CHAPTER 9. SPECIAL-STATUS PLANTS AND WILDLIFE

9.1. INTRODUCTION

The Mutual Goals Statement (see Chapter 1) directs the scope of the San Joaquin River Restoration Study to consider restoration of the entire ecosystem, including plants, wildlife, and other native fish species as well as anadromous salmonids. The purpose of this chapter is to describe the life histories and habitat requirements of special-status plants and wildlife along the San Joaquin River corridor, with the exception of special-status fish species, which are discussed in Chapter 7.

This chapter also provides an overview of the special-status plant and wildlife species that could be affected by future restoration efforts. The degradation and elimination of natural habitat in the floodplain of the San Joaquin River and adjacent upland areas has contributed to a decline in population size for many fish, wildlife, and plant species. In particular, species that depend on wetlands and riparian habitats have declined, and several species that depend on grassland have also declined (Moore et al. 1990, Williams et al. 1997). State and federal resource agencies have listed a number of species as threatened or endangered, while other species are of concern and may become listed in the future. These species are of significance to the Restoration Study because restoration actions should benefit many of these species and result in an increase of their habitat. Restoration efforts could potentially contribute to the recovery of some of these species, or could reduce the necessity of future listing of species of concern. However, restoration actions could potentially also adversely affect listed species. Some potentially adverse impacts will be short-lived, such as those associated with physical modification of the river channel, while others could persist as a result of long-term changes to habitat.

Several species that historically occurred within the San Joaquin River basin that are now extirpated from the study area are included in this report because restoration of the historical habitat of these species along the San Joaquin River could potentially contribute to their reintroduction to the area. Examples include the California red-legged frog, a federally threatened species that occurs in wetlands and aquatic habitats; the least Bell's vireo, a state- and federally endangered bird that breeds in riparian habitats; and the fulvous whistling duck, a federal candidate for listing, which used to breed in the San Joaquin Valley.

Describing the life histories and habitat requirements of these species is an important step in developing the Restoration Study. This understanding will allow the Restoration Study to target actions that would benefit numerous native plant and animal species. For example, a healthy floodplain with riparian vegetation in Reach 5 may improve habitat connectivity and provide migratory corridors between areas of the San Joaquin National Wildlife Refuge. Restoring specific hydrograph components and associated physical processes, such as the historical spring snowmelt flood, may benefit many other native fish species (in addition to salmonids).

9.2. OBJECTIVES

The objectives of this chapter are to:

- identify threatened and endangered species and other species of concern that may be adversely impacted or benefited by a restoration program on the San Joaquin River;
- summarize life history and habitat requirements of each special-status species as well as its historical and existing abundance and distribution; and
- provide a brief statement how restoration activities may affect these species of concern.

The number of species that are threatened, endangered, sensitive, and/or extirpated from the study area is substantial, and providing detailed descriptions of each species and speculating on anticipated responses of each species to the myriad of potential restoration actions is beyond the scope of this chapter. The following sections provide an introductory description of the species and their distribution. For conciseness, the anticipated responses of each species to potential restoration actions is illustrated in three matrices in Section 9.6.

9.3. STUDY AREA

The study area encompasses the San Joaquin River from Friant Dam to the confluence with the Merced River, and includes the riparian corridor and adjacent upland habitats. The width of the study area would vary based on this definition, ranging from as low as 1,000 feet in Reach 1 to several miles in downstream reaches. Thus, the study area includes the area that will be directly affected by the Restoration Study, as well as upland habitats that also may be used by species associated with the San Joaquin River corridor during part of their life cycle or for some life-history needs.

9.4. DATA SOURCES

Information was gathered and reviewed to develop lists of and describe special-status plant and wildlife species that are known to exist, could potentially exist, or historically existed in the study area. Several data sources were reviewed to develop these lists, including records from CDFG's California Natural Diversity Data Base (CNDDB 2002), published and unpublished literature, and reconnaissance-level field surveys conducted for this and other projects along the San Joaquin River (e.g., Riparian Habitat Restoration Program, Rank Island channel repair, Milburn Unit restoration project). The following USGS quadrangles encompass the study area (within about 2 miles of the San Joaquin River and bypass systems) and were searched in the CNDDB: Biola, Bliss Ranch, Broadview Farms, Delta Ranch, Firebaugh, Firebaugh Northeast, Fresno North, Friant, Gravelly Ford, Gregg, Gustine, Herndon, Ingomar, Jamesan, Lanes Bridge, Little Table Mountain, Madera, Mendota Dam, Millerton Lake West, Newman, Ocalis, Poso Farm, San Luis Ranch, Sandy Mush, Santa Rita Bridge, Stevinson, Tranquility, and Turner Ranch. These quadrangles provided adequate coverage of the study area.

Focused field surveys and habitat assessments for special-status species have not been conducted in the project area for the specific purpose of this chapter, although pilot studies have collected useful information (Newman et al. 2001; PRBO unpublished data 2002; Wolfe and Assoc. unpublished data 2000 and 2001; and Kucera et al. 2001 for Reach 2). This chapter is based on information available from the existing data sources described above. Comprehensive reach-specific data for most species that could occur along or adjacent to the San Joaquin River are lacking. Previous analyses of special-status species occurrences in the study area have been conducted in the West Bear Creek area (JSA et al. 2000, JSA 2001a), which includes portions of Reaches 5 and 4B, and Reach 2A (JSA 2001b). Therefore, the data available for these reaches is generally more comprehensive than for other locations in the project area. The West Bear Creek area includes all or portions of the West Bear Creek (formerly the West Gallo Property), San Luis, Kesterson, Frietas, and Arena Plains units of the San Luis National Wildlife Refuge (NWR); and Great Valley Grasslands State Park. Available information on species occurrence in the vicinity of the San Joaquin River is summarized below for each species, but it should be noted that species could occur in areas where they have not been documented, as long as suitable habitat is available.

9.5. SPECIAL-STATUS SPECIES

For the purpose of this document, special-status species are plants and animals that are legally protected under the federal Endangered Species Act (ESA), California Endangered Species Act (CESA) or other state regulations, and species that are considered sufficiently rare by the scientific community to warrant conservation concern.

Special-status plants and animals are species in the following categories:

- species listed, proposed for listing, or candidates for possible future listing as threatened or endangered under the federal ESA (50 CFR 17.12 [listed plants], 50 CFR 17.11 [listed animals], various notices in the Federal Register [proposed species], and 64 FR 57534, October 25, 1999 [candidate species]);
- species listed or proposed for listing by the State of California as threatened or endangered under the CESA (14 CCR 670.5);
- plants designated as rare under the California Native Plant Protection act (California Fish and Game Code, Section 1900 et seq.);
- plants considered by the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California" (Lists 1B and 2 in CNPS 2001);
- animals considered species of special concern by California Department of Fish and Game (CDFG) (Remsen 1978 [birds], Williams 1986 [mammals], and Jennings and Hayes 1994 [amphibians and reptiles]);
- animals fully protected in California (California Fish and Game Code, Section 3511 [birds], 4700 [mammals], and 5050 [amphibians and reptiles]);
- birds of prey, their nests, and eggs (California Fish and Game Code, Section 3503.5);
- bald and golden eagles (Bald Eagle Protection Act of 1940); and
- birds designated as sensitive species under California Forest Practice Rules by the California Department of Forestry and Fire Protection (14 CCR 898.2(d)).

9.5.1. Federally-Listed and State-Listed Plants

This section describes the special-status plant species that occur or have the potential to occur in the project area. A total of 28 special-status plant species were identified as having the potential to occur in the project area (Table 9-1). Ten of these 28 species have been reported to occur in the project area. The remainder of these 28 species is not known to occur in the project area, but they occur, or occurred historically, in the vicinity of the project area, and the project area contains potential habitat for these species. The potential for occurrence of these species was classified as low, moderate, or high (Table 9-1). This classification was based primarily on the availability of suitable habitat in the project area, and the proximity of the project area to documented occurrences of the species.

The legal status, California distribution, habitat requirements, and potential for occurrence of special-status plants are summarized in Table 9-1. Each of the species is briefly described below.

9.5.1.1. Succulent (Fleshy) Owl's Clover (*Castilleja campestris* ssp. *succulenta*)

Succulent owl's-clover is listed as threatened by the US Fish and Wildlife Service (USFWS) and as endangered by the State of California (CDFG 2000). The California Native Plant Society has placed it on List 1B (CNPS 2001). Its discontinuous distribution extends along the base of the Sierra Nevada

Table 9-1. Special-status plant species with potential to occur in the study area.

Common and Scientific Names	Status[1] Federal/State/CNPS	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
Alkali milk-vetch *Astragalus tener* var. *tener*	--/--/1B	Central Valley and eastern San Francisco Bay Area	Alkaline wetlands, vernal pools, and adobe clay valley and foothill grasslands and playas	Documented in study area
Heartscale *Atriplex cordulata*	--/--/1B	West edge of the Central Valley	Alkali grasslands, alkali meadows, alkali scrub	Documented in study area
Crownscale *Atriplex coronata* var. *coronata*	--/--/1B	Central Valley, eastern south inner coast range	Alkaline chenopod scrub, valley and foothill grassland, and vernal pools	Moderate potential
Brittlescale *Atriplex depressa*	--/--/1B	Central Valley and Tulare Basin	Chenopod scrub, playas, valley and foothill grassland on alkaline or clay soils	Documented in study area
San Joaquin spearscale *Atriplex joaquiniana*	--/--/1B	West edge of Central Valley from Glenn County to Tulare County	Alkali meadows, alkali grasslands, saltbush scrub	Moderate potential
Lesser saltscale *Atriplex minuscula*	--/--/1B	Southern San Joaquin Valley	Adjacent to alkali sinks and alkaline vernal pools on sandy soils	Documented in study area
Vernal pool smallscale *Atriplex persistens*	--/--/1B	Scattered locations throughout the Central Valley from Glenn, Merced, Stanislaus, and Tulare counties	Vernal pools on alkaline soils	Documented in study area
Subtle orache *Atriplex subtilis*	--/--/1B	Known from fewer than 20 occurrences including locations in Fresno, King, Madera, and Merced counties	Valley and foothill grassland	High potential; documented in several USGS quads adjacent to study area
Lost Hills crownscale *Atriplex vallicola*	--/--/1B	Lost Hills, vicinity of McKittrick in Kern County, scattered locations in Fresno and Merced counties	Alkali sink, alkaline vernal pool, saltbush scrub	Low potential
Succulent (Fleshy) owl's-clover *Castilleja campestris* ssp. *succulenta*	T/CE/1B	Southern Sierra Nevada foothills, eastern San Joaquin Valley, Fresno, Madera, Merced, Mariposa, San Joaquin, and Stanislaus counties	Vernal pools	Moderate potential; occurs near Friant
Hoover's spurge *Chamaesyce hooveri*	T/--/1B	Central Valley from Butte County to Tulare County	Vernal pools	Moderate potential
Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus*	--/--/1B	Scattered locations in San Joaquin Valley from Solano County to Kern County	Meadows, grasslands, and playas on alkaline soils	Documented in study area

Table 9-1, Cont'd

Common and Scientific Names	Status[1] Federal/State/CNPS	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
Palmate-bracted bird's-beak *Cordylanthus palmatus*	E/CE/1B	Glenn, Colusa, Yolo, Alameda, Madera, and Fresno counties	Chenopod scrub, alkaline grasslands	Moderate potential; known to occur near the study area at the Alkali Sink Ecological Reserve and Mendota Wildlife Management Area
Recurved larkspur *Delphinium recurvatum*	--/--/1B	San Joaquin Valley and central valley of the South Coast Ranges, Contra Costa County to Kern County	Subalkaline soils in annual grassland, saltbush scrub, cismontane woodland, and vernal pools	Moderate potential
Four-angled spikerush *Eleocharis quadrangulata*	--/--/2	Central Valley	Freshwater marshes, lake and pond margins	Moderate potential; known to occur near study area
Round-leaved filaree *Erodium macrophyllum*	--/--/2	Lassen to San Diego counties	Cismontane woodland, clay soils in valley and foothill grassland	Low potential
Delta button-celery *Eryngium racemosum*	--/CE/1B	San Joaquin River delta and floodplains	Seasonally-inundated depressions along floodplains	Documented in study area
Spiny-sepaled button celery *Eryngium spinosepalum*	--/--/1B	Southern and eastern San Joaquin Valley	Valley and foothill grassland, and vernal pools	Moderate potential; known to occur near study area
Munz's tidy-tips *Layia munzii*	--/--/1B	Western San Joaquin Valley and interior foothills valleys from Fresno County to San Luis Obispo County	Chenopod scrub, grasslands, flats and hillsides in alkaline clay soils	Low potential
Madera linanthus *Linanthus serrulatus*	--/--/1B	Fresno, Kern, Madera, Mariposa, and Tulare counties	Cismontane woodland, lower montane coniferous forest	Low potential
Prostrate navarretia *Navarretia prostrata*	--/--/1B	Merced County	Valley and foothill grassland on alkaline soils; vernal pools and other mesic habitats	Moderate potential
Colusa grass *Neostapfia colusana*	T/CE/1B	Merced, Solano, Stanislaus, and Yolo counties	Vernal pools	Moderate potential; known to occur near study area
San Joaquin Valley Orcutt grass *Orcuttia inaequalis*	T/CE/1B	Eastern part of the San Joaquin Valley from Tulare to Merced County	Vernal pools	Moderate potential; occurs near Friant
Hairy Orcutt grass *Orcuttia pilosa*	E/CE/1B	Scattered locations along east edge of the Central Valley and adjacent foothills, from Tehama County to Merced County	Vernal pools	Moderate potential

Table 9-1, Cont'd

Common and Scientific Names	Status[1] Federal/State/CNPS	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
Slender-leaved pondweed *Potamogeton filiformis*	--/--/2	Central Sierra Nevada, San Joaquin Valley, San Francisco Bay Area, and Modoc Plateau	Shallow freshwater marshes	Documented in study area
Hartweg's golden sunburst *Pseudobahia bahiifolia*	E/CE/1B	Eastern side of Sacramento and San Joaquin Valleys and adjacent foothills; historically as far north as Yuba County	Predominantly on northern slopes of rocky, bare or grassy areas along rolling hills, and adjacent to vernal pools and streams	Moderate potential
Sanford's arrowhead *Sagittaria sanfordii*	--/--/1B	Scattered locations in Central Valley and Coast Range	Freshwater marshes, sloughs, canals, and other slow-moving water habitats	Documented in study area
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	--/--/2	Central Valley and south coast	Alkaline meadows, marshes and swamps, riparian forests, and vernal pools	Documented in study area

[1]Status :

Federal
E = listed as endangered under the federal Endangered Species Act
T = listed as threatened under the federal Endangered Species Act
-- = no status

State
CE = listed as endangered under the California Endangered Species Act
-- = no status

California Native Plant Society (CNPS)
1B = List 1B species: rare, threatened, or endangered in California and elsewhere
2 = List 2 species: rare, threatened, or endangered in California, but more common elsewhere

[2] See the text for specific information regarding the location and timing of documented occurrences.

foothills through northern Fresno, western Madera, eastern Merced, southeastern San Joaquin, and Stanislaus counties (CDFG 2000). Thirty-two of the 35 extant populations occur on privately owned land. Succulent owl's-clover occurs in a few vernal pools on Big Table Mountain near Friant in Fresno County on land owned by CDFG and the Bureau of Land Management (BLM). It also occurs in a vernal pool complex in Madera County owned by CalTrans. One population occurs on land owned by the U.S. Bureau of Reclamation (USBR) near the Madera Equalization Reservoir in Madera County. Seven privately owned populations occur on the Flying M Ranch in Merced County, portions over which The Nature Conservancy (TNC) has a conservation easement. Two small occurrences were found in 1997 at the old Castle Air Force Base in Merced County (CDFG 2000).

