cleaning station, a picnic area, trail access including a 1.5-mile ADA-compliant trail to Check 12, and 171 parking spaces for vehicles with boat trailers and 390 spaces for single vehicles. In addition, camping facilities include 53 tent and RV campsites (including six ADA accessible) with electric and water hookups, fire pits, and picnic tables. San Luis Creek has five group picnic facilities and two group campsites. The first group campsite, which can accommodate 60 campers, provides a large cooking/gathering shelter with lights and electricity, eight shade ramadas with fire rings and picnic tables, and restrooms with showers. The second, which can accommodate 30 campers, provides a smaller cooking shelter with lights and electricity, five shade ramadas with fire rings and picnic tables, and restrooms with showers. The group campsites also share an irrigated lawn area and a parking area with approximately 36 single-vehicle spaces. In 2008, numerous upgrades were constructed at the San Luis Creek campgrounds and day use picnic sites to make the area ADA compliant.

2.9.2.4 Medeiros Use Area

The Medeiros Use Area is located on the southeastern shore of O'Neill Forebay. The area provides 50 campsites with shade ramadas, picnic tables, and barbecues, approximately 300 informal parking spaces, as well as approximately 350 primitive campsites for tents and RVs. The day use and camping areas have potable water from four portable water tanks (water is trucked in), and chemical toilets. The boat launch at the Medeiros Use Area was closed in 2001 for security reasons. Although security is no longer a concern, the boat launch remains closed because shallow water in the area prevents year-round launching.

2.9.2.5 OHV Use Area

The OHV Use Area, also known as the Jasper-Sears OHV Area, is located south of Gonzaga Road and approximately 2 miles east of the CSP administrative offices. The OHV Use Area is an open, flat, partially vegetated 150-acre parcel that is developed with an OHV track consisting of unpaved trails. With fairly flat terrain, the track is ideal for beginners. The use area also has two picnic tables with shade ramadas, a parking lot with two vehicle loading ramps, and chemical toilets. In accordance with emission standards regulations for OHVs, noncompliant vehicles (Red Sticker OHVs) are seasonally restricted (see Section 2.5.1.2).

2.9.2.6 Los Banos Creek Use Area

The Los Banos Creek Use Area surrounds Los Banos Creek Reservoir. The main use area at Los Banos Creek Reservoir is located at the northeast end of the reservoir and includes 14 campsites with shade ramadas, barbecues, and picnic tables. The Los Banos Creek Use Area also includes a two-lane boat launch ramp with a 60-foot boarding float, an equestrian camp, and parking for approximately 40 vehicles with boat trailers, chemical toilets, hiking and equestrian trail access, and a swimming area. The "Path of the Padres" historic hiking trail is located at Los Banos Creek Reservoir, and guided tours of the trail as well as a boat tour are led by volunteer and CSP staff.

2.9.2.7 Other Areas

DFW staff based at the Los Banos Wildlife Area field office in Los Banos manages the two wildlife areas in the Plan Area. The San Luis Wildlife Area is located at the northwest edge of San Luis Reservoir, south of SR 152, and is accessed from a parking area off of Dinosaur Point Road. Some visitors to the wildlife area also park in pull-outs west of the parking area but within the Plan Area boundary. As such, access to the pull-outs is restricted to between sunrise and sunset.

The O'Neill Forebay Wildlife Area is at the eastern side of O'Neill Dam and is accessible from a parking area off of SR 33.

Both sites have a self-registration system at the entry points and permit nature study, hiking, and hunting. Hunting for waterfowl, pheasants, quail, doves, rabbits, and crows is allowed at O'Neill Forebay Wildlife Area; and hunting for all legal species, including deer, pig, dove, quail, turkey, and small game, subject to DFW regulations, is allowed at the San Luis Wildlife Area. Portions of the O'Neill Forebay Wildlife Area are cultivated to provide forage and habitat for various game species. Crops grown consist of safflower, wheat or vetch, and turkey mullen.

2.9.3 Plan Area Infrastructure

2.9.3.1 Visitor's Center

The Romero Visitor's Center, operated by the DWR, is located on the eastern side of San Luis Reservoir at the Romero Overlook. The visitor's center provides extensive information on the reservoirs and water projects through audio-visual and printed materials. Telescopes are also available for viewing the area.

2.9.3.2 Entrance Stations

There are four vehicular access points with an entrance station: the Basalt, Los Banos Creek, Medeiros, and San Luis Creek use areas. Entrance stations are located in the roadway, with windows on both sides to serve traffic entering and leaving the recreation area. All entrance stations provide climate-controlled work space for staff, some with multiple rooms. The Basalt and San Luis Creek Use entrance stations are equipped with restroom facilities. Entrance stations are staffed during the peak season when funding is available. Self-registration is used to collect fees at other times.

2.9.3.3 Operations Facilities

The SRA administrative offices are located on Gonzaga Road, south of SR 152. CSP facilities at this location include the administrative office building, the ranger office building, and a number of storage and maintenance buildings, including a multipurpose building, CSP's maintenance shop, an auto shop, and a large warehouse. In addition, a large fuel tank and propane tank are at this location. Finally, there is one trailer used to house visiting specialists and SRA seasonal workers.

The CSP operations area on Gonzaga Road formerly contained an underground fuel storage tank and a waste oil tank. After removal of the tanks, releases to soil and groundwater were detected. Remediation including groundwater monitoring and soil vapor extraction has been ongoing at the site and will continue independent of Plan implementation until the case file is closed by the oversight agencies, the Merced County Division of Environmental Health and RWQCB (SWRCB 2012).

Other CSP operations facilities include water treatment facilities, sewer lift stations, and wind warning lights located at the Basalt, San Luis Creek, and O'Neill Forebay areas. Water tanks are located at each of the use areas.