Conversion of habitat to agriculture, urbanization, proposed gravel and aggregate mining, land fills, flood control, highway expansion, disking of vernal pools, competition from non-native weeds, and inappropriate grazing practices have all been cited as threats to succulent owl's clover. The type-locality of the species near Ryer in Merced County has been destroyed (CDFG 2000).

Succulent owl's-clover is a succulent, hemiparasitic (partly parasitic) annual herb in the figwort family (Scrophulariaceae). It has brittle narrow leaves and heads of bright yellow flowers. This species grows in drying vernal pools in valley grassland areas of the San Joaquin Valley (CDFG 2000).

This species has been recorded in the Fresno North, Friant, Lanes Bridge, and Millerton Lake West study area quadrangles (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.1.2. Hoover's Spurge (*Chamaesyce hooveri*)

Hoover's spurge is listed as threatened under the ESA. It is endemic to vernal pool complexes in the Central Valley. Its historical distribution is not well documented, but presumably it was more common than at present among the vernal pools of the eastern Sacramento and San Joaquin Valleys. This species has been found in 11 pools on the Sacramento NWR in the Sacramento Valley. Hoover's spurge is a small, prostrate, annual herb of the spurge family (Euphorbiaceae) that forms mats from a few inches to a few feet across (Federal Register [149]:41700-41708, August 5, 1993). Hoover's spurge occurs in relatively large, deep vernal pools among the rolling hills, remnant alluvial fans, and depositional stream terraces at the base of the Sierra Nevada foothills. It tends to occur where competition from other species has been reduced by prolonged inundation. Hoover's spurge blooms in July (Skinner and Pavlik 1994).

Hoover's spurge is not known to occur in the study area but it occurs in the region and suitable habitat for this species is present. It has been documented in the Turner Ranch quadrangle (CNDDB 2002). Restoration actions that restore or modify vernal pools could affect this species.

9.5.1.3. Palmate-bracted Bird's-beak (*Cordylanthus palmatus*)

Palmate-bracted bird's-beak is listed as endangered under the ESA and CESA. In 1985, there were only 2 known occurrences of palmate-bracted bird's-beak in the state. As a result of intensive survey efforts and additional introductions, palmate-bracted bird's-beak is now known to occur in 7 populations: 4 in the Sacramento Valley, 1 in the Livermore Valley, and 2 in the San Joaquin Valley (USFWS 1998).

Cordylanthus species are hemiparasitic annuals, meaning that they manufacture their own food but obtain water and nutrients from the roots of other plants. Saltgrass is the most likely host plant for palmate-bracted bird's-beak. The combination of hemiparasitism, salt excretion, and a deep

root system allows palmate-bracted bird's-beak to grow during the hot, dry months after most other annuals have died (Coats et al. 1993). This species is restricted to seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 150 meters (500 feet). Within these areas, palmate-bracted bird's-beak grows primarily along the edges of channels and drainages, with a few individuals scattered in seasonally wet depressions, alkali scalds, and grassy areas (USFWS 1998).

The occurrence of palmate-bracted bird's-beak has been recorded at the Alkali Sink Ecological Reserve and Mendota National Wildlife Refuge, approximately 6 kilometers (km) (4 miles) south of Reach 2A. It has been documented in the Firebaugh Northeast, Poso Farm, and Tranquility quadrangles (CNDDB 2002). Restoration actions that influence seasonally flooded areas along the river corridor could affect this species.

9.5.1.4. Delta Button-celery (*Eryngium racemosum*)

Delta button-celery is listed as endangered under CESA. Delta button-celery's historical distribution includes Calaveras, Merced, Stanislaus, and San Joaquin counties. Of the approximately 20 occurrences recorded in the CNDDB, most have been extirpated, including all occurrences in San Joaquin County and most in Stanislaus County. Most extant occurrences are found in Merced County along the San Joaquin River.

Delta button-celery is an herbaceous perennial in the carrot family (Apiaceae). It grows 10–50 cm tall and occurs at elevations of 15–75 feet. Delta button-celery occurs on clay soils on sparsely vegetated margins of seasonally flooded plains and swales. Suitable habitat is supported by periodic flooding, which maintains seasonal wetland hydrology and reduces competition through scouring (CDFG 1998). The flowering period of Delta button-celery is July to October.

Delta button-celery is known from at least 4 occurrences along the San Joaquin River in the West Bear Creek Unit (CNDDB 2001), and from several locations in seasonal wetlands in the flood basin of the San Joaquin River in the Great Valley Grasslands State (CNDDB 2001, Hoopes et al. 1996). It frequently occurs in association with the mat-forming lippia. More individuals than are recorded in the CNDDB have been observed outside the levees of the West Bear Creek Unit after the 1997 and 1998 flood events. In areas of suitable habitat, these populations were still present in 1999 (D. Woolington, pers. comm., as cited in JSA et al. 2000).

Several occurrences reported by Hoopes et al. (1996) in vernal pools outside the floodplain in the West Bear Creek area were visited during field surveys in 2000 but were not relocated (JSA et al. 2000). The species has been documented in the Gustine, San Luis Ranch, Sandy Mush, Stevinson, and Turner Ranch quadrangles (CNDDB 2002). Restoration actions that restore floodplain inundation could benefit this species.

9.5.1.5. Colusa Grass (*Neostapfia colusana*)

Colusa grass is listed as threatened under ESA and as endangered under CESA. Colusa grass is endemic to the Sacramento and San Joaquin valleys. The species' historical distribution included Merced, Stanislaus, Solano, and Colusa counties. Forty populations are currently known from Merced, Stanislaus, and Solano counties; none remain in Colusa County (CDFG 1992).

Colusa grass is an annual belonging to the grass family (Poaceae) and grows 10–30 centimeters (cm) tall. It occurs in large or deep vernal pools on clay substrates (CNDDB 1998). The flowering period for Colusa grass is May–July.

Colusa grass currently exists within one vernal pool on the Arena Plains Unit of the San Luis NWR, and on privately owned vernal pools located approximately 3 miles east of the Arena Plains Unit (JSA et al. 2000). It has the potential to occur in the study area because suitable habitat is present in the study area. It has been documented in the Sandy Mush and Turner Ranch quadrangles (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.1.6. San Joaquin Valley Orcutt Grass (*Orcuttia inaequalis*)

San Joaquin Valley Orcutt grass is listed as threatened under ESA and endangered under CESA. This grass is the only Orcutt grass restricted to the San Joaquin Valley. San Joaquin Valley Orcutt grass was once common along the eastern margin of the valley in Stanislaus, Merced, Fresno, Madera, and Tulare counties. Most of the remaining occurrences of San Joaquin Valley Orcutt grass are concentrated in 2 small areas in eastern Merced County. The species occurs in 2 vernal pools that are partially on land owned by BLM and partially on private land on Big Table Mountain near Friant in Fresno County. San Joaquin Valley Orcutt grass also occurs in a vernal pool complex in Madera County that was acquired by the California Department of Transportation (CalTrans) in 1995 for mitigation purposes. Just before acquisition by CalTrans, the pools were disked, which resulted in an invasion by upland plants. Nonetheless, the pools still support rare species. In 1997, a small population of San Joaquin Valley Orcutt grass was discovered in a vernal pool on CDFG's Stone Corral Ecological Reserve in Tulare County. Three occurrences of the species on the Flying M Ranch in Merced County are protected through conservation easement agreements with TNC. Twenty-two of the approximately 25 extant occurrences are privately owned. The overall trend for this species is one of decline (CDFG 1999).

San Joaquin Valley Orcutt grass is a small, grayish-green, sticky, aromatic, tufted annual of the grass family (Poaceae) that occurs in vernal pools. The plant has several stems 2–6 inches tall, terminating in a spike-like inflorescence (58 Federal Register [149]:41700-41708, August 5, 1993). The blooming period for this species is from May though September (Skinner and Pavlik 1994).

San Joaquin Valley Orcutt grass occurs near Friant, and suitable habitat for this species is present on clay soils on hillsides far above the river. It has been documented in the Fresno North, Friant, and Lanes Bridge quadrangles (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.1.7. Hairy Orcutt Grass (*Orcuttia pilosa*)

Hairy Orcutt grass is listed as endangered by both the USFWS and the state of California (CDFG 2000). The California Native Plant Society has placed it on List 1B (CNPS 2001). The historical range includes the eastern margins of Sacramento and San Joaquin valleys from Tehama County south to Stanislaus County and through Merced and Madera Counties. Only 24 of 34 historically known populations still exist (USFWS 2002). Conversion of vernal pool habitat to irrigated agriculture or to urban uses has been the primary factor leading to decline in this species (USFWS 2002). Of the 24 native, extant populations and 1 translocated population, only 12 populations are considered stable (USFWS 2002). CDFG (2000) reported that several extant occurrences are damaged or declining, and at least 11 occurrences contain less than 1,000 individuals. Occurrences with such small numbers of individuals are particularly susceptible to decline over time and ultimate extirpation.

Hairy Orcutt grass is a yellow-green, aromatic, tufted, annual in the grass family (Poaceae) (CDFG 2000). It inhabits vernal pools in rolling topography on remnant alluvial fans and stream terraces. Hairy Orcutt grass can tolerate some grazing, but ecologically appropriate livestock numbers, timing,

and intensity are unknown (CDFG 2000). However, as long as the land remains in dry pasture, moderate grazing regimes appear to have little impact on Orcutt grasses (USFWS 2002).

This species has been recorded in the Gregg, Herndon, Lanes Bridge and Madera quadrangles (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.1.8. Hartweg's Golden Sunburst (*Pseudobahia bahiifolia*)

Hartweg's golden sunburst, also known as Hartweg's pseudobahia, is listed as endangered under ESA and CESA. Hartweg's golden sunburst is endemic to the Central Valley. Historically, the species' range may have extended from Yuba County south to Fresno County, approximately 200 miles, but it was only abundant in a few locations. Today, only 16 extant occurrences are known, which are concentrated in the Friant region of Fresno and Madera counties and the La Grange region in Stanislaus County (CDFG 1992; 57 FR [230]:56549-56555, November 30, 1992). Twelve populations remain in Stanislaus County, 2 in Madera County, and 2 in Fresno County (CDFG 1999). Of the 16 extant occurrences of Hartweg's golden sunburst, 11 are very small and contained fewer than 200 plants in 1990. Part of one population in Fresno County occurs on land owned by the U.S. Bureau of Reclamation, and another part of the same population is protected by a conservation easement with the Nature Conservancy. All other populations are on privately owned land. The overall trend for species is one of decline (CDFG 1999).

Hartweg's golden sunburst is a slender, woolly annual in the sunflower family (Asteraceae). It has 1 or a few stems 2–6 inches tall, with mostly narrow, undivided leaves, and yellow ray flowers. Hartweg's golden sunburst occurs on the grassy slopes of valley and foothill grasslands and at the margins of blue-oak woodland, primarily on shallow, well-drained, fine-textured and gravelly soils of the Amador and Rocklin series (57 FR [230]:56549-56555, November 30, 1992). Hartweg's golden sunburst typically occurs on the north- or northeast-facing slopes of mima mounds, which are often associated with vernal pools, with the highest densities on upper slopes having minimal grass cover (CDFG 1999). Hartweg's golden sunburst blooms in March and April (Skinner and Pavlik 1994).

Hartweg's golden sunburst occurs near Friant. It has been documented in the Millerton Lake West and Friant quadrangles (CNDDB 2002). Restoration actions that influence grasslands and vernal pools could affect this species.

9.5.2. Other Special-status Plants

9.5.2.1. Alkali Milk-Vetch (*Astragalus tener* var. *tener*)

The California Native Plant Society has placed alkali milk-vetch on List 1B (CNPS 2001). The historical distribution of alkali milk-vetch includes the southern Sacramento Valley, northern San Joaquin Valley, and the eastern San Francisco Bay Area. This species is believed extirpated from all historical occurrences except for those in Merced and Yolo counties.

Alkali milk-vetch is an annual herb of the legume family (Fabaceae) that grows 4–30 cm tall (Hickman 1993). This species is associated with the clay soils of alkaline flats and meadows, valley and foothill grasslands, and alkaline vernal pools. The flowering period of alkali milk-vetch is March–June (Skinner and Pavlik 1994).

Four occurrences of this plant have been reported from the Great Valley Grasslands State Park in the West Bear Creek area of the San Luis NWR (Hoopes et al. 1996). It has been documented in the Gustine, San Luis, and Stevinson quadrangles (CNDDB 2002). Restoration actions that influence alkaline wetlands and grasslands could affect this species.

9.5.2.2. Heartscale (*Atriplex cordulata*)

Heartscale has been placed on List 1B by CNPS (CNPS 2001). It is endemic to alkali desert scrub and grassland habitats of Alameda, Butte, Fresno, Glenn, King, Kern, Madera, Merced, Solano, and Tulare counties. There are more than 35 known occurrences of heartscale, with populations ranging from 10 to 3,500 individuals (CNDDB 1998).

Heartscale is an annual herb of the goosefoot family (Chenopodiaceae) that grows 10–50 cm (4–20 inches) tall (Hickman 1993). This species lives in moderately alkaline or saline soil in chenopod scrub, desert scrub, or sandy grassland habitats (Skinner and Pavlik 1994). Heartscale blooms from May to October (Skinner and Pavlik 1994).