2.9.3.4 Concessions

Concessions within the Plan Area are limited. No buildings are used for concessions, however, an ice cream concession stand is in operation at San Luis Creek Use Area on a two-year trial basis. The concessionaire also sells water between Easter and September 30.

2.9.3.5 Employee Housing

Employee housing is located at Basalt and Los Banos Creek use areas and the SRA administrative offices. The Basalt Use Area has one mobile home pad. The

Los Banos Creek Use Area has one CSP-owned mobile home trailer, which is usually occupied by the unit ranger. Some staff are currently housed at Pacheco State Park. The SRA administrative offices also provide one CSP-owned mobile home trailer; however, it has no full-time residents and typically is used to house visiting specialists and seasonal workers.

2.9.3.6 Restrooms

Restrooms are available at the Romero Visitor's Center and each use area, excluding the wildlife areas. The Basalt Use Area has three restrooms: two ADA-accessible restrooms with showers, and one non-ADA-accessible stand-alone bathroom. The Dinosaur Point Use Area has one vault toilet that is ADA accessible, and the Los Banos Creek Use Area provides eight to 16 chemical toilets and one vault toilet. The Medeiros Use Area provides four vault toilets, three of which are ADA accessible; and the San Luis Creek Use Area provides seven restrooms in the day use area, four vault toilets throughout the campground and day use areas, and one restroom with showers in the group camp. Chemical toilets are available at the OHV area. In addition, there are a number of chemical toilets located throughout high-use areas during the peak season.

2.9.4 Interpretive and Educational Resources

A visitor's center at the Romero Overlook, operated by the DWR, provides educational information on the CVP and SWP, the local reservoirs and dams, and statewide water projects through audio-visual and printed materials. The location of the center is high above San Luis Reservoir and provides spectacular views to the east, west, and south. Telescopes are available for viewing the area.

A campfire center that seats about 75 visitors is located in the Basalt Campground, and interpretive staff or rangers conduct Saturday evening programs during the summer months when budget and staffing permit. The group campsite facilities at San Luis Creek and O'Neill Forebay are used occasionally for more informal presentations to scouts and other groups that request a ranger program. School field trips to the Plan Area primarily from April through June have used the picnic facilities, swim beach, and expansive turf areas at San Luis Creek, although no formal program is offered.

A variety of special events, including Kids' Fishing Day (a joint DWR/CSP program) and the California Police Activities League (CalPAL) Northern California Camporee, also make use of the group and family picnic facilities at the north beach. Freestanding outdoor exhibit shelters house interpretive displays in six locations throughout the Plan Area, and informational bulletin boards are provided at most restrooms.

The Path of the Padres all-day guided boat ride and hike at Los Banos Creek Reservoir takes visitors on the route once used by the padres of Mission San Juan Bautista to travel to and from the Central Valley. Along the way, there are stops by Native Californian acorn grinding rocks, and the pools that gave the town of Los Banos its name. Cultural history and natural history are both featured in this popular all-day hike, which is booked solid 4 days each week during March and

April. Thursday and Friday dates are held for school group hikes, and on Saturdays and Sundays the route is open to the public. The CSP's pontoon boat carries the hikers to the trailhead at the west end of Los Banos Creek Reservoir, which limits group size into the backcountry area.

Additionally, the following interpretive themes are used to tell the story of the area through campfire programs, boat tours, guided hikes, audio-visual programs, and outdoor exhibits:

- Wind and Water: Strong winds are common at the Plan Area, making the area a treacherous location for boaters and anglers. Signage and wind danger signals are provided to assist in informing visitors of this climatic factor.
- Big Fish: San Luis Reservoir holds the world record for land-locked striped bass.
- Life in the Rain Shadow: Despite an abundance of imported water, the Plan Area receives less than 10 inches of rainfall each year. Roadrunners, tarantulas, kangaroo rats, and kit foxes are among the desert-adapted species that inhabit the area.
- San Luis Reservoir: The reservoir stores water for state and federal water projects, supplying drinking water to Santa Clara County, the San Joaquin Valley, and Southern California, as well as providing irrigation to farmers as far south as the Imperial Valley.

2.9.5 Visitation Data and Trends

2.9.5.1 Visitor Attendance and Seasonal Fluctuations

Total visitor attendance figures (Table 2-21) show large fluctuations between fiscal year (FY) 2005–2006 and FY 2010–2011. The average total attendance per fiscal year over that period was just over 327,000, consisting of approximately 268,700 visitors for paid day use, 36,350 visitors for free day use, and 27,000 visitors for camping. The average number of boat launches per fiscal year during that period was approximately 9,000. In all fiscal years, the greatest number of visitors come to the Plan Area for paid day use, followed by free day use and camping, in that order.

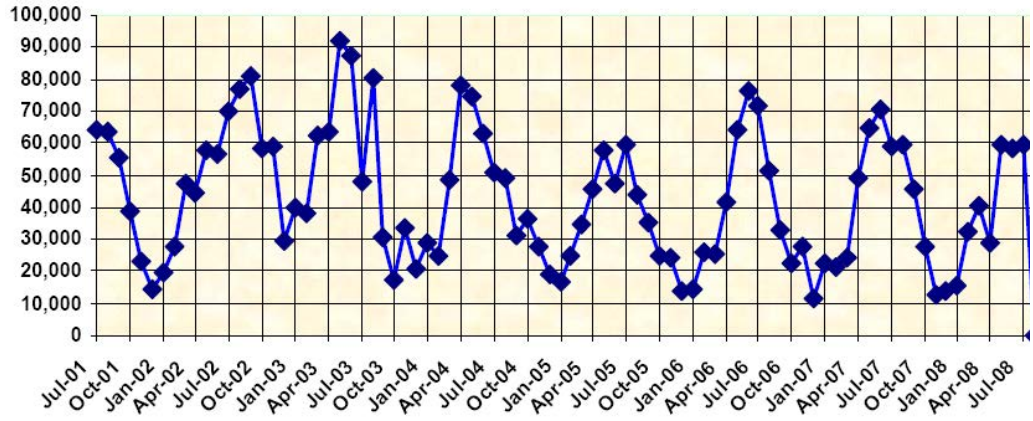
The highest fiscal year attendance in the past decade was in FY 2002–2003 (757,330; CSP 2012a). The lowest attendance was in FY 2009–2010 (144,222), likely due to the nationwide economic downturn.[5]