Heartscale has been reported to occur in the study area in the Great Valley Grasslands State Park, and also occurs elsewhere in the region (CNDDB 2001). It has been documented in numerous quadrangles of the project area (CNDDB 2002). Restoration actions that influence alkaline or saline scrub or grassland could affect this species.

9.5.2.3. Crownscale (*Atriplex coronata* var. *coronata*)

Crownscale has been placed on List 1B by CNPS (CNPS 2001). It is known from the Central Valley and southeastern inner coast range, including Alameda, Contra Costa, Stanislaus, Merced, Fresno, Kings, Kern, Monterey and San Luis Obispo counties (Skinner and Pavlik 1994).

Crownscale is an annual herb of the goosefoot family (Chenopdiaceae) and is similar to heartscale (Hickman 1993). It occurs on alkaline soils in chenopod scrub, grassland, and vernal pools. The flowering period is from April to October. Crownscale is known to occur in the region and habitat is present in West Bear Creek area (JSA et al. 2000). Restoration actions that affect alkaline uplands and vernal pools could affect this species.

9.5.2.4. Brittlescale (*Atriplex depressa*)

Brittlescale has been placed on List 1B by CNPS (CNPS 2001). It is known to occur in Alameda, Contra Costa, Colusa, Fresno, Glenn, Kern, Madeira, Merced, Solano, Tulare, and Yolo counties. It is believed to be extirpated from Stanislaus County (Skinner and Pavlik 1994).

Brittlescale is an annual herb from the goosefoot family (Chenopodiaceae). The species is found in chenopod scrub, playas, and valley-foothill grassland habitats on clay or alkaline soils (Skinner and Pavlik 1994). One occurrence of brittlescale has been reported from the Great Valley Grasslands State Park in the West Bear Creek area (Hoopes et al. 1996). It has been documented in the Bliss Ranch, Jamesan, Sandy Mush, Stevinson, and Tranquility quadrangles (CNDDB 2002). Restoration actions that influence alkaline uplands and wetlands could affect this species.

9.5.2.5. San Joaquin Spearscale (*Atriplex joaquiniana*)

San Joaquin spearscale has been placed on List 1B by CNPS (CNPS 2001). It is known from Alameda, Contra Costa, Colusa, Glenn, Merced, Napa, Sacramento, San Benito, Solano, and Yolo counties. It is believed to be extirpated from Santa Clara, San Joaquin, and Tulare counties (Skinner and Pavlik 1994).

San Joaquin spearscale is an annual herb of the goosefoot family (Chenopodiaceae). This species grows to 10–100 cm in height (Hickman 1993). San Joaquin spearscale grows on sites with low vegetative cover in alkali desert scrub, chenopod scrub, seasonal alkali meadows, and grassland habitats on alkaline soils. The flowering period of San Joaquin saltbush is April–September (Skinner and Pavlik 1994).

San Joaquin spearscale has been reported from the region and suitable habitat is present in the West Bear Creek area (JSA et al. 2000). It has been documented in the Gustine quadrangle (CNDDB 2002). Restoration actions that influence alkaline uplands could affect this species.

9.5.2.6. Lesser Saltscale (*Atriplex minuscula*)

Lesser saltscale has been placed on List 1B by CNPS (CNPS 2001). It is known to have occurred historically in the southern San Joaquin Valley (Hickman 1993). Its distribution extended through Fresno, Kern, Madera, Merced, and Tulare counties (Skinner and Pavlik 1994). The species is now known to occur only in Merced, Kern, Fresno, and Butte counties (CNDDB 1998).

Lesser saltscale is an annual herb of the goosefoot family (Chenopodiaceae) (Hickman 1993). The species has many upright reddish stems that grow up to 40 cm (16 inches) tall, and egg-shaped leaves. Lesser saltscale occurs in alkaline soils of chenopod scrub, playa, and grassland habitats (Skinner and Pavlik 1994). The flowering period of lesser saltscale is May–October (Skinner and Pavlik 1994).

Two occurrences of lesser saltscale have been reported from the Great Valley Grasslands State Park (Hoopes et al. 1996) and from occurrences in the Freitas Unit (Woolington, pers. comm., as cited in JSA et al. 2000) in the West Bear Creek area. It has been documented in the Bliss Ranch, Jamesan, Mendota Dam, Poso Farm, and Sandy Mush quadrangles (CNDDB 2002). Restoration actions that influence alkaline uplands and wetlands could affect this species.

9.5.2.7. Vernal Pool Smallscale (*Atriplex persistens*)

Vernal pool smallscale has been placed on List 1B by CNPS (CNPS 2001). It is distributed throughout portions of Glenn, Merced, Solano, Stanislaus, and Tulare counties (CNDDB 1999, Skinner and Pavlik 1994).

Vernal pool saltbush is an annual herb of the goosefoot family (Chenopodiaceae). This species is found in chenopod scrub and vernal pool communities. The flowering period of vernal pool saltbush blooms is July–September (Skinner and Pavlik 1994).

This species has been reported from in the West Bear Creek Unit of the San Luis NWR (CNDDB 1999). It has been documented in the Gustine, San Luis Ranch, Sandy Mush and Stevinson quadrangles (CNDDB 2002). Restoration actions that influence alkaline scrub and vernal pools could affect this species.

9.5.2.8. Subtle Orache (*Atriplex subtilis*)

Subtle orache has been placed on List 1B species by CNPS (CNPS 2001). It is confined to south-central California, mostly in Tulare, Fresno, Kern, and Kings counties (Stutz and Chu 1997). Subtle orache is a short-statured, fine-textured, diploid annual (Stutz and Chu 1997) found in valley and foothill grasslands (CNPS 2001). The blooming period is from June to October.

This species has been recorded in the Bliss Ranch, Jamesan, Sandy Mush, and Santa Rita Bridge quadrangles (CNDDB 2002). Restoration actions that influence grasslands could affect this species.

9.5.2.9. Lost Hills Crownscale (*Atriplex vallicola*)

Lost Hills crownscale has been placed on List 1B species by CNPS (CNPS 2001). A dicot in the family Chenopodiaceae, this annual herb is endemic to California (Lum 1975 and Walker 1992, both as cited in CalFlora 2002). Historical locations for Lost Hills crownscale include Fresno, Kern, and

San Luis Obispo counties. Only two large centers of concentration remain today. Other historically-known occurrences and much suitable valley-floor habitat have been destroyed by conversion to agriculture (Cypher 2002).

Walker (1992, as cited in CalFlora 2002) describes the Lost Hills crownscale as occurring in alkaline soil under vernally-flooded conditions in vernal-pool habitats. USFWS (1997, as cited in CalFlora 2002) reported that the species usually occurs in wetlands, but is also occasionally found in non-wetlands. Lost Hills crownscale has been reported at elevations between 0 and 1,000 feet (Lum 1975 and Walker 1992, both as cited in CalFlora 2002).

The two main remaining populations occur in the Kern-Kings county boundary near the community of Lost Hills, and on the Carrizo Plain in San Luis Obispo County (Cypher 2002). Much smaller populations are known from the Kerman Ecological Reserve in Fresno County, the Lokern-McKittrick area of Kern County, and southwestern Merced County (Cypher 2002). CNDDB has records of this species in the Firebaugh, Jamesan, Mendota Dam, and Tranquility quadrangles (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.2.10. Hispid Bird's-beak (*Cordylanthus mollis* ssp. *hispidus*)

Hispid bird's-beak has been placed on List 1B by CNPS (CNPS 2001). Historically, Hispid bird's-beak has been distributed in California's central and southern Central Valley, including Alameda, Merced, Placer, Kern, and Solano counties (Hickman 1993, Skinner and Pavlik 1994). Although this species is believed to be extirpated from most of the San Joaquin Valley, it is known from approximately 30 occurrences within its range (CNDDB 1999, Skinner and Pavlik 1994).

Hispid bird's-beak is a hemiparasitic annual herb of the figwort family (Scrophulariaceae) that grows 10–40 cm tall (Hickman 1993). This species grows in playas, alkaline meadows, saline marshes, and flats. The flowering period of Hispid bird's-beak is June–September (Skinner and Pavlik 1994). Hispid bird's-beak has been observed in the West Bear Creek area in the San Luis and Kesterson units of the San Luis NWR (Woolington, pers. comm., as cited in JSA et al. 2000). It has been documented in the Gustine, Ingomar, San Luis Ranch, and Delta Ranch quadrangles (CNDDB 2002). Restoration actions that influence alkaline uplands and wetlands could affect this species.

9.5.2.11. Recurved Larkspur (*Delphinium recurvatum*)

Recurved larkspur has been placed on List 1B by CNPS (CNPS 2001). It is widely distributed throughout elevations of 30–600 meters in California's Central Valley (Hickman 1993). The species is known from over 60 recorded populations from Alameda, Contra Costa, Colusa, Fresno, Glenn, Kern, Kings, Merced, Monterey, San Benito, San Luis Obispo, Solano, and Tulare counties.

Recurved larkspur, a member of the buttercup family (Ranunculaceae), is a perennial herb that grows 18–85 centimeters tall (Hickman 1993). This species grows in seasonal alkali wetlands of chenopod scrub, grassland, and montane woodland communities, typically on valley bottoms on heavy clay alkali soils (JSA 1988). Recurved larkspur is usually found along sloughs or above vernal pools, directly adjacent to soils that are moist at least one time during the year (M. Wolfe, pers. comm.). Recurved larkspur blooms from March through May (Skinner and Pavlik 1994).

Recurved larkspur has not been reported from the West Bear Creek area, although suitable habitat is present. It has been documented in the Jamesan quadrangle (CNDDB 2002). Restoration actions that influence alkaline uplands and wetlands could affect this species.

9.5.2.12. Four-angled Spikerush (*Eleocharis quadrangulata*)

Four-angled spikerush has been placed on List 2 by CNPS (CNPS 2001). It is distributed throughout the Central Valley, below 455-meter (1,500-foot) elevation (Hickman 1993). There are 9 known occurrences of this species, in Butte, Shasta, and Tehama Counties. Two historical occurrences have been recorded in Merced County. Four-angled spikerush is a perennial herb of the sedge family (Cyperaceae) that grows 50–100 cm (20–39 inches) tall (Hickman 1993). This species is found in freshwater marshes and lake and pond margins of valley and foothill grasslands and woodlands (Hickman 1993, CNDDB 2001, Skinner and Pavlik 1994). The flowering period of four-angled spikerush is July–September (Skinner and Pavlik 1994).

The occurrence of four-angled spikerush has been reported from the region, and there is suitable habitat in the West Bear Creek area (JSA et al. 2000). It has been documented in the Gustine, Ingomar, and Stevinson quadrangles (CNDDB 2002). Restoration actions that influence wetlands could affect this species.

9.5.2.13. Round-leaved filaree (*Erodium macrophyllum*)

Round-leaved filaree has been placed on List 2 by CNPS (CNPS 2001). It is known to occur in Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, King, Kern, Lake, Lassen, Los Angeles, Merced, Monterey, Napa, Riverside, Santa Barbara, San Benito, Santa Cruz Island, San Diego, San Joaquin, San Luis Obispo, San Mateo, Solano, Stanislaus, Tehama, Ventura, and Yolo counties. It is believed to be extirpated from Alameda County (CNPS 2001).

Round-leaved filaree, a dicot in the family Geraniaceae, is an annual herb that is native to California (Hrusa 2001, as cited in the CalFlora 2002). The species is found in cismontane woodland areas and valley and foothill grassland habitats on clay soils (CNPS 2001). The flowering period of the round-leaved filaree is March to May (CNPS 2001).

Round-leaved filaree has not been recorded in the study area quadrangles (CNDDB 2002). If it occurs in the study area, restoration actions that influence upland habitats could affect this species.

9.5.2.14. Spiny-sepaled button celery (*Eryngium spinosepalum*)

Spiny-sepaled button-celery has been placed on List 1B by CNPS (CNPS 2001). It is known to occur in Fresno, Madera, Stanislaus, Tulare, and Tuolumne counties.

Spiny-sepaled button-celery, a dicot in the family Apiaceae, is an herb that is endemic to California (Lum 1975, Walker 1992 as cited in CalFlora 2002). The species is found in valley and foothill grassland habitats and vernal pools (CNPS 2001). The flowering period of spiny-sepaled button-celery is April to May (CNPS 2001).

Spiny-sepaled button-celery has been recorded in the Little Table Mountain quadrangles (CNDDB 2002). Restoration actions that influence grassland and vernal pools could affect this species.

9.5.2.15. Munz's tidy-tips (*Layia munzii*)

Munz's tidy-tips has been placed on List 1B species by CNPS (CNPS 2001). Historically, the species was widespread in the western San Joaquin Valley and inner Coast Ranges from Fresno south (Williams et al 1998). Conversion of low-lying areas in Fresno County may have destroyed populations of Munz's tidy-tips (Williams et al. 1998).

Munz's tidy-tips is an annual that grows on alkaline clay in low-lying areas and on hillsides in grasslands, valley saltbush scrub, and valley sink scrub (Williams et al 1998). Historical and current sites ranged from 150 to 2,600 feet (45 to 800 meters) in elevation (CDFG 1995, Lewis 1997).

In Fresno County, the species was collected near Firebaugh, Little Panoche Creek, Mendota, the town of San Joaquin, and Wheatville (Williams et al 1998). CNDDB has records of this species in the Firebaugh and Tranquility quadrangles (CNDDB 2002). Restoration actions that influence grasslands and scrub could affect this species.

9.5.2.16. Madera linanthus (*Linanthus serrulatus*)

Madera linanthus has been placed on List 1B species by CNPS (CNPS 2001). It is endemic to California (Lum 1975 and Walker 1992, both as cited in CalFlora 2002). It is known to occur in Fresno, Kern, Madera, Mariposa, and Tulare counties.

Madera linanthus, a dicot in the family Polemoniaceae, is an annual herb that is found in cismontane woodland and lower montane coniferous forest. It has been reported at elevations between 1,000 and 4,000 feet (Lum 1975, Walker 1992, both as cited in CalFlora 2002). The species blooms from April to May.

Madera linanthus has been documented in the Friant, Madera, and Millerton Lake West quadrangles (CNDDB 2002). Restoration actions that influence upland woodlands and forests could affect this species.

9.5.2.17. Prostrate navarretia (*Navarretia prostrata*)

Prostrate navarretia has been placed on List 1B by CNPS (CNPS 2001). It is known to occur in Alameda, Los Angeles, Merced, Monterey, Orange, Riverside, San Bernardino, and San Diego counties. It is believed to be extirpated from Alameda County (CNPS 2001).