In general, the Plan Area has substantially higher numbers of visitors during spring and summer months and lower numbers during fall and winter (see Chart 2-1). Based

[5] Visitor data presented in this section is based on use fees paid at Plan Area entrance stations. The ability to staff entrance stations is based on the availability of CSP funding. During some periods, the entrance stations were staffed only on peak period weekends, and at other times visitors were requested to place fees in payment collection boxes. Some of the apparent visitation trends may be related to fluctuations in visitor payment rather than actual attendance.

on historic use patterns, San Luis Creek and Basalt are the most popular use areas, with up to 40,000 visitors a month at San Luis Creek Use Area during peak use. The Dinosaur Point, Los Banos Creek, and Medeiros use areas experience similar seasonal fluctuations, although visitor attendance is typically lower.

Chart 2-1
San Luis Reservoir SRA Monthly Attendance, Fiscal Years 2001 - 2008



Note: For FY 2008-2009 through 2010-2011, no monthly data are available.

Table 2-21 summarizes visitor attendance data for the Plan Area between FY 2005–2006 and 2010–2011.

Table 2-21
San Luis Reservoir State Recreation Area Fiscal Year Attendance Data: Fiscal Years 2005 - 2010

Month	2005 - 2006					2006 - 2007					2007 - 2008				
	Paid Day Use	Free Day Use	Overnight Use	Boats Launched	Total Attendance	Paid Day Use	Free Day Use	Overnight Use	Boat Use	Total Attendance	Paid Day Use	Free Day Use	Overnight Use	Boat Use	Total Attendance
July	48,002	5,589	5,413	644	59,274	60,270	6,594	4,773	1,089	71,637	50,154	6,307	2,748	915	59,209
August	36,770	4,203	2,734	720	43,707	43,179	5,103	3,419	867	51,701	50,388	5,763	3,438	774	59,589
September	28,776	3,495	2,968	714	35,239	24,463	3,007	5,201	1,059	32,671	38,441	4,898	2,103	644	45,442
October	50,585	2,652	1,661	975	24,898	16,868	2,828	2,654	1,097	22,350	23,385	2,737	1,503	871	27,625
November	19,737	2,392	2,127	1,191	24,256	22,051	2,887	2,701	1,296	27,639	7,995	2,607	2,277	985	12,879
December	11,427	1,645	761	582	13,833	8,561	1,960	1,109	658	11,630	11,550	1,197	1,197	707	13,944
January	12,178	1,456	1,020	618	14,654	14,895	6,431	1,296	672	22,622	13,116	1,509	1,116	671	15,741
February	21,601	2,597	1,707	872	25,905	17,433	2,469	1,419	904	21,321	28,434	3,045	1,125	609	32,604
March	20,883	2,522	1,966	671	25,371	20,640	2,146	1,647	1,157	24,433	32,214	4,959	3,283	809	40,456
April	34,590	4,018	2,842	774	41,450	41,068	4,943	3,218	776	49,229	24,453	3,313	1,262	887	29,028
May	53,573	6,040	4,732	974	64,345	54,364	5,995	4,605	939	64,964	50,171	5,669	3,914	914	59,754
June	64,270	7,225	4,953	778	76,222	59,532	6,593	4,185	786	70,309	50,867	5,253	2,327	835	58,447
Fiscal Year Totals	**402,392**	**43,834**	**32,884**	**9,513**	**449,154**	**383,324**	**50,956**	**36,227**	**11,300**	**470,506**	**381,168**	**47,257**	**26,293**	**9,621**	**454,718**

Fiscal Year	Paid Day Use	Free Day Use	Overnight Use	Boats Launched	Total Attendance
2008 - 2009	229,135	30,913	26,381	9,774	286,429
2009 - 2010	105,690	18,697	19,835	6,748	144,222
2010 - 2011	110,518	26,363	20,093	6,898	156,974

Source: CSP 2012a.

Note: For FY 2008-2009 through 2010-2011, no monthly data are available.

2.9.5.2 Visitor Demographics

Table 2-22 summarizes visitor demographics on CSP-managed lands by age, gender, ethnicity, education, and income.

Table 2-22
Visitor Demographics

Age (Years)									
	No Response	0 – 18	18 – 24	25 – 34	35 – 44	45 – 54	55 – 64	64+	
% Visitors	13.80%	1.10%	3.50%	8.60%	14.50%	18.70%	19.50%	20.20%	
Gender									
	No Response/Other			Male			Female		
% Visitors	18.10%			50.40%			31.50%		
Ethnicity									
	No response	Asian	Native American	Black	Filipino	Hispanic	Pacific Islander	White	Other
%Visitors	23.20%	3.00%	3.20%	2.70%	0.90%	8.80%	0.90%	54.20%	3.20%
Education									
	No response	Some High School		High School Graduate		Some College		College Graduate	
% Visitors	16.50%	3.70%		17.00%		29.00%		33.80%	
Income									
	No response	$0 – $14,999	$15,000 – $29,999	$30,000 – $44,999	$45,000 – $59,999	$60,000 – $75,000	Over $75,001		
% Visitors	29.90%	5.00%	11.70%	15.00%	11.50%	10.30%	16.60%		

Note: Based on responses to voluntary surveys. Total number of respondents: 565.
Source: CSP 2008b.