Prostrate navarretia, a dicot in the family Polemoniaceae, is an annual herb that is endemic to California (Lum 1975, Walker 1992, as cited in the CalFlora 2002). The species is found in coastal scrub areas, valley and foothill grassland habitats on alkaline soils, vernal pools, and other mesic habitats (CNPS 2001). The flowering period of prostrate navarretia is April to June (CNPS 2001).

Prostrate navarretia has not been recorded in the study area (CNDDB 2002). If it occurs in the study area, restoration actions that influence grasslands and wetlands could affect this species.

9.5.2.18. Slender-leaved Pondweed *(Potamogeton filiformis*)

Slender-leaved pondweed has been placed on List 2 by CNPS (CNPS 2001). It is an aquatic macrophyte that in California occurs only from the vicinity of the study area to Mono County; this species is also known to occur in Arizona, Nevada, and Oregon (Skinner and Pavlik 1994).

This species is found in marshes and open water habitat. Slender-leaved pondweed occurs in the study area along Reach 2A and in the West Bear Creek area. Four occurrences of this plant in the Great Valley Grasslands State Park have been reported by Hoopes et al. (1996). It is likely to occur in the West Bear Creek area because there is suitable habitat (JSA et al. 2000). It has been documented in the Ingomar quadrangle (CNDDB 2002). Restoration actions that influence open, marshy habitat could affect this species.

9.5.2.19. Sanford's Arrowhead (*Sagittaria sanfordii*)

Sanford's arrowhead has been placed on List 1B by CNPS (CNPS 2001). It is distributed throughout the northern part of the north coast, Central Valley, and northern part of the south coast of California (Hickman 1993). Of its original range, this species is believed to be extirpated from Orange and Ventura counties and mostly extirpated from the Central Valley (Skinner and Pavlik 1994). There are approximately 50 known occurrences of Sanford's arrowhead.

Sanford's arrowhead is a rhizomatous emergent perennial herb of the waterplantain family (Alismataceae). This species grows in freshwater marshes, ponds, and ditches and various other shallow freshwater habitats (Hickman 1993, Skinner and Pavlik 1994). It flowers from May through August (Skinner and Pavlik 1994).

One occurrence of Sanford's arrowhead has been reported along Reach 2A, although it has not been observed since 1948 (CNDDB 2001). There is suitable habitat for the species in the West Bear Creek area (JSA et al. 2000). It has been documented in the Delta Ranch, Firebaugh, Fresno North, Jamesan, Mendota Dam, Tranquility, and Turner Ranch quadrangles (CNDDB 2002). Restoration actions that influence freshwater lentic habitats could affect this species.

9.5.2.20. Wright's Trichocoronis (*Trichocoronis wrightii* var. *wrightii*)

Wright's trichocoronis has been placed on List 2 by CNPS (CNPS 2001). It is known from Riverside and Merced counties and is presumed extirpated from San Joaquin, Colusa, and Sutter counties. Although rare in California, this species is more common in Texas.

Wright's trichocoronis is an annual herb of the sunflower family (Asteraceae). It grows in meadows, freshwater marshes, riparian forests, and vernal pools and occurs on alkaline soils (Skinner and Pavlik 1994). The flowering period of Wright's trichocoronis is May–September (Skinner and Pavlik 1994).

Wright's trichocoronis has been reported from one population in the Great Valley Grasslands State Park (Hoopes et al. 1996). It has been documented in the San Luis Ranch quadrangle (CNDDB 2002). Restoration actions that influence riparian forest or wetlands could affect this species.

9.5.3. Federally-listed and State-listed Wildlife

The following sections describe the special-status wildlife species that occur or have the potential to occur in the project area. A total of 57 special-status wildlife species were identified as having the potential to occur in the project area (Table 9-2). Forty-four of these 57 species have been reported to occur in the project area. The remainder of these species is not known to occur in the project area, but they occur in the vicinity of the project area or occurred there historically, and the project area contains potential habitat for these species. The potential for occurrence of these species was classified as low, moderate, or high (see Table 9-2). This classification was based primarily on the availability of suitable habitat in the project area, and the proximity of the project area to documented occurrences of the species.

The legal status, California distribution, habitat requirements, and potential for occurrence of special-status wildlife are summarized in Table 9-2. Each species is briefly described below.

9.5.3.1. Conservancy fairy shrimp (*Branchinecta conservatio*)

The Conservancy fairy shrimp is a federally endangered species that is endemic to California's Central Valley grassland vernal pools. The species has an elevation range of between 16 and 476 feet. The population distribution is limited within this range to Vina Plains in Butte County, the

Table 9-2. Special-status wildlife species with potential to occur in the study area.

Common and Scientific Names	Status[1] Federal	Status[1] State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
INVERTEBRATES					
Conservancy fairy shrimp *Branchinecta conservatio*	E	--	Disjunct occurrences in Solano, Merced, Butte, and Glenn counties	Large, deep vernal pools in annual grasslands	Documented in study area
Longhorn fairy shrimp *Branchinecta longiantenna*	E	--	Eastern margin of central Coast Ranges from Contra Costa County to San Luis Obispo County	Small, clear to moderately turbid, clay- or grass-bottomed pools, or pools in sandstone rock outcrops	Documented in study area
Vernal pool fairy shrimp *Branchinecta lynchi*	T	--	Central Valley, central and south Coast Range from Shasta County to Santa Barbara County; isolated populations also in Riverside County	Vernal pools; also found in sandstone rock outcrop pools	Documented in study area
Vernal pool tadpole shrimp *Lepidurus packardi*	E	--	Shasta County to Merced County	Vernal pools and ephemeral stock ponds	Documented in study area
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T	--	Streamside habitats in Central Valley	Riparian habitats with elderberry shrubs (elderberries are the host plant)	Documented in study area
AMPHIBIANS					
California tiger salamander *Ambystoma californiense* (= *A. tigrinum c.*)	C	SSC	Central Valley, including Sierra Nevada foothills and coastal region from Butte County south to Santa Barbara County	Small ponds, lakes, or vernal pools in grasslands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover and summer dormancy for adults	Documented in study area
Western spadefoot *Scaphiopus hammondii*	--	SSC	Sierra Nevada foothills, Central Valley, Coast Ranges, coastal counties in southern California	Seasonal wetlands, such as vernal pools, in annual grasslands and oak woodlands	Documented in study area
California red-legged frog *Rana aurora draytoni*	T	SSC	Coast and coastal mountain ranges of California from Humboldt County to San Diego County; Sierra Nevada mid-elevations from Butte County to Madera County; historically occurred on floor of Central Valley	Permanent and semipermanent aquatic habitats, such as creeks and coldwater ponds with emergent and submergent vegetation and riparian species along edges; may aestivate in rodent burrows or cracks during dry periods	Low potential; species has been extirpated from area
REPTILES					
Western pond turtle *Clemmys marmorata*	--	SSC	Found throughout California, west of the Sierra-Cascade crest; absent from most desert regions	Ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation, in woodlands, grasslands, and open forests	Documented in study area

Table 9-2, Cont'd.

Common and Scientific Names	Status[1] Federal	Status[1] State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
REPTILES, Cont'd					
Blunt-nosed leopard lizard *Gambelia*(= *Crotaphytus*) *silus*	E	E, FP	San Joaquin Valley from Stanislaus County through Kern County and along eastern edges of San Luis Obispo and San Benito counties	Open habitats with scattered low bushes on alkali flats, canyon floors, plains, washes, and arroyos; substrates may range from sandy or gravelly soils to hardpan	High potential; documented near study area (near Mendota Pool)
California horned lizard *Phrynosoma coronatum frontale*	--	SSC	Sacramento Valley, including foothills, south to southern California; Coast Ranges south of Sonoma County	Grasslands, brushlands, woodlands, and open coniferous forests with sandy or loose soil	Documented in study area
Silvery legless lizard *Anniella pulchra pulchra*	--	SSC	Along Coast, Transverse, and Peninsular ranges from Contra Costa County to San Diego County, with spotty occurrences in San Joaquin Valley	Habitats with loose soil for burrowing, or thick duff or leaf litter (often forages in leaf litter at plant bases); may be found on beaches, sandy washes, and in woodland, chaparral, and riparian areas	Documented in study area
San Joaquin whipsnake (= coachwhip) *Masticophis flagellum ruddocki*	--	SSC	From Colusa County in Sacramento Valley south to the Grapevine in San Joaquin Valley and west into inner Coast Ranges; an isolated population occurs at Sutter Buttes	Open, dry, vegetative associations with little or no tree cover, such as valley grassland and saltbush scrub associations; often occurs in association with mammal burrows	Low potential
Giant garter snake *Thamnophis gigas*	T	T	Central Valley from Fresno north to Gridley/ Sutter Buttes area; has been extirpated from areas south of Fresno	Sloughs, canals, and other small waterways where there is a prey base of small fish and amphibians; requires grassy banks and emergent vegetation for basking, and areas of high ground protected from flooding during winter	Documented in study area
BIRDS					
American white pelican (nesting colony) *Pelecanus erythrorhynchos*	--	SSC	Historically, nested at large lakes throughout California; the only breeding colonies in the state occur at lower Klamath National Wildlife Refuge, Siskiyou County, and at Clear Lake, Modoc County; winters along California coast from southern Sonoma County to San Diego County; inland, occurs at Salton Sea, in Delta region, and in Central Valley	Freshwater lakes with islands for breeding; inhabits river sloughs, freshwater marshes, salt ponds, and coastal bays during the rest of the year	Documented in study area

Table 9-2, Cont'd.

Common and Scientific Names	Status[1] Federal	Status[1] State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
BIRDS, Cont'd					
Double-crested cormorant (rookery site) *Phalacrocorax auritus*	--	SSC	Winters along entire California coast and inland over Coast Range into Central Valley from Tehama County to Fresno County; a permanent resident along the coast from Monterey County to San Diego County, along Colorado River, in Imperial, Riverside, Kern, and Kings counties; also nests in Central Valley	Rocky coastlines, beaches, inland ponds, and lakes; needs open water for foraging; nests in riparian forests or on protected islands, usually in snags	Documented in study area
Western least bittern (nesting) *Ixobrychus exilis hesperis*	--	SSC	Permanent resident along Colorado River and Salton Sea and in isolated areas in Imperial, San Diego, and Los Angeles counties; summers at Tulare Lake and parts of Fresno, Merced, Madera, Siskiyou, and Modoc counties; also summers in marshlands of Yolo, Sutter, Colusa, Glenn, and Butte counties	Marshes and pond edges, where tules and rushes provide cover; nests are built low in tules over water	Documented in study area
Great blue heron (nesting colonies) *Ardea herodias*	--	CDF	Fairly common throughout most of California year-round in shallow estuaries and fresh and saline emergent wetlands. Few rookeries have been found in southern California but many are scattered throughout the Central Valley	Usually nest in colonies in the tops of secluded large snags or live trees, usually among the tallest trees available; require fish-bearing water	Documented in study area
Great egret (nesting colonies) *Ardea alba*	--	CDF	Humboldt, Bolinas, and San Francisco bays and the large streams, lakes, and rivers of the Central Valley. Winters throughout the Central Valley, Suisun Marsh, and San Francisco Bay Area	Require groves of trees that are suitable for nesting and roosting, relatively isolated from human activities, and near aquatic foraging areas	Documented in study area
White-faced ibis (rookery site) *Plegadis chihi*	--	SSC	Both resident and winter populations on Salton Sea and in isolated areas in Imperial, San Diego, Ventura, and Fresno counties; breeds at Honey Lake, Lassen County, at Mendota Wildlife Management Area, Fresno County, and near Woodland, Yolo County; winters in Merced County and along the Sacramento River in Colusa, Glenn, Butte, Sutter, and Yolo counties	Prefers freshwater marshes with tules, cattails, and rushes, but may nest in trees and forage in flooded agricultural fields, especially flooded rice fields	Documented in study area

Table 9-2, Cont'd.

Common and Scientific Names	Status[1] Federal	Status[1] State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
BIRDS, Cont'd					
Fulvous whistling duck (nesting) *Dendrocygna bicolor*	--	SSC	Formerly nested in San Joaquin Valley; currently nests in only a few locations in Imperial Valley	Prefers freshwater marshes for nesting and roosting; forages in marshes and in nearby open ponds and flooded fields	Low potential; species has been extirpated from area. Historically a common breeding species in wetlands near Los Banos; has not been reported as a breeding species in San Joaquin Valley since early 1960s
Osprey (nesting sites) *Pandion haliaetus*	--	SSC, CDF	Nests along the north coast from Marin County to Del Norte County, east through Klamath and Cascade ranges, and in upper Sacramento Valley; important inland breeding populations at Shasta Lake, Eagle Lake, and Lake Almanor; small numbers elsewhere south through Sierra Nevada; winters along the coast from San Mateo County to San Diego County	Nests in snags, trees, or utility poles near the ocean, large lakes, or rivers with abundant fish populations	Documented in study area
White-tailed kite (nesting) *Elanus leucurus*	--	FP	Coastal and valley lowlands west of the Sierra Nevada	Rarely found away from agricultural areas; nest near the top of dense oak or other tree stands; forage in wetlands and grasslands	Documented in study area
Bald eagle *Haliaeetus leucocephalus*	T (PD)	E, FP, CDF	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino counties and in Lake Tahoe Basin; reintroduced into central coast; winter range includes the rest of California, except southeastern deserts, very high altitudes in Sierra Nevada, and east of Sierra Nevada south of Mono County	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, reservoir, stream, or the ocean	Documented in study area
Northern harrier (nesting) *Circus cyaneus*	--	SSC	Throughout lowland California; has been recorded in fall at high elevations	Grasslands, meadows, marshes, and seasonal and agricultural wetlands	Documented in study area
Golden eagle *Aquila chrysaetos*	--	SSC, FP, CDF	Foothills and mountains throughout California; uncommon non-breeding visitor to lowlands such as Central Valley	Nests on cliffs and escarpments or in tall trees overlooking open country; forages in annual grasslands, chaparral, and oak woodlands with plentiful medium and large mammals	Documented in study area

Table 9-2, Cont'd.

Common and Scientific Names	Status[1] Federal	Status[1] State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
BIRDS, Cont'd					
Merlin (wintering) *Falco columbarius*	--	SSC	Does not nest in California; rare but widespread winter visitor to Central Valley and coastal areas	Forages along coastline in open grasslands, savannas, and woodlands; often forages near lakes and other wetlands	Documented in study area
American peregrine falcon *Falco peregrinus anatum*	--	E, FP, CDF	Permanent resident along north and south Coast Ranges; may summer in Cascade and Klamath Ranges and through Sierra Nevada to Madera County; winters in Central Valley south through Transverse and Peninsular ranges and plains east of Cascade Range	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large prey populations	Documented in study area
Prairie falcon (nesting) *Falco mexicanus*	--	SSC	Permanent resident in south Coast, Transverse, Peninsular, and northern Cascade ranges, the southeastern deserts, Inyo-White Mountains, foothills surrounding Central Valley, and in Sierra Nevada in Modoc, Lassen, and Plumas counties; winters in Central Valley, along the coast from Santa Barbara County to San Diego County, and in Marin, Sonoma, Humboldt, Del Norte, and Inyo counties	Nests on cliffs or escarpments, usually overlooking dry, open terrain or uplands; forages in open upland habitat	Documented in study area
Sharp-shinned hawk (nesting) *Accipiter striatus*	--	SSC	Permanent resident in Sierra Nevada, Cascade, Klamath, and North Coast ranges at middle elevations and along the coast in Marin, San Francisco, San Mateo, Santa Cruz, and Monterey counties; winters over the rest of the state except at very high elevations	Nests in dense-canopy ponderosa pine or mixed-conifer forest, and riparian habitats; forages in woodland and scrub	Documented in study area
Cooper's hawk (nesting) *Accipiter cooperii*	--	SSC	Throughout California except high altitudes in Sierra Nevada; winters in Central Valley, southeastern desert regions, and plains east of Cascade Range	Nests in a wide variety of habitat types, from riparian woodlands and grey pine-oak woodlands to mixed-conifer forests; forages on open water and in riparian vegetation	Documented in study area
Swainson's hawk *Buteo swainsoni*	--	T	Lower Sacramento and San Joaquin Valleys, Klamath Basin, and Butte Valley; highest nesting densities occur near Davis and Woodland, Yolo County	Nests in oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grainfields	Documented in study area

Table 9-2, Cont'd.

Common and Scientific Names	Status[1] Federal	State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
BIRDS, Cont'd					
Ferruginous hawk (wintering) *Buteo regalis*	--	SSC	Does not nest in California; winter visitor along the coast from Sonoma County to San Diego County, eastward to Sierra Nevada foothills and southeastern deserts, Inyo-White Mountains, plains east of Cascade Range, and Siskiyou County	Open terrain on plains and in foothills where ground squirrels and other prey are available	Documented in study area
Yellow rail *Coturnicops noveboracensis*	--	SSC	Historical records of nests in Mono County east of Sierra Nevada and Marin County on the coast; winters on the coast from Humboldt County to Orange County, and in Merced and Riverside counties	Freshwater marshes, brackish marshes, coastal salt marshes, and grassy meadows	Low potential
Greater sandhill crane *Grus canadensis tabida*	--	T, FP	Breeds in Siskiyou, Modoc, Lassen, Plumas, and Sierra counties; winters in Central Valley, southern Imperial County, Lake Havasu National Wildlife Refuge, and Colorado River Indian Reserve	Summers in open terrain near shallow lakes or freshwater marshes; winters on plains and in valleys near bodies of fresh water	Documented in study area
Western snowy plover (inland population) *Charadrius alexandrinus nivosus*	--	SSC	Nests at inland lakes throughout northeastern, central, and southern California; occasionally nests in Central Valley	Nests at alkaline or brackish inland lakes; forages on sandy shorelines	Documented in study area
Mountain plover *Charadrius montanus*	PT	SSC	Does not breed in California; in winter, found in Central Valley south of Yuba County, along the coast in parts of San Luis Obispo, Santa Barbara, Ventura, and San Diego counties, and in parts of Imperial, Riverside, Kern, and Los Angeles counties	Open plains or rolling hills with short grasses or very sparse vegetation; nearby bodies of water are not needed; may occupy newly plowed or sprouting grainfields	Documented in study area
Long-billed curlew (nesting) *Numenius americanus*	--	SSC	Nests in northeastern California in Modoc, Siskiyou, and Lassen counties; winters along the coast and in interior valleys west of Sierra Nevada	Nests in high-elevation grasslands adjacent to lakes or marshes; during migration and in winter, frequents coastal beaches, mudflats, interior grasslands, and agricultural fields	Documented in study area
Black tern (nesting colony) *Chlidonias niger*	--	SSC	Spring and summer resident of Central Valley, Salton Sea, and northeastern California where suitable emergent wetlands occur	Freshwater wetlands, lakes, ponds, moist grasslands, and agricultural fields; feeds mainly on fish and invertebrates while hovering over water	Documented in study area

Table 9-2, Cont'd.

Common and Scientific Names	Status[1] Federal	Status[1] State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
BIRDS, Cont'd					
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C	E	Nests along upper Sacramento River, lower Feather River, south fork of Kern River, and Amargosa, Santa Ana, and Colorado Rivers; migratory range includes Central Valley	Wide, dense riparian forests with a thick understory of willows for nesting; sites with a dominant cottonwood overstory are preferred for foraging	Low potential
Western burrowing owl *Athene cunicularia*	--	SSC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast	Uses rodent burrows in sparse grassland, desert, and agricultural habitats	Documented in study area
Long-eared owl (nesting) *Asio otus*	--	SSC	Permanent resident east of Cascade Range from Placer County north to Oregon border, east of Sierra Nevada from Alpine County to Inyo County; scattered breeding populations along the coast, Sierra Nevada foothills, and in southeastern California; winters throughout Central Valley and southeastern California	Nests in abandoned crow, hawk, or magpie nests, usually in dense riparian stands of willows, cottonwoods, live oaks, or conifers	Documented in study area
Short-eared owl (nesting) *Asio flammeus*	--	SSC	Permanent resident along the coast from Del Norte County to Monterey County (although very rare in summer north of San Francisco Bay), in Sierra Nevada north of Nevada County, in plains east of Cascades, and in Mono County; winters primarily in Central Valley	Freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and daytime roosts	Documented in study area
Willow flycatcher *Empidonax traillii*	--	E	Summer range includes a narrow strip along the eastern Sierra Nevada from Shasta County to Kern County, another strip along the western Sierra Nevada from El Dorado County to Madera County; widespread in migration	Riparian areas and large, wet meadows with abundant willows for breeding; usually found in riparian habitats during migration	Documented in study area (migrating)
California horned lark *Eremophila alpestris actia*	--	SSC	Throughout much of California; less common in mountainous areas of the north coast and absent from coniferous and chaparral habitats	Open habitats, usually where large trees and shrubs are absent; prefers grasslands and deserts	Documented in study area

Table 9-2, Cont'd.

Common and Scientific Names	Status[1] Federal	Status[1] State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
BIRDS, Cont'd					
Bank swallow *Riparia riparia*	--	T	The state's largest remaining breeding populations are along the Sacramento River from Tehama County to Sacramento County, along the Feather and lower American rivers and Cache Creek, and in the Owens Valley; nesting areas also include the plains east of the Cascade Range south through Lassen County, northern Siskiyou County, and small populations near the coast from San Francisco County to Monterey County	Nests in bluffs or banks, usually adjacent to water, where the soil consists of sand or sandy loam to allow digging	Documented in study area
Loggerhead shrike *Lanius ludovicianus*	--	SSC	Resident and winter visitor in lowlands and foothills throughout California; rare on coastal slope north to Mendocino County, occurring only in winter	Open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches	Documented in study area
Least Bell's vireo *Vireo bellii pusillus*	E	E	Historically occurred in central and southern California; small populations remain in Riverside, San Diego, Orange, Los Angeles, Ventura, Santa Barbara, southern Inyo, and southern San Bernardino counties	Riparian thickets; nests along margins of bushes and forages low to ground	Low potential; species has been extirpated from area
California yellow warbler (nesting) *Dendroica petechia brewsteri*	--	SSC	Small permanent populations in San Diego and Santa Barbara counties; largest California breeding populations are in San Bernardino and Kern counties; spring and fall migrant in Central Valley	Nests in riparian trees dominated by willows, cottonwoods, sycamores, or alders, or in mature chaparral; may also use oaks, conifers, and urban areas near streams; during migration, uses woodland, forest, and scrub	Documented in study area
Tricolored blackbird (nesting colony) *Agelaius tricolor*	--	SSC	Permanent resident in Central Valley from Butte County to Kern County; breeds at scattered coastal locations from Marin County south to San Diego County and at scattered locations in Lake, Sonoma, and Solano counties; rare nester in Siskiyou, Modoc, and Lassen counties	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grainfields; habitat must be large enough to support 50 pairs; probably requires water at or near nesting colony	Documented in study area

Table 9-2, Cont'd.

Common and Scientific Names	Status[1] Federal	Status[1] State	California Distribution	Habitat Requirements	Occurrence in Study Area[2]
MAMMALS					
Pale Townsend's (= western) big-eared bat *Corynorhinus townsendii pallescens*	--	SSC	Klamath Mountains, Cascades, Sierra Nevada, Central Valley, Transverse and Peninsular ranges, Great Basin, and Mojave and Sonora deserts	Uses a wide variety of habitats; gleans insects from brush or trees and feeds along habitat edges. Roosts in caves, tunnels, mines, trees, and buildings.	Low potential
Pacific Townsend's (=western) big-eared bat *Corynorhinus townsendii townsendii*	--	SSC	Coastal regions from Del Norte County south to Santa Barbara County	Uses a wide variety of habitats; gleans insects from brush or trees and feeds along habitat edges. Roosts in caves, tunnels, mines, trees, and buildings.	Low potential
Riparian brush rabbit *Sylvilagus bachmani riparius*	E	E	Limited to San Joaquin County at Caswell State Park near confluence of Stanislaus and San Joaquin Rivers; historically ranged from Stanislaus County to the Delta	Dense thickets of brush associated with riparian or chaparral habitats	Low potential; not documented near study area
San Joaquin (Nelson's) antelope ground squirrel *Ammospermophilus nelsoni*	--	T	Western side of San Joaquin Valley from southern Merced County south to Kern and Tulare counties; also found on Carrizo Plain in San Luis Obispo County and Cuyama Valley in San Luis Obispo and Santa Barbara counties	Arid grasslands with loamy soils and moderate shrub cover of *Atriplex* and other shrub species	Low potential; not documented near study area
Fresno kangaroo rat *Dipodomys nitratoides exilis*	E	E	Fresno County only	Found at 200-foot to 300-foot elevations in alkali-sink habitats	Moderate potential; captured at Alkali Sink Ecological Reserve and Wildlife Management Area near the study area
San Joaquin Valley (Riparian) woodrat *Neotoma fuscipes riparia*	E	SSC	Known only from an area along the San Joaquin, Stanislaus, and Tuolumne rivers in Stanislaus and San Joaquin counties; only verified extant population is restricted to Caswell Memorial State Park on the Stanislaus River; historically occurred in northern San Joaquin Valley	Riparian forest where trees and brush are available for cover and nesting	Low potential; not documented near study area
San Joaquin kit fox *Vulpes macrotis mutica*	E	T	Principally occurs in San Joaquin Valley and adjacent open foothills to the west; recent records show presence in 17 counties, extending from Kern County north to Contra Costa County	Saltbush scrub, grasslands, oak savannas, and freshwater scrub	Documented in study area

Table 9-2, Cont'd.

FOOTNOTES

[1]Legal Status:

Federal status

E = listed as endangered under the federal Endangered Species Act
T = listed as threatened under the federal Endangered Species Act
PE = proposed for federal listing as endangered under the federal Endangered Species Act
PT = proposed for federal listing as threatened under the federal Endangered Species Act
C = candidate species; species for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list
PD = proposed for delisting
-- = no status

State status

E = listed as endangered under the California Endangered Species Act
T = listed as threatened under the California Endangered Species Act
SSC = species of special concern in California
FP = fully protected under the California Fish and Game Code
CDF = listed as "sensitive" by the California Department of Forestry and Fire Protection
-- = no status

[2]See the text for specific information regarding the location and timing of documented occurrences.

Jepson Prairie Reserve in Solano County, the Sacramento Wildlife Refuge in Glenn County, Haystack Mountain in Merced County (Eng et al. 1990), and in the San Luis NWR complex (USFWS file data). There is also 1 unconfirmed population from Ventura County on Matau Flat Road.

The Conservancy fairy shrimp is found in large, clay-bottomed vernal pools. Average depth of occupied ponds is approximately 7.8 inches. Specimens have been collected from poorly vegetated, turbid pools from November to early April (Eng et al. 1990). Copulation occurs shortly before the pools dry up and the eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and then sinks to the bottom of the pool. These eggs can withstand heat, cold, and prolonged desiccation and are often referred to as "resting" or "summer" eggs. When the pool is re-watered within the current season, or several seasons later, some, but not all, of the eggs may hatch (USFWS 1994). Fairy shrimp develop quickly after hatching. According to Donald (1983, as cited in USFWS 1994), the egg bank in the soil of a vernal pool could be comprised of eggs from several years of breeding. This species achieves sexual maturity at a mean age of 37 days, reproduces at a mean age of 46 days, and has a mean life span of approximately 114 days (Helm 1998).

This species has been documented at the San Luis, Kesterson, and Arena Plains units of the San Luis NWR complex (USFWS file data) but would not be expected elsewhere in the study area because suitable vernal pool habitat is lacking.

This species was reported from one vernal pool at Great Valley Grasslands State Park (Hoopes et al. 1996); however, the tabular data did not correspond with the published map. Subsequent examination by a Jones & Stokes invertebrate biologist of the specimens collected during the Hoopes et al. (1996) study (1996) did not confirm the identity of the Conservancy fairy shrimp at Great Valley Grasslands State Park. The species has been documented in the Gustine, San Luis Ranch, Stevinson, and Turner Ranch quadrangles (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.3.2. Longhorn Fairy Shrimp (*Branchinecta longiantennae*)

Longhorn fairy shrimp are federally endangered. This species is known from 8 disjunct populations along the eastern margin of the central Coast Range from Alameda and Contra Costa counties south to Carrizo Plain in San Luis Obispo County (USFWS 1994). This species also was identified at the Kesterson Unit of San Luis NWR.

Longhorn fairy shrimp inhabit clear to turbid, grass-bottomed vernal pools in grasslands and clear-water pools in sandstone depressions (USFWS 1994). They have been observed from late December until late April in grassland pools characterized by low conductivity, total dissolved solids, and alkalinity (USFWS 1994). This species achieves sexual maturity at a mean age of 22 days, reproduces at a mean age of 43 days, and has a mean life span of approximately 114 days (Helm 1998).