2.10 Circulation

2.10.1 Regional Transportation

The Plan Area is between two of California's primary north-south conduits, U.S. Highway 101 (US 101) and I-5, and is adjacent to one of the main east-west routes through the Diablo Range, SR 152. I-5 lies approximately 5 miles east of the reservoir and provides a direct route from the Stockton and Sacramento areas to Los Banos and further south. US 101 is located 35 miles west of the reservoir and provides a relatively direct route from the San Francisco Bay and San Jose to the Salinas area. Numerous smaller roads and highways, SR 33, SR 99, SR 156, and SR 25, located east and west of the recreation area, connect with SR 152 in the general vicinity of the Plan Area. These routes provide access from Fresno, Modesto, Hollister, Monterey, Santa Cruz, Castroville, and surrounding areas.

SR 152 between the Merced–Santa Clara County line and the junction with I-5 has been designated as a High Emphasis and Focus Route for the Interregional Road System (IRRS), a designation that highlights the route's critical importance to interregional travel and to the state as a whole. SR 152 carries industrial,

commercial, agricultural, recreational, and private vehicle traffic. In addition to the IRRS designation, the segment of SR 152 in the project vicinity is a designated Bike Route on State Highway (Caltrans 2009).

Public transportation along SR 152 near the recreation area includes the Merced Area Regional Transit System (MARTS) and Greyhound-Trailways bus lines, though neither stops within the Plan Area. In addition, a high-speed rail line has been proposed and is being evaluated by the California High Speed Rail Authority (see description below under "Regional Planning Influences") that may pass through Pacheco Pass, northeast of San Luis Reservoir. Public transportation is recognized as an important alternative to private vehicles.

2.10.2 Plan Area Access and Roads

The locations of Plan Area access points are noted in Table 2-23. In addition to the roads accessing use areas, there are numerous roads within the recreation area that provide access to San Luis Dam and the associated operations facilities, areas along the western shore of O'Neill Forebay, and areas along the southeastern shore of San Luis Reservoir in Basalt Use Area. Access roads are all two-lane paved roads, but roads extending past designated use areas include a variety of two-lane paved, single-lane paved, gravel, and unimproved roads.

Table 2-23
Plan Area Entrance Points

Entrance	Location	Nearest Primary Rd.	Entrance Road
Basalt Use Area	Southeast corner of San Luis Reservoir	SR 152	Basalt Road
Dinosaur Point	Northwest corner of San Luis Reservoir	SR 152	Dinosaur Point Road
San Luis Wildlife Area	West side of San Luis Reservoir	SR 152	Parking area off Dinosaur Point Road
San Luis Creek Use Area	Western edge of O'Neill Forebay	SR 152	San Luis Creek Service Road, South Loop
O'Neill Forebay Wildlife Area	East of O'Neill Forebay and dam	SR 33	Parking area off SR 33
Medeiros Use Area	South side of O'Neill Forebay	SR 33	Entry road off SR 33.
Los Banos Creek Use Area	Around Los Banos Creek Reservoir	SR 152	Unnamed (off of Canyon Road)

2.10.3 Traffic Volumes and Operations

2.10.3.1 Traffic Volumes

In 2007, the annual average daily traffic (AADT) on SR 152 just north of its intersection with SR 33 was 24,400. The intersection borders the Plan Area to the

east. The AADT on SR 33 (east of SR 152) was 9,000 (Caltrans 2007b).[6] Table 2-24 lists the peak daily vehicle trips to the five use areas at the SRA for each month for the 2007–2008 fiscal year and the average of the peak vehicle trips to each area.

The combined average of peak daily trips to use areas at the SRA in fiscal year (FY) 2007–2008 was 1,167. This total is approximately 5 percent of FY 2007–2008 AADT on SR 152 and 13 percent of the AADT on SR 33.

Table 2-24
Peak Vehicle Daily Trips for the Five Use Areas in the San Luis Reservoir State Recreation Area for Fiscal Year 2007–2008

Month	Daily Trips					
	Basalt	Dinosaur Point	Los Banos Creek	Medeiros	San Luis Creek	Total
July 2007	444	263	103	253	1,221	2,284
August 2007	294	187	121	248	747	1,597
September 2007	183	191	59	142	759	1,334
October 2007	137	74	26	61	284	582
November 2007	60	78	21	38	110	307
December 2007	69	70	31	52	124	346
January 2008	103	89	143	26	204	565
February 2008	167	132	125	108	417	949
March 2008	184	138	47	168	1416	1,953
April 2008	227	141	110	133	674	1,285
May 2008	242	173	90	265	588	1,358
June 2008	176	109	68	173	908	1,434
Total Trips	2,286	1,645	944	1,667	7,452	13,994
Average Peak Daily Trips	191	137	79	139	621	1,167

Source: CSP Four Rivers Sector 2008

2.10.3.2 Traffic Operations

The Merced County Association of Governments (MCAG) evaluates existing and potential future deficiencies in the regional road network in terms of Level of Service (LOS). LOS is a metric used to describe the traffic flow conditions of a road segment in relation to the capacity of the roadway. LOS characterizes traffic conditions in terms of speed and travel time, volume and capacity, traffic interruptions, and safety. LOS for a road may range from LOS A to F with LOS A being free-flow and LOS F being heavily congested. MCAG has set the standard

[6] In 2010, the AADT on SR 152 near its intersection with SR 33 was 23,800, and the AADT on SR 33 (east of SR 152) was 5,900 (Caltrans 2010). AADT data for 2007 are included to allow comparison with the most recent Plan Area trip data, which is for FY 2007–2008.

of LOS D for the entire regional road network. Any segment of roadway that is worse than LOS D is considered to be a deficiency in the transportation system. These deficiencies are considered when prioritizing projects in the county's capital improvement program. Caltrans has set the thresholds of LOS C for SR 152 and LOS D for SR 33 (MCAG 2010a).