Presence of this species at Kesterson suggests that they might be found elsewhere in vernal pools of the San Luis NWR complex (JSA et al. 2000), but would not be expected elsewhere in the study area because suitable vernal pool habitat is lacking. The species has been documented in the Gustine, Ingomar, San Luis Ranch, and Stevinson quadrangles (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.3.3. Vernal pool fairy shrimp (*Branchinecta lynchi*)

The vernal pool fairy shrimp is listed as threatened under ESA. It is found from Shasta County in the north, throughout the Central Valley, and west to the central Coast Ranges. Southern populations occur on the Santa Rosa Plateau and near Rancho, California in Riverside County (Eng et al.1990).

The vernal pool fairy shrimp is endemic to small, shallow wetlands in California (Helm 1998). It is found in grassland vernal pools, rock outcrops, and roadside ditches from December through early May. This species achieves sexual maturity at a mean age of 18 days, reproduces at a mean age of 40 days, and has a mean life span of approximately 91 days (Helm 1998).

The vernal pool fairy shrimp has been documented at the West Bear Creek, San Luis, Kesterson, and Arena Plains units of the San Luis NWR complex (USFWS file data, as cited in JSA et al. 2000), but would not be expected elsewhere in the study area because suitable vernal pool habitat is lacking. This species was documented at 11 of 71 surveyed vernal pools in the West Bear Creek Unit (JSA et al. 2000). It has been documented in the Gustine, Lanes Bridge, Little Table Mountain, San Luis Ranch, Sandy Mush, Stevinson, Turner Ranch, Friant, and Gregg quadrangles (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.3.4. Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)

The vernal pool tadpole shrimp is listed as endangered under ESA. The vernal pool tadpole shrimp is found scattered throughout the Central Valley from the Millville and Stillwater Plains in Shasta County south to Merced County (Helm 1998).

The vernal pool tadpole shrimp is found in stockponds and vernal pools. The eggs are deposited on vegetation and other objects on the bottom of the pool. These eggs can withstand heat, cold, and prolonged desiccation and will wait out the summer months as diapaused eggs in pool sediment (USFWS 1994). When the pool is re-watered in the fall and winter of subsequent seasons, some, but not all, of the eggs may hatch. This species achieves sexual maturity at a mean age of 38 days, reproduces at a mean age of 54 days, and has a mean life span of approximately 144 days (Helm 1998). Specimens have been collected from winter through spring (Helm 1998).

This species has been documented at the West Bear Creek, San Luis, Kesterson, and Arena Plains units of the San Luis NWR complex (JSA et al. 2000), but would not be expected elsewhere in the study area because suitable vernal pool habitat is lacking.. It was documented at 41 of 71 surveyed vernal pools at the West Bear Creek Unit and at 34 vernal pools at Great Valley Grasslands State Park (JSA et al. 2000). It has been documented in the Gustine, Ingomar, San Luis Ranch, Stevinson, and Turner Ranch quadrangles (CNDDB 2002). This species could occur in other locations of the study area that support suitable habitat. Restoration actions that influence vernal pools could affect this species.

9.5.3.5. Valley Elderberry Longhorn Beetle (*Desmocercus californicus dimorphus*)

The valley elderberry longhorn beetle is listed as threatened under ESA. The valley elderberry longhorn beetle is found in scattered populations throughout its historical distribution. The valley elderberry longhorn beetle was historically distributed throughout the Central Valley from Redding (Shasta County) to Bakersfield (Kern County) (Arnold et al. 1994). The species' range includes most of the California Central Valley north to Trinity County, south to San Diego County, and east to San Bernardino County (Barr 1991). Occurrences have been recorded in Merced, Stanislaus, and San Joaquin counties (CDFG 1997). These beetles are dependent on elderberry plants (*Sambucus* spp.), which occur within riparian forests of the Central Valley or occasionally in separate patches or as individuals in non-forested habitat types.

Eggs are laid in crevices in elderberry bark and hatch in about 10 days. Larvae bore into the pith of elderberry roots, branches, and trunks to create an opening in the stem within which they pupate for one or two years before they emerge as adults. Larvae feed on tree pith, while adults eat the foliage and possibly the flowers of the plants. After metamorphosing into an adult, the beetle chews a circular

exit hole through which it emerges (Barr 1991). Current information on the habitat of the beetle indicates that it is found only with its host plant, the elderberry.

A population of valley elderberry longhorn beetles was reported in a stand of elderberry shrubs at RM 245 (Reach 1A) of the San Joaquin River (Thelander 1994). Numerous host plants were also identified in surveys conducted east of Mendota near the Chowchilla Canal, several of which had holes in the trunk that may have been made by exiting beetle larvae (Kucera et al. 2001). The species has been documented in the Lanes Bridge and Herndon quadrangles (CNDDB 2002). This species could occur in other locations of the study area that support suitable habitat. Restoration actions that influence riparian scrub could affect this species.

9.5.3.6. California Red-legged Frog (*Rana aurora draytonii*)

The California red-legged frog is a federally threatened taxon and is considered a species of special concern by CDFG. This species is one of two subspecies of the red-legged frog (*Rana aurora*) that occur along the Pacific Coast. The species occurs west of the Sierra-Cascade crest and along the Coast Ranges for the length of the state of California (Stebbins 1985). The California subspecies (*Rana aurora draytonii*) historically ranged from the vicinity of Point Reyes National Seashore (Marin County) along the coast and from the vicinity of Redding (Shasta County) inland, south to northwestern Baja California. There are no known extant populations of this subspecies in California's Central Valley (Jennings and Hayes 1994). According to Jennings and Hayes (1994), there are several old records for the California red-legged frog from western Stanislaus County and western Tuolumne County.

A highly aquatic species invariably associated with water, the California red-legged frog inhabits still or slow water in streams, marshes, ponds, reservoirs, and canals (Stebbins 1951). Like all frogs, tadpoles are herbivorous and switch to carnivory after metamorphosis (Zeiner et al. 1988). The California red-legged frog preys on terrestrial and aquatic insects, crustaceans and mollusks, and sometimes small fish and tadpoles as well. Preferred riparian habitat consists of deep, still pools surrounded by dense stands of cattails and overhanging vegetation such as willow. On occasion, individuals may be found in less optimal habitat. California red-legged frogs utilize small mammal burrows and moist leaf litter up to 85 feet (26 m) from water in dense riparian vegetation for aestivation. Permanent, deep pools are required for reproduction and larval development (Zeiner et al. 1988). Rain or moist conditions may be necessary for dispersal.

The California red-legged frog, once considered a culinary delicacy, was harvested to the brink of extinction in the late 1800s. Some remaining populations are highly restricted and consist of small numbers of individuals (Jennings et al. 1992). Human activities that result in habitat destruction and the introduction of exotic competitors and predators have a negative effect on populations (Moyle 1973). This species has been historically recorded from the Newman quadrangle by CNDDB, although it is now extirpated from the San Joaquin Valley (CNDDB 2002).

9.5.3.7. Blunt-nosed Leopard Lizard (*Gambelia silus*)

The blunt-nosed leopard lizard is listed as endangered under ESA and CESA, and as a fully protected species under the California Fish and Game Code. The blunt-nosed leopard lizard was historically found throughout the San Joaquin Valley and adjacent foothills from San Joaquin County to eastern San Luis Obispo County (CDFG 1992). Blunt-nosed leopard lizard habitat was reduced from 228,000 acres to 158,000 acres between 1976 and 1980 (CDFG 1992). The species currently occupies isolated and scattered areas of undeveloped habitat on the San Joaquin Valley floor and in the eastern foothills of the Coast Ranges (CDFG 1992).

Blunt-nosed leopard lizards are found in sparsely vegetated plains, alkali flats, grasslands, low foothills, canyon floors, and large washes (CDFG 1988). They inhabit areas with sandy soils and scattered vegetation and are usually absent from thickly vegetated habitats (CDFG 1992). The mating season for the blunt-nosed leopard lizard is from late April through May (Zeiner et al. 1988). Breeding females can be identified by the orange or reddish spots on their sides (CDFG 1992). Blunt-nosed leopard lizards feed on a variety of insects, as well as on other small lizards, and have been known to be cannibalistic (Zeiner et al. 1988).

There are several records of this species occurring near Mendota Pool. Restoration actions that influence open upland habitats may affect this species.

9.5.3.8. Giant Garter Snake (*Thamnophis couchi gigas*)

The giant garter snake is listed as threatened under ESA and CESA. According to Fitch (1940, as cited in USFWS 1993), the historical range of the giant garter snake extended from the vicinity of Sacramento and Contra Costa counties south to Buena Vista Lake, near Bakersfield in Kern County. The lack of records prior to 1970 makes it difficult to precisely establish the species' former range; however, the records coincide with the historical distribution of large flood basins, freshwater marshes, and tributary streams in the Central Valley (USFWS 1993).

The giant garter snake was apparently extirpated from the southernmost portion of its range by the 1940s to 1950s due to loss of wetlands to agriculture and other land uses (Hansen and Brode 1980, as cited in USFWS 1993). As recently as the 1970s, the species was found from near Burrell, Fresno County (Hansen and Brode 1980, as cited in USFWS 1993) north to the vicinity of Chico, Butte County (Rossman and Stewart 1987, as cited in USFWS 1993). According to Fisher et al. (1994), the giant garter snake currently is found from Butte Creek near Gridley, 19 km (12 mi) south of Chico in Butte County south to the Mendota Wildlife Area, 16 km (10 mi) west of Fresno, implying that they could still be distributed in general vicinity of the study area. However, according to Hansen (1988, as cited in USFWS 1993), the species is distributed in portions of the rice production zones of Sacramento, Sutter, Butte, Colusa, and Glenn counties; along the western border of the Yolo Bypass in Yolo County; and along the eastern edge of the Sacramento-San Joaquin River delta from the Laguna Creek-Elk Grove region of central Sacramento County south to the Stockton area of San Joaquin County.

The giant garter snake is the largest member of its genus and one of the most aquatic of the garter snakes, feeding on small fish, tadpoles, and frogs (Fisher et al. 1994). It frequents areas of permanent freshwater, particularly sloughs and marshes overgrown with tules, willows, and weeds (Hansen and Brode 1980), and is rarely seen more than a few feet from water. It requires terrestrial burrows or crevices that do not flood for winter hibernation. Hibernation occurs from late October to mid- or late March, in the abandoned burrows of small mammals located above prevailing flood elevations (Fisher et al. 1994). Breeding occurs in March and April (Hansen and Hansen 1990, as cited in USFWS 1993). Females give birth to live young from July through September, with litter size varying between 10 and 46 young (Fisher et al. 1994).

The CNDDB lists records for this species for San Joaquin and Merced counties; no records were found for Stanislaus County (CDFG 1997). According to CNDDB records (as cited in USFWS 1993), there have been no records of observations from Burrell, Fresno County, north to Stockton, San Joaquin County since 1980. This subspecies has been observed at the San Luis, Kesterson, and West Bear Creek units of the San Luis NWR (Woolington, pers. comm., as cited in JSA et al. 2000). It has also been documented in the Mendota Wildlife Area (Newman et al. 2001), and south of the study area in Fresno Slough. Restoration actions that influence wetlands could affect this species.

9.5.3.9. Bald Eagle (Haliaeetus leucocephalus)

The bald eagle is listed as threatened under ESA (but has been proposed for delisting), as endangered under CESA, as fully protected under the California Fish and Game Code, and as sensitive by the California Department of Forestry and Fire Protection. The bald eagle is also protected under the federal Bald and Golden Eagle Protection Act. Historically, the bald eagle nested throughout California; however, the current breeding distribution is restricted primarily to the mountainous habitats in the northern quarter of the state, in the northern Sierra Nevada, Cascades, and northern Coast Ranges (CDFG 1992). Bald eagles winter at lakes, reservoirs, and along major river systems throughout most of central and northern California and in a few southern California localities.

By 1972, there were only 26 known active bald eagle territories in California. Currently, approximately 100 pairs of bald eagles nest in the state. Nesting remains primarily restricted to the northern part of the state, with concentrations of birds at Shasta Lake, Claire Engle Lake, Eagle Lake, and Lake Almanor, and on the Pit River between Lake Britton and Shasta Lake. Additionally, 3 pairs of bald eagles are known to nest on the floor of the Central Valley in Shasta and Tehama counties. Another pair of bald eagles is known to nest at Eastman Lake (Chowchilla River) in Madera County. The species appears to be increasing in most portions of the state (CDFG 1992).

Bald eagle nesting territories in California are found primarily in ponderosa pine and mixed conifer forests. Bald eagle nest sites are always associated with a lake, river, or other large water body and are usually within 1 mile of water. Nests are usually constructed in a tree that provides an unobstructed view of the water body and that is almost always the dominant or codominant tree in the surrounding stand. Snags and dead-topped live trees are important habitat components in a bald eagle nesting territory, providing perch and roost sites. Bald eagles winter along rivers, lakes, or reservoirs that support adequate fish or water bird prey and have mature trees or large snags available for perch sites. Bald eagles often roost communally during winter, typically in mature trees or snags with open branching structures that are isolated from human disturbance.

Bald eagles are annual winter residents within the San Luis NWR complex, with sightings at the West Bear Creek Unit in 1995 and 1999 (JSA et al. 2000). Large numbers of bald eagles overwinter at Lake Millerton each year, and a few have been observed foraging along the river near Rank Island (M. Wolfe, pers. obs.). Restoration actions that influence fish, the bald eagle's prey, in the San Joaquin River, or that influence nesting or roosting trees near the river, could affect this species.

9.5.3.10. American Peregrine Falcon (*Falco peregrinus anatum*)

American peregrine falcons are listed as endangered under the CESA, designated a sensitive species by the California Department of Forestry and Fire Protection, and fully protected under the California Fish and Game Code. This species was nearly driven to extinction in the 1970s by DDT use and PCB poisoning. Current recovery efforts are directed at controlling pesticides and protecting breeding sites (CDFG 1992). If successful, these efforts will increase population sizes, thereby reducing vulnerability to stochastic environmental factors. The breeding population is stable and increasing, with population increases occurring in some parts of the state, but little or no improvement occurring in others (Cade 1988, CDFG 1992). The USFWS delisted the species in 1999. It historically bred over most of North America, from the tree line south to Baja California. It is now absent from large areas except where it has been successfully reintroduced. This species has reoccupied most of its historical breeding range in California, including the Channel Islands, the Coast and Cascade ranges, and the Sierra Nevada Range. Peregrines inhabit all counties in the state at various times of the year (Gertsch et al. 1994).

Peregrine falcons usually breed near water bodies in open areas with cliffs and canyons. While breeding pairs tend to remain near their breeding territories throughout the year, immature and non-breeding individuals range over large distances, including Oregon and Mexico. During winter, the California peregrine population increases in areas where prey is abundant (Gertsch et al. 1994). Peregrines feed almost exclusively on other birds, usually pigeons, songbirds, shorebirds, and waterfowl, which they kill in mid-air with blows from their talons. Nesting sites are typically on ledges of large cliff faces, but some pairs are now nesting on city buildings and bridges. Nesting and wintering habitats are varied, including wetlands, woodlands, and other forested habitats, cities, agricultural lands, and coastal habitats (Gertsch et al. 1994).

Although this taxon has been documented in the West Bear Creek area (JSA et al. 2000), the CNDDB lists no records of this species in the study area quadrangles (CNDDB 2002). Restoration actions that influence wetlands and other areas where their prey is concentration could affect this taxon.

9.5.3.11. Swainson's Hawk (*Buteo swainsoni*)

Swainson's hawks are listed as threatened under CESA. The Swainson's hawk's breeding range extends from southwestern Canada to northern Mexico (Godfrey 1986, Semenchuk 1992, Howell and Webb 1995, Smith 1996, England et al. 1997). Nearly all North American populations of Swainson's hawks winter in South America and Mexico; however, some small populations regularly winter in the United States in southern Florida (Stevenson and Anderson 1994) and in the San Francisco Bay Delta (Yee et al. 1991, Herzog 1996).

Throughout its range, the Swainson's hawk nests almost exclusively in only a few species of trees (Schlorff and Bloom 1983). A survey of nesting birds in California during 1979 revealed that Swainson's hawks nested almost exclusively in large, sparsely vegetated flatlands characterized by valleys, plateaus, broad flood plains, and large expanses of desert (Bloom 1980). In a study of movements and habitat use, it was found that single trees or riparian areas were used most often for nesting (Estep 1989). Swainson's hawks forage in many crops, and Schmutz (1987) found that the species is more abundant in areas of moderate cultivation than in either grassland or areas of extensive cultivation. Alfalfa is routinely used by foraging Swainson's hawks (Estep 1989, Woodbridge 1991), but the ability of the hawk to use cultivated lands for foraging is a complex interaction of crop phenology and cultural practices (Schmutz 1987, Estep 1989, Woodbridge 1991). Orchards and vineyards, in general, are not suitable foraging habitat for Swainson's hawks because of the dense woody cover, and rice is unsuitable most of the season because it is flooded (Estep 1989).

Swainson's hawks can be observed throughout the San Luis NWR complex from early spring until late summer (JSA et al. 2000). Nests have been documented in riparian habitats at the West Bear Creek Unit and at Great Valley Grasslands State Park (JSA et al. 2000). The floodplain of the West Bear Creek Unit is an important staging area for fall migrants, with flocks up to 70 individuals being documented (San Luis NWR file data, as cited in JSA et al. 2000). Swainson's hawks were frequently observed in the vicinity of the Chowchilla Canal on the San Joaquin River east of Mendota, typically within 1 mile (1.6 km) upstream of the diversion dams (Kucera et al. 2001). Nesting territories in the Mendota Pool area have been observed since 1979 by CDFG (R. Schlorff, pers. comm., as cited in Kucera et al. 2001), and three Swainson's hawks were observed soaring above the river approximately 0.20 miles upstream from the Gravelly Ford Gauging Station near river milepost 227.7 (Newman et al. 2001). The species has been reported in numerous quadrangles in the project area by (CNDDB 2002). Restoration actions that influence riparian trees, adjacent grasslands, or adjacent alfalfa fields may affect this species.

9.5.3.12. Greater Sandhill Crane (*Grus canadensis tabida*)

Greater sandhill cranes are listed as threatened under CESA and are fully protected under California Fish and Game Code Section 3511. Historically, greater sandhill cranes nested in eastern Siskiyou County, northeastern Shasta County, and at Honey Lake in Lassen County (California Department of Fish and Game 1992). In a study of crane reproduction in 1988, nesting populations were found in Lassen (75 pairs), Modoc (165 pairs), Plumas (7 pairs), Shasta (1 pair), Sierra (1 pair), and Siskiyou (27 pairs) counties (Littlefield 1989, Littlefield et al. 1994, California Department of Fish and Game 1997, Pacific Flyway Council 1997). Lesser sandhill cranes *(G. c. canadensis*) breed in Siberia, Alaska, and northern Canada (Johnsgard 1983). Both subspecies winter in the Central Valley. During winter, they feed on grasses, forbs, waste grains, small mammals, amphibians, snakes, and invertebrates (Zeiner et al. 1990). They feed in pastures, flooded grain fields, and seasonal wetlands. The Grasslands Ecological Area, specifically the Merced NWR and Arena Plains Unit, is the primary wintering area for the majority (over 12,000) of the Pacific Flyway's lesser sandhill crane population.

USFWS has conducted sandhill crane surveys within the West and East Bear Creek units of the San Luis NWR since 1994. The highest counts for lesser sandhill cranes (2,500) were within the West Bear Creek Unit native uplands in 1995 (JSA et al. 2000). The highest counts for greater Sandhill cranes (37) were along the San Joaquin River in October 1997 (JSA et al. 2000). San Luis NWR personnel reported that sandhill crane populations appear to be doing well at the refuge complex (JSA et al. 2000). Sandhill cranes have been observed in Reach 2 over several years (M. Wolfe, pers. obs.). Restoration actions that influence wetlands and grasslands may affect this species.

9.5.3.13. Western Snowy Plover (*Charadrius alexandrinus nivosus*)

The western snowy plover is designated as a species of special concern by CDFG, and designated a migratory non-game bird of management concern by USFWS. There are two distinct populations of western snowy plover: coastal and inland. The inland population is the one that occurs in the Central Valley; the coastal population, listed as threatened under the ESA, is restricted to the coastline.

The western snowy plover's current distribution in California is along the coast from Oregon to Mexico and near lakes in the drier interior portions of California. In 1980, the adult population was estimated at 3,408 individuals; by 1989 it was estimated at 3,031. The largest coastal breeding population of this species is found around the San Francisco Bay; the largest inland breeding populations are found around Owens Lake (Inyo County) and Alkali Lake (Modoc County) (Small 1994).

The inland populations nest around the shores of alkali lakes and along dikes of saltponds (Grinnell and Miller 1944). There are nesting sites scattered along the coast from the Oregon border to San Diego County, as well as along many inland lakes and saltponds and on the Channel Islands (Remsen 1978). Western snowy plovers nest from April to August. Nests are built by digging a depression in the sand and lining it with shells and other debris (Zeiner et al. 1990). Western snowy plovers feed on arthropods in the dry sands of the upper beach, rarely foraging in the wet sand, and primarily on brine flies around saltponds and alkali lakes (Cogswell 1977).

The western snowy plover has been documented to occur at the Kesterson Unit of the San Luis NWR. It probably also occurs at the San Luis and Arena Plains units (San Luis NWR file data, as cited in JSA et al. 2000). Restoration actions that influence sandy beaches and shorelines could affect this taxon.

9.5.3.14. Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)

Western yellow-billed cuckoos are a candidate species for federal listing and are listed as endangered by the state of California. The cuckoo ranges across most of the U.S. and northern Mexico, and winters in South America. The western subspecies of the yellow-billed cuckoo historically nested from British Columbia south to Mexico and was known to breed in all regions of California except the central and northern Sierra Nevada, the Great Basin, and the Colorado Desert. The western yellow-billed cuckoo's population has been severely reduced by loss of riparian habitats. Grazing, cutting of streamside vegetation, and water diversion projects have also impacted habitat for this species. In addition, pesticide use has resulted in eggshell thinning and reproductive failure (Laymon and Halterman 1987). Now, the western yellow-billed cuckoo has been extirpated as a nesting species from most of the state and the current distribution of the western subspecies is limited to scattered locations in California and along the Colorado River.

The species was observed in 1916 on the Tuolumne River near Modesto; this nesting population is currently presumed to be extirpated (CDFG 1997). In the late 1960s, a few yellow-billed cuckoos were regularly observed near the confluence of the Tuolumne and San Joaquin rivers, but this area was subsequently subject to intensive logging and no cuckoos have been observed in recent years (H. Reeve, pers. comm., 1998). Reeve (1988) considers the yellow-billed cuckoo to be a rare migratory species during the spring in Stanislaus County. No summer occurrences have been recorded.

This species forages primarily on grasshoppers, cicadas, caterpillars and other insects, which it gleans from foliage, and occasionally on small vertebrates and fruits (Bent 1940, Preble 1957). It is monogamous, with both sexes sharing in incubation of eggs and feeding of young during mid-June to late July. It nests in extremely dense willows, cottonwood, or occasionally mesquite vegetation (Hamilton and Hamilton 1965). Cuckoos inhabit densely foliated, deciduous trees and shrubs, particularly willows, with a dense understory formed by blackberry, nettles and/or wild grapes, and which abut on slow-moving watercourses, backwaters, or seeps (CDFG 1983). River bottoms and other mesic habitats, including valley-foothill and desert riparian habitats are necessary for breeding. Dense low-level or understory foliage with high humidity is preferred (Gaines 1974, 1977). This taxon may avoid valley-oak riparian habitats where scrub jays are abundant.

The western yellow-billed cuckoo has been recorded in the Firebaugh and Mendota Dam quadrangles (CNDDB 2002). Restoration actions that influence riparian scrub could affect this species.

9.5.3.15. Willow Flycatcher (*Empidonax traillii*)

The willow flycatcher is listed as endangered under CESA. Currently, 2 subspecies, *E. t. brewsteri* and *E. t. adastus*, are fairly common migrants in riparian habitats of the Central Valley. A third subspecies, Southwestern willow flycatcher (*E. t. extimus*), a rare breeder along the South Fork Kern River (Whitfield et al. 1999), is also listed as endangered under the federal ESA.

This species is a rare to locally uncommon summer resident in wet meadow and montane riparian habitats. The willow flycatcher most often occurs in broad open river valleys or large mountain meadows with lush growth of shrubby willow.

Within the San Joaquin River floodplain, willow flycatchers are rare spring and uncommon fall migrants in riparian habitats of the San Luis and West Bear Creek units of the San Luis NWR (JSA et al. 2000). The Point Reyes Bird Observatory (PRBO) banded migrant willow flycatchers in riparian habitats of the San Joaquin River in spring and fall (Ballard and Geupel 1999). Restoration actions that influence willow scrub in riparian areas and meadows may affect this species.

9.5.3.16. Bank Swallow *(Riparia riparia*)

The bank swallow is listed as threatened under the CESA. The bank swallow historically occurred along the larger lowland rivers throughout California, with the exception of southern California, where the species occurred principally along the coast and at the mouths of large rivers such as the Los Angeles River (Humphrey and Garrison 1987, Laymon et al. 1988). This species has now been extirpated from southern California and its range has been reduce by 50% since 1900 (Laymon et al. 1988, CDFG 1997). It is currently confined to the Sacramento River above the town of Colusa, where colonies averaging about 250–410 burrows each have been documented since 1986 (Humphrey and Garrison 1987, Laymon et al. 1987, CDFG 1993), and is scattered in colonies in northern California. During a survey conducted in 1987, 111 colonies were located and the statewide population was estimated at 18,800 pairs, about 70% of which occurred along the Sacramento River (Laymon et al. 1988, CDFG 1993). The last stronghold for the bank swallow is along the banks of the Sacramento River (CDFG 1992) and its major tributaries (Humphrey and Garrison 1987). The population estimate as of 2000 of 4,990 nesting pairs, based on annual CDFG monitoring surveys, indicates a population decline of about 73% since 1987.

The bank swallow is a migrant that breeds primarily in the Central Valley of California and winters in South America. It arrives in California in mid-March, with numbers of birds peaking in May (Humphrey and Garrison 1987, Laymon et al. 1988). The bank swallow requires bluffs or banks with soft sand and sandy loam soil primarily immediately adjacent to still or running water. Gravel extraction sites, such as those along Cache Creek in Yolo County, are sometimes used for nesting. Sacramento River colonies have ranged from 78 in 1987 to the current total of 42. The species constructs burrows 2–3 feet deep into the nearly vertical eroding banks where it chooses to establish nesting colonies. The bank swallow breeds and lays a clutch of 4–5 eggs in April; the young hatch in May and 2–3 young are fledged by July each year in a single breeding attempt. The adults and young-of-the-year remain along the riverbanks until they migrate south in the fall.

Bank swallows occur near Mendota Pool. Restoration actions that influence the structure or flooding of high river banks could affect this species.

9.5.3.17. Least Bell's Vireo (*Vireo bellii pusillus*)

The least Bell's vireo is listed as endangered by both the USFWS and the state of California (CDFG 2000). Formerly, the vireo was known to breed from interior northern California near Red Bluff in Tehama County south through the Sacramento and San Joaquin valleys and Sierra Nevada foothills, and in the coastal ranges from Santa Clara County south to the approximate vicinity of San Fernando in Baja California. It historically nested throughout riparian areas in the Central Valley and in other low-elevation riparian zones in California (CPIF and RHJV 1998). The bird also occurred in the Owens and Death valleys in Inyo County and at scattered oases and canyons throughout the Mojave Desert (CDFG 2000).

The species was characterized as abundant at one time (USFWS 1998, as cited by CPIF and RHJV 1998), but is now absent from most of its historical range. In 1973, no members of the species were found during an extensive search of formerly occupied habitat between Tehama County and San Joaquin County (Gaines 1974, as cited by CPIF and RHJV 1998). By 1980, the species was extirpated from the entire Central Valley (USFWS 1998, as cited by CPIF and RHJV 1998). Currently, its breeding range is restricted to Southern California, with large populations in Riverside and San Diego counties and smaller populations in Santa Barbara, Ventura, and San Diego counties and in northern Baja California (CDFG 2000). However, recent observations indicate that the species' range is expanding northward and individuals are currently recolonizing areas that have been unoccupied

for decades (USFWS 1998, as cited in CPIF and RHJV 1998). The vireo is threatened by loss and degradation of its habitat through human and human-induced activities and by nest parasitism of the brown-headed cowbird. Adverse impacts to vireo habitat result from clearing of land for urban and suburban development and for agriculture, water projects, severe flooding due to water releases from dams, military activities (e.g., troop training), fires, off-road vehicles, livestock activities, invasion of non-native plant species, and long-term camping activities (CDFG 2000).