Existing LOS data for SR 152 and SR 33 near the Plan Area are not available. According to the *Route 152 Trade Corridor Study Summary Report*, however, SR 152 east of Gilroy and on the eastbound ascent to Pacheco Pass is nearing capacity and will exceed capacity by 2015 (VTA 2010).

MCAG's 2011 Regional Transportation Plan forecasts that by 2035, both SR 152 and SR 33 in the Plan Area vicinity will operate at LOS F (MCAG 2010a).

2.10.4 Parking

In addition to the roads throughout the Plan Area, CSP maintains public parking areas at each of the use areas. Parking capacity is listed by use area in Table 2-25.

Table 2-25
Use Area Parking Capacity

Location	Capacity	Description
Basalt Use Area (511 Total)		511 auto spaces, 54 spaces for autos with trailers
Fisherman's Point	115	
Willow Point	125	
Goosehead	115	
Main Boat Ramp	156	
Dinosaur Point Use Area	123	Auto spaces, with additional auto and boat trailer parking on boat ramp
San Luis Creek Use Area (698 Total)		698 auto spaces, 181 spaces for autos with boat trailers
South Beach	110	
North Beach	204	
Main Boat Ramp	189	
Upper Boat Lot	118	
Group Camp	40	
Check 12	37	
Medeiros Use Area	300	Informal, unpaved parking along existing roads
OHV Use Area	30	Informal, unpaved parking
Los Banos Creek Use Area	40	All for autos or autos with boat trailers
TOTAL	1,702	

Source: CSP Four Rivers Sector 2012.

The Plan Area currently experiences parking shortages only in certain areas during peak visitation periods. Sufficient parking is available at Basalt and Dinosaur Point use areas that capacity is never exceeded. Medeiros Use Area has no formally designated parking areas (visitors park at their campsites), and adequate space for parking is available to accommodate much higher levels of visitation than currently exist. Parking lots at San Luis Creek and Los Banos

Creek use areas reach capacity frequently, and overflow parking is directed to dirt lots. At Los Banos Creek, CSP staff restrict entry of additional vehicles when parking capacity is reached.

2.11 Utilities and Emergency Services

2.11.1 Utilities

2.11.1.1 Sewage and Water Treatment

The Plan Area has two water treatment facilities. The 72,000 gallons per day (gpd) San Luis Reservoir Water Treatment Plant, located in the Basalt Use Area, serves the campground and dump station. A new raw water intake line and pump for water utilization at Basalt Day Use and campgrounds were completed in 2008. The 72,000 gpd O'Neill Forebay Water Treatment Plant, located in the San Luis Creek Use Area, serves the day use areas and campgrounds. Sewage treatment at both facilities routes waste through sewer grinders and uses lift station pumps to move wastewater to evaporation/percolation ponds, located at the facilities. Chemical and vault toilets located throughout the Plan Area are serviced by pumper trucks on a regular basis.

2.11.1.2 Water Storage Tanks

A total of seven water storage tanks are located throughout the Plan Area. Table 2-26 details tank locations, sizes, and purposes.

Table 2-26
Plan Area Potable Water Storage Facilities

Location	Tank Size (Gallons)	Tank Purpose
Basalt Use Area	100,000	Storage at Treatment Plant
Dinosaur Point Use Area	1,000 1,000	Potable Water Irrigation
San Luis Creek Use Area	260,000 (total storage)	Storage (2 tanks) at Treatment Plant Potable Water at Group Camp
Medeiros Use Areas	2 x 1,400 2 x 1,000	Potable Water: Campgrounds
Los Banos Creek Use Area	3,000 3,000 3,000	Potable Water: Residences Potable Water: Boat Launch Potable Water: Campgrounds

Source: CSP Four Rivers Sector 2011

2.11.1.3 Electricity

Electricity throughout the Plan Area is provided by the Pacific Gas and Electric Company (PG&E). Reclamation has a PG&E substation (the San Luis Substation) next to the Gianelli Pumping-Generating Plant. The substation is interconnected

with a double circuit, 230-kilovolt (kv) transmission line that connects to PG&E's Los Banos Substation.

Distribution lines enter the San Luis Creek area from the north, paralleling the Plan Area's western boundary and terminating at the San Luis Creek entrance station kiosk. Electricity is provided to the Medeiros Use Area by the same distribution network, with lines terminating at the entrance station. Distribution lines enter the Basalt Use Area from the east, paralleling the Basalt entrance road and terminating at the San Luis Reservoir Water Treatment Plant and Quien Sabe wind warning lights. Los Banos Creek receives electricity from distribution lines on Canyon Road, which enter the use area and terminate at the residence area. No electricity is provided at the Dinosaur Point area.

2.11.1.4 Other Utilities

Other utilities within the Plan Area include propane tanks located at the SRA administrative offices, Basalt campground, and Los Banos Creek residences. In recent years, solar panels have been used to power gates in some Plan Area locations, but have been subject to theft.

2.11.2 Emergency Services

2.11.2.1 Fire Protection

Emergency fire protection is provided by Cal Fire, stationed south of Gonzaga Road, east of the SRA Administrative Offices, with supplemental protection provided by the County of Merced. Fire protection includes fire prevention efforts, which range from signs to public education, as well as emergency response in the event of a fire, rescue, or other incident.

2.11.2.2 Security

Rangers and lifeguards perform law enforcement duties at the Plan Area. Use areas and camping areas are patrolled daily. Patrol shifts vary according to the season; patrols are longer, more frequent, and at later hours during peak use seasons. Seasonal lifeguard staff is added during peak seasons as funds are available. A patrol boat patrols the reservoirs on weekends during high use seasons as staffing is available. In addition, general CSP staff aid in Plan Area security by performing camp checks, collecting fees, assisting rangers, and reporting disorderly or suspicious activity to ranger staff.

2.11.2.3 Medical Aid

All rangers and lifeguards are trained for emergency medical response. At times, advanced life support services may be delivered and rendered by Cal Fire, which is equipped to respond to all medical emergencies and holds cooperative contracts and agreements with other state and local emergency response agencies that provide supplemental resources when needed. Their primary mission, however, is fire protection services.

2.12 Socioeconomics

The proximity of SR 152 places the Plan Area within travel distance of not only nearby cities such as Los Banos and Gustine in Merced County but locations in the Bay Area, particularly from adjacent Santa Clara County, as well as the Stockton, Fresno, and Sacramento metropolitan areas. Existing and projected demographic data play an important part in planning for the Plan Area. Therefore, this discussion considers population and economic influences for both Merced County and the greater regional area. This section considers the following:

- Regional population trends and projections
- Local population trends and projection
- Demographic and economic projections and trends

2.12.1 Regional Population Trends and Projections

The population change in Merced County from 1970 to 2010 was 144.5 percent and in neighboring Santa Clara County, 67.3 percent. Over the long term, regional growth could contribute to higher use demand at the Plan Area. Between 2000 and 2010, the Bay Area added 366,979 residents, an increase of more than 5 percent, for a total current population of approximately 7.2 million (ABAG 2011a). The Association of Bay Area Governments (ABAG) projects that growth in the region will accelerate, adding another 1.2 million residents by 2025, an increase of more than 16 percent (ABAG, no date).

In Santa Clara County, the closest Bay Area county to the Plan Area, most population growth is expected to occur in San Jose and to a lesser extent in the south county, while the north and west valley cities are expected to experience relatively little growth. Santa Clara County's projected growth rates for the periods of 2000 to 2010 and 2010 to 2020 are much lower than Merced County, 12 percent and 7 percent, respectively. In 2010, the population of Santa Clara County reached 1.8 million persons, nearly 285,000 more than in 1990 (ABAG 2011b). Annual growth rates during that period ranged from 12,000 to 22,000 persons per year. From 2010 to 2040, the population of Santa Clara County is expected to grow by 21 percent (DOF 2012).

2.12.2 Local Population Trends and Projections

2.12.2.1 Population Growth

Population growth in the San Joaquin Valley and for Merced County in particular could also contribute to higher use demand at the Plan Area. The County's 2010 population of 258,495 is distributed among six incorporated cities: Atwater (27,755), Dos Palos (5,041), Gustine (5,250), Livingston (14,051), Los Banos (36,421), and Merced (80,985). The remaining 88,992 residents are in unincorporated areas.

Table 2-27 depicts population growth during the past decade among jurisdictions in Merced County. Population shifts in Los Banos are especially noteworthy. The catalyst for its rapid growth (78.1 percent between 1990 and 2000 and 40.8

percent between 2000 and 2010) was migration from Santa Clara and other Bay Area counties, as families pursued affordable housing on the west side of Merced County. In 2010, Merced County's total population was 258,495, a 22.8 percent increase over the population in 2000 (210,554).

Table 2-27
Merced County Census Population Estimates and Percent Change 2000-2010

Jurisdiction	2000	2010	Percent Change
Merced County Total	210,554	258,495	22.8%
Atwater	23,113	27,755	20.1%
Dos Palos	4,385	5,041	15.0%
Gustine	4,698	5,250	11.7%
Livingston	10,473	14,051	34.2%
Los Banos	25,869	36,421	40.8%
Merced	63,893	80,985	26.8%
Unincorporated areas	78,123	88,992	13.9%

Source: California Department of Finance 2010.

2.12.2.2 Population Forecast

Merced County Population projections for Merced County and its cities and communities are shown in Tables 2-28 and 2-29. The county is projected to grow by 27 percent between 2010 and 2020, and 26 percent between 2020 and 2030. From 2010 to 2040, the population of Merced County is projected to grow by a total of 98 percent (DOF 2012). The actual growth rates may be affected by the recent downturn in housing and the economy. The majority of the county's population lives in incorporated areas including Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced, all of which have shown steadily increasing population growth over recent decades.

Table 2-28
Merced County Population and Employment Forecast

	2010	2015	2020	2025	2030	2035
Population	260,000	287,000	331,000	372,000	417,500	465,500
Employment	85,200	--	110,800	--	138,200	155,300

Source: Merced County Association of Governments 2010a.

Table 2-29
Population Forecast by City or Community Growth Area Boundaries

	2010	2015	2020	2025	2030	2035
City or Community						
Atwater	28,100	30,100	34,200	37,700	41,600	45,400
Dos Palos	5,000	6,700	7,100	7,500	8,000	8,500
Gustine	5,300	5,600	6,200	6,700	7,300	8,000
Livingston	141,000	16,400	19,900	22,900	26,200	29,500
Los Banos	36,600	41,000	48,100	54,300	61,200	68,000
Merced	81,500	91,500	107,600	121,800	137,400	152,100
Delhi	10,900	12,400	14,800	16,800	19,000	21,300
Franklin/Beachwood	4,500	4,800	5,400	5,900	6,400	7,100
Hilmar	5,600	6,100	7,000	7,800	8,600	9,500
Le Grand	1,800	1,800	1,900	2,000	2,100	2,300
Planada	4,800	5,000	5,500	5,900	6,300	6,800
Santa Nella	1,800	2,600	3,600	4,500	5,400	6,400
Winton	9,900	10,300	11,300	12,100	13,000	14,100
UC Merced & UC Community	1,900	4,700	9,400	15,600	22,500	31,300
Remainder of Unincorporated	48,200	48,000	49,000	50,500	52,500	55,200
Totals						
Incorporated	170,600	191,300	233,100	250,900	281,700	311,500
Unincorporated	89,400	95,700	107,900	121,100	135,800	154,000
Merced County	260,000	287,000	331,000	372,000	417,500	465,500

Source: Merced County Association of Governments 2010a.

Notes:

Population for years 2010 through 2030 are rounded to nearest 100.

South Dos Palos/Midway assumed to be annexed into Dos Palos as of 2010 (shift of 1,500 persons from "Remainder Unincorporated" to "Dos Palos")

Population and forecast data are from MCAG, which prepares and maintains population and employment forecasts for use in regional planning and relies on the latest Department of Finance (DOF) projections for the county-wide total. DOF's latest forecasts were published in 2007; however, MCAG staff calculated an alternate forecast using decentennial growth rates implied by the DOF 2007 projections, but started from a lower base population to account for the recent slowdown in growth associated with the economic downturn (MCAG 2010a).

City of Los Banos The City of Los Banos General Plan used shift-share projections from the ABAG to formulate population projections. This data was adjusted to fit probability trends, and then further projected for Los Banos using a constant share method. Population growth estimates are included in Table 2-30. The actual population of Los Banos in 2010 was 35,972 (U.S. Census Bureau 2011).

Table 2-30
Los Banos Population Projections: 2020-2030

Year	Population
2020	60,700
2030	90,400

Source: City of Los Banos General Plan 2007.

Santa Nella In 1990, the community of Santa Nella had 584 residents living in 273 dwelling units. In 2010, the Santa Nella population was 1,380 residents in 493 dwelling units (U.S. Census Bureau 2011). The current Santa Nella Community Specific Plan, published in May 2000, proposes development with a buildout population of 18,941, but most of the planned development has not yet occurred.

2.12.3 Demographic and Economic Projections and Trends

2.12.3.1 Demographic Diversity

Merced County has a relatively young population, with a median age of 29.6 years. Santa Clara County has a slightly older population, with a median age of 36.2 years (2010 data). Of the Merced adults age 25 and older, 68.6 percent are high school graduates and 12.3 percent have a bachelor's degree or higher. Of those in Santa Clara County, 86.4 percent are high school graduates and 46.1 percent have a bachelor's degree or higher (2010 data). Merced County has a diverse ethnic profile: 58.0 percent white, 3.9 percent black or African American, 1.4 percent Native American or native Alaskan, 7.4 percent Asian, and 54.9 percent Hispanic or Latino (of any race) (2010 data). A language other than English is spoken in 51.9 percent of households; 24.5 percent of the county population is foreign-born (2010 data). Santa Clara County is 47.0 percent white, 2.6 percent black or African American, 0.7 percent Native American or Native Alaskan, 32.0 percent Asian, and 26.9 percent Hispanic or Latino (of any race) (2010 data). A language other than English is spoken in 51.1 percent of Santa Clara County households; 37.1 percent of the county population is foreign-born (2010 data) (U.S. Census Bureau 2011; American Community Survey 2010).

2.12.3.2 Employment (Local Market Analysis)

Merced County's economy has historically been based on agriculture and related industries, along with a substantial tourist trade, leading to highly seasonal employment patterns and high rates of unemployment. The county's economy is now primarily based on the health, education, and social services industries. The median household income is $42,449 (2010 data). Unemployment is 18.2 percent and 23.0 percent of the population lives below the poverty level (2010 data). In recent years, the county has sought to develop a broader economic base by expanding the tourist trade, such as recreational opportunities associated with the Plan Area. The county's primary employers include health, education, and social services (20 percent), retail (13 percent), agriculture and natural resources (12

percent), manufacturing (11 percent), and professional and managerial services (6 percent). Minor employers include construction, arts and entertainment, recreation and tourism, transportation, utilities, finance, insurance, real estate, wholesale trade, and the state and federal governments (U.S. Census Bureau 2011, American Community Survey 2010).

Santa Clara County, by comparison, has a higher median household income of $85,002 (2010 data). Santa Clara County has a broader economic base, and its primary employers are health, education, and social services (19.3 percent), manufacturing (18.7 percent), and professional and managerial services (18.5 percent). At 11.2 percent, the unemployment rate in Santa Clara County is lower than in Merced County, as is the poverty level, with 10.5 percent of the population living below the poverty level (U.S. Census Bureau 2011, American Community Survey 2010).

ABAG estimated that the Bay Area economy supported nearly 3.5 million jobs during 2010 (ABAG 2009). The majority of jobs in the nine-county Bay Area in 2010 were distributed among the health and education services industry (17 percent), the manufacturing and wholesale industry (16 percent), the professional and managerial services industry (15 percent), and the arts, recreation, and related industries (13 percent). The remaining 39 percent of the region's jobs were distributed among the following industry categories: retail, financing and leasing, construction, transportation and utilities, information, government, agriculture, and natural resources. (Employment refers to the number of full- and part-time jobs by category or sector for the Bay.)

2.13 Environmental Justice

To comply with Executive Order 12898, Federal Action to Address Environmental Justice in Minority and Low-Income Populations, data were compiled for the ethnic composition and income and poverty levels of the State, Merced County, and Santa Clara County.

2.13.1 Race and Ethnicity

A minority community is defined as a distinct population that is composed of predominantly one or more racial or ethnic group that is nonwhite. Table 2-31 presents racial/ethnic composition data for the State of California and Merced and Santa Clara Counties. In 2020, nonwhites are projected to comprise approximately 72 percent of the population of Merced County, which is about 9 percent higher than the total percentage of nonwhites in California (63 percent). In Santa Clara County, the percentage of nonwhites (63 percent) is about equal to the State percentage of nonwhites. In both Merced and Santa Clara Counties, the Hispanic population will form the greatest portion of the nonwhite population (63 and 28 percent of the total population, respectively, for 2020). The percentages of nonwhite and Hispanic populations have increased in California, and Merced and Santa Clara Counties since 2000 and are projected to increase, with the most

significant increase occurring in Merced County (California Department of Finance 2007).

In 2030, California's population is projected to be approximately 67 percent nonwhite, with 45 percent of the total population being Hispanic. In Merced County in 2030, the percentages of nonwhite residents (77 percent) is projected to be greater than the State average (67 percent), while the percentage of nonwhite residents in Santa Clara County is anticipated to be lower (66 percent) than both Merced County and the State. In both Merced and Santa Clara Counties, the Hispanic population will continue to form the greatest portion of the nonwhite population (69 and 31 percent of the total population, respectively), for 2030 (California Department of Finance 2007).

Table 2-31
Population Ethnicity Estimates for California, Merced and Santa Clara Counties

	Population								
Year	White	Hispanic	Asian	Pacific Islanders	Black	American Indian	Multi-Race	% Non-White	Total
California									
2000	16,134,334	11,057,467	3,761,994	110,355	2,218,281	185,996	637,010		34,105,437
Percent	47.3%	32.4%	11%	0.3%	6.5%	0.5%	1.9%	52.7%	
2010	16,438,784	14,512,817	4,684,005	149,878	2,287,190	240,721	822,281		39,135,676
Percent	42%	37.1%	12%	0.4%	5.8%	0.6%	2.1%	58%	
2020	16,508,783	18,261,267	5,527,783	196,576	2,390,459	299,599	951,456		44,135,923
Percent	37.4%	41.4%	12.5%	0.5%	5.4%	0.7%	2.2%	62.6%	
2030	16,377,652	22,335,895	6,334,719	246,363	2,475,477	350,649	1,120,136		49,240,891
Percent	33.3%	45.4%	12.9%	0.5%	5%	0.7%	2.3%	66.7%	
Merced County									
2000	88,105	95,961	14,738	307	7,718	1,177	3,475		211,481
Percent	41.7%	43.4%	7%	0.2%	3.7%	0.6%	1.6%	58.3%	
2010	91,799	153,698	15,949	350	6,920	1,232	3,987		273,935
Percent	33.5%	56.1%	5.8%	0.1%	2.5%	0.5%	1.5%	66.5%	
2020	97,109	220,060	18,055	395	7,009	1,306	4,756		348,690
Percent	27.9%	63.1%	5.2%	0.1%	2%	0.4%	1.4%	72.1%	
2030	101,543	304,592	19,191	427	6,984	1,321	5,847		439,905
Percent	23.1%	69.2%	4.4%	0.1%	1.6%	0.3%	1.3%	76.9%	
Santa Clara County									
2000	761,619	405,854	434,437	5,345	45,712	5,487	34,674		1,693,128
Percent	45%	24%	25.7%	0.3%	2.7%	0.3%	2%	55%	
2010	744,753	475,255	500,916	15,733	47,092	8,517	45,095		1,837,361
Percent	40.5%	25.9%	27.3%	0.9%	2.6%	0.5%	2.5%	59.5%	
2020	738,743	560,058	548,927	30,498	47,586	12,589	54,404		1,992,805
Percent	37.1%	28.1%	27.6%	1.5%	2.4%	0.6%	2.7%	62.9%	
2030	742,591	672,298	598,866	48,166	47,096	17,407	70,077		2,192,501
Percent	33.9%	30.7%	27.3%	2.2%	2.2%	0.8%	3.2%	66.1%	

Source: State of California, Department of Finance, Race/Ethnic Population with Age and Sex Detail, 2000–2050. Sacramento, CA, July 2007.

2.13.2 Income and Poverty

The U.S. Census Bureau uses a set of income thresholds that vary by family size and composition to determine which families are living in poverty. Poverty thresholds do not vary geographically but are updated annually for inflation using the Consumer Price Index. According to the U.S. Census Bureau, the average

poverty threshold in 2010 was $11,139 for an individual and $22,314 for a family of four.

Table 2-32 shows estimated median household income and poverty levels for California, and Merced and Santa Clara Counties. According to the 2010 U.S. Census, the percentage of the population of Merced County at income levels below the poverty threshold (23 percent) was greater than the State average of 15.8 percent. The median household income in Merced ($42,449) was also below the State household median income of $57,708 (U.S. Census Bureau 2010). On the other hand, the percentage of the population of Santa Clara County at income levels below the poverty threshold (10.5 percent) is about 5 percent lower than the State average. The median household income in Santa Clara County ($85,002) is significantly higher than the median household income of California.

Table 2-32
Median Household Income and Poverty Levels, 2010

Location	Median Household Income	Percent in Poverty
California	$57,708	15.8%
Merced County	$42,449	23%
Santa Clara County	$85,002	10.5%

Source: U.S. Census Bureau, 2010 American Community Survey