The least Bell's vireo is a summer resident of cottonwood-willow forest, oak woodland, shrubby thickets, and dry washes with willow thickets at the edges (CDFG 2000). It inhabits low, dense riparian growth along water or along dry parts of intermittent streams and gleans insects from foliage and branches. The least Bell's vireo is typically associated with willow, cottonwood, coyote bush, wild blackberry, or mesquite in desert localities, as they afford nesting and roosting cover.

The least Bell's vireo has not been recorded in the study area quadrangles (CNDDB 2002). Restoration actions that influence riparian scrub and forest could affect habitat for this species and the potential for its recolonization of the area.

9.5.3.18. Riparian Brush Rabbit (*Sylvilagus bachmani riparius*)

The riparian brush rabbit is listed as endangered under both the federal and state ESA. Historically, the brush rabbit was found along portions of the San Joaquin River and its tributaries on the valley floor from Stanislaus County to the Sacramento-San Joaquin Delta. Currently, due to habitat destruction, the entire remaining population of this species is believed to be confined to Caswell Memorial State Park, at the confluence of the Stanislaus River with the San Joaquin River.

Riparian brush rabbits are found in small clearings amongst dense riparian vegetation, where they feed on grasses, sedges, clover, forbs, and leaves. They tend to avoid riparian forests with a continuously closed canopy because this type of habitat does not support shrubs and forbs preferred as food (Williams et al. 1997). The riparian brush rabbit has been heavily impacted by construction of large dams in the Central Valley and the conversion of large tracts of land to agriculture, which has fragmented riparian habitat. The remaining population of riparian brush rabbits suffered heavy mortality during the floods of 1986 and 1997 (Williams et al. 1997). The recovery strategy for the riparian brush rabbit includes establishment of new populations at sites other than Caswell Memorial State Park to reduce the risk of catastrophic floods or wildfires driving this species to extinction.

The taxon is not known to occur in the study area and has not been documented in the CNDDB in the vicinity of the study area. Restoration actions that influence the formation and maintenance of riparian scrub could affect habitat for this rabbit, and its potential to re-colonize the study area.

9.5.3.19. San Joaquin (Nelson's) Antelope Ground Squirrel (*Ammospermophilus nelsoni*)

The San Joaquin antelope ground squirrel is listed as endangered by the state of California. The historical distribution of the San Joaquin antelope ground squirrel included the western and southern portions of the Tulare Basin, San Joaquin Valley, and the contiguous areas to the west in the upper Cuyama Valley and on the Carrizo and Elkhorn plains. The species ranged from western Merced County on the northwest, southward along the western side of the San Joaquin Valley to its southern end (Williams et al. 1998). San Joaquin antelope squirrels range in elevation from about 165 feet (50 meters) on the San Joaquin Valley floor to about 3,600 feet (1,100 meters) in the Temblor Mountains. Loss of habitat to agricultural developments, urbanization, and petroleum extraction is the principal factor threatening San Joaquin antelope ground squirrels (Williams et al 1998). Another threat to these ground squirrels on private land may be the long-term effects of excessive grazing by livestock (Williams et al. 1998).

In the southern and western San Joaquin Valley, San Joaquin antelope ground squirrels are associated with open, gently sloping land with shrubs. Typical vegetation includes saltbushes and ephedra (Hawbecker 1975, as cited in Williams et al 1998).

Hawbecker (1975, as cited in Williams et al. 1998) reported that near Los Banos, Merced County, and near Mendota, Fresno County, the habitat is mostly devoid of brushy cover. Extant, uncultivated habitat for San Joaquin antelope squirrels was estimated in 1979 to be 275,000 hectares (680,000 acres) (Williams 1980, as cited in Williams et al 1998). None of the best habitat described by Grinnell and Dixon (1918, as cited in Williams et al 1998) remained.

This species has been documented in the Mendota Dam and Tranquility quadrangles (CNDDB 2002). Restoration actions that influence open habitat with brushy cover could affect the species.

9.5.3.20. Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*)

The Fresno kangaroo rat is listed as endangered under ESA and CESA. The Fresno kangaroo rat is a subspecies of the San Joaquin kangaroo rat and is the smallest of California's kangaroo rats (Culbertson 1946, Grinnell 1922). The historical range of the Fresno kangaroo rat probably extended north through north-central Merced County and south through southwestern Madera and central Fresno counties (Hoffman 1974, CDFG 1991). A survey in the late 1970s indicated that the Fresno kangaroo rat remained on only 857 acres in western Fresno County (Hoffman and Chesemore 1982). The last known capture was in late 1992 in the Alkali Sink Ecological Reserve (USFWS 1998, as cited in Kucera et al. 2001), and extensive trapping since 1993 in Fresno and Madera counties have not documented additional kangaroo rats (Kucera et al. 2001).

The Fresno kangaroo rat has narrow habitat requirements, only occupying alkali desert scrub communities between 200 and 300 feet elevation (CDFG 1992) within the alkali desert scrub habitat type. Seasonally flooded or arid alkaline plains with alkaline, clay-based soil and sparse growths of grassland or low brush are used. Vegetation such as saltbush, iodine bush, saltgrass, and alkali bite provide food and cover for this subspecies (Culbertson 1946). Areas with a hummocky land surface are used as sites for burrow systems (Culbertson 1946). The Fresno kangaroo rat is not known to use areas that are cultivated or irrigated.

Fresno kangaroo rats have been documented in the Fresno North, Mendota Dam, and Tranquility quadrangles (CNDDB 2002). They were captured at the Alkali Sink Ecological Reserve and Mendota Wildlife Management Area near the study area in 1981, 1985, and 1992. There is an unconfirmed report of capture of Fresno kangaroo rats in the Gravelly Ford area on the San Joaquin River (P. Kelly, pers. comm., as cited in Newman et al. 2001). Recent trapping at well locations in Reach 2 revealed only Heerman's kangaroo rat (*D. heermanii*) (Wolfe and Assoc. 2000 and 2001, Kucera et al. 2001), and this species is considered by some to be extirpated along the San Joaquin River (J. Single, pers. comm. to M. Wolfe, 2002). Restoration actions that influence upland alkaline desert scrub could affect habitat for this kangaroo rat, and its potential to re-colonize the study area.

9.5.3.21. San Joaquin Valley (Riparian) Woodrat (*Neotoma fuscipes riparia*)

The San Joaquin Valley (or riparian) woodrat is listed as endangered under the ESA and is a CDFG species of special concern. It is a subspecies of the dusky-footed woodrat (*Neotoma fuscipes*). Historically found along the San Joaquin, Stanislaus, and Tuolumne rivers, the subspecies likely occurred throughout the extensive riparian forests along major streams flowing onto the floor of the northern San Joaquin Valley (Williams et al. 1997). The type locality for the San Joaquin Valley woodrat is Kincaid's Ranch, about 3 km (2 mi) northeast of Vernalis in Stanislaus County (Hooper 1938, as cited in Williams et al. 1997).

Since 1938, the range of the subspecies has become far more restricted due to extensive modification and destruction of riparian habitat along streams in its former range in the Central Valley. The San Joaquin Valley woodrat is vulnerable to flooding of its riparian habitats because its current habitat consists of small, narrow riparian forest patches (Williams et al. 1997). Although it is arboreal and can therefore escape rising water levels, its stick nests are essential for survival and may be severely impacted by flooding. Cattle grazing may also negatively impact woodrats by trampling, browsing, and grazing in riparian areas used by the species. The only verified extant population is restricted to about 100 ha (250 acres) of riparian forest in Caswell Memorial State Park on the Stanislaus River, at the confluence with the San Joaquin River (Williams et al. 1997). There have been no reports of the San Joaquin Valley woodrat from the type locality near Vernalis since the 1970s (Williams and Kilburn 1992).

Although little is known about its diet, the San Joaquin Valley woodrat is believed to be a generalist herbivore that feeds on a wide variety of leaves, fruits, terminal shoots of twigs, flowers, nuts, and fungi (Williams et al. 1992). It is most numerous in areas where there is dense shrub cover with an overstory of valley oaks (USFWS 1998). Highest densities are often encountered in willow thickets with oak overstory (Linsdale and Tevis 1951, as cited in USFWS 1998). The San Joaquin Valley woodrat typically constructs stick houses on the ground against or straddling a log or the exposed roots of a standing tree, often in dense brush (Williams et al. 1997). It may also occasionally nest in trees and in nest boxes constructed for wood ducks (Williams 1993, as cited in Williams et al. 1997). Reproduction may occur throughout the year, with the fewest pregnancies in December and the most in February (Williams et al. 1997). Females have from one to five litters per year, consisting of three to four young each (Williams et al. 1997).

This taxon has not been documented near the study area, and there are no CNDDB records of it within the quadrangles covering the study area (CNDDB 2002). Restoration actions that influence riparian forest could affect habitat for this taxon, and its potential to re-colonize the study area.

9.5.3.22. San Joaquin Kit Fox (*Vulpes macrotis mutica*)

The San Joaquin kit fox is listed as endangered under ESA and as threatened under CESA. San Joaquin kit foxes occur in seasonal wetland, alkali desert scrub, grassland, and valley-foothill hardwood habitats (USFWS 1983). Before the rapid expansion of irrigated agriculture in the San Joaquin Valley, the alkali desert scrub association was probably the species' prime habitat (Grinnell et al. 1937). Although the precise historical range of the San Joaquin kit fox is unknown, it is believed to have extended from Contra Costa and San Joaquin counties in the north to Kern County in the south. By the 1930s, the range had been reduced to the southern and western portions of the Central Valley (Grinnell et al. 1937). Surveys conducted between 1969 and 1975 extended the known range of the kit fox back into portions of its historical range in the northern San Joaquin Valley, including Contra Costa, Alameda, and San Joaquin counties (Orloff et al. 1986). Additionally, kit foxes were found in three counties outside the originally defined historical range: Monterey, Santa Clara, and Santa Barbara counties (Orloff et al. 1986).

USFWS conducted surveys for the San Joaquin kit fox at the West Bear Creek Unit in 1981, 1993, and 1997 (JSA et al. 2000). A single fox was observed just south of the West Bear Creek/San Luis Unit boundary during the 1981 survey. One kit fox was observed in 1997 near the location of the 1981 observation (JSA et al. 2000). In 1986, a single kit fox was seen near the State Route 165 bridge over Salt Slough in the West Bear Creek Unit (JSA et al. 2000). In August 2001, there was an unconfirmed sighting in the vicinity of the Chowchilla Bifurcation Structure, located at the Chowchilla Bypass along the San Joaquin River. Researchers observed the fox at night with a spotlight (Kucera et al. 2001). A scent dog signaled the presence of suspected kit fox scat near where the fox was observed

the previous night, but molecular genetics analysis of the collected scat identified it as coming from a gray fox (*Urocyon cinereoargenteus*) (Kucera et al. 2001). No observations of kit foxes have been confirmed in the West Bear Creek area since 1997. Restoration actions that influence upland and wetland habitats could affect this taxon.

9.5.4. Other Special-Status Wildlife

9.5.4.1. California Tiger Salamander (*Ambystoma californiense*)

The California tiger salamander is a candidate for federal listing (except in Sonoma County, where it is listed as engendered), and considered a species of special concern by CDFG. The tiger salamander is endemic to California. Its range includes the Central Valley and the eastern foothills of the Sierra Nevada from Yolo County (possibly up to Colusa County) south to Kern County, and coastal grasslands from Sonoma County to Santa Barbara County. In California, most populations occur at elevations of less than 455 meters (1,500 feet), but they have been recorded at elevations up to 1,370 meters (4,500 feet). The species is most commonly found in annual grassland habitat but also occurs in the grassy understory of valley foothill hardwood habitats. Adults spend most of the year in subterranean refugia, especially in ground squirrel burrows and occasionally in human-made structures. Seasonal ponds or vernal pools are crucial to breeding. Permanent ponds or reservoirs that do not contain predatory fish or bullfrogs may also be used for breeding.

USFWS conducted surveys for California tiger salamanders at 71 vernal pools at the West Bear Creek Unit of the San Luis NWR in 1992, 1993, and 1994 (JSA et al. 2000). These surveys revealed the presence of larval salamanders at 28 surveyed vernal pools (JSA et al. 2000). This species also was detected at 24 vernal pools at Great Valley Grasslands State Park (JSA et al. 2000). It has been documented in numerous quadrangles in the study area (CNDDB 2002). Restoration actions that influence seasonal or vernal pools and grasslands could affect this species.

9.5.4.2. Western Spadefoot (*Scaphiopus hammondii*)

Western spadefoot is considered a species of special concern by CDFG. The western spadefoot occurs in much of California west of the Sierra Nevada from Redding south to the Mexico (Jennings and Hayes 1994). Severe reductions of this species have occurred throughout its range; more than 80% of its habitat in southern California has been developed or altered and more than 30% of its habitat in the Central Valley has been converted such that it is unusable (Jennings and Hayes 1994).

Western spadefoot breed in temporary pools (typically vernal pools) created by winter rains in grassland habitats. Pools must last more than 3 weeks to allow for successful metamorphosis of larvae (Jennings and Hayes 1994). As pools dry, adults dig down into the soil and create a burrow where they estimate for most of the year (Zeiner et al. 1988). Adults feed on most types of insects and other invertebrates; larvae are carnivorous and feed on dead amphibians, even their own species, as well as plankton and algae (Zeiner et al. 1988).

USFWS conducted surveys for the western spadefoot at 71 vernal pools at the West Bear Creek Unit of the San Luis NWR complex in 1992, 1993, and 1994 (JSA et al. 2000). These surveys revealed the presence of larval spadefoots at 14 surveyed vernal pools (JSA et al. 2000). This species was also detected at 20 vernal pools at Great Valley Grasslands State Park (Hoopes et al. 1996). It has been documented in numerous quadrangles in the study area (CNDDB 2002). Restoration actions that influence vernal pools could affect this species.

9.5.4.3. Western Pond Turtle (*Clemmys marmorata*)

The western pond turtle is considered a species of special concern by CDFG. The western pond turtle is the only freshwater turtle native to most of the west coast of temperate North America. This species is found throughout California, principally west of the Sierra Cascade crest. Two subspecies are present in California, the southwestern pond turtle (*C. m. pallida*) and the northwestern pond turtle (*C. m. marmorata*). The San Joaquin Valley is within an intergrade zone for the two subspecies (Stebbins 1985).

Low fecundity, low hatchling and juvenile survivorship, high adult survivorship, and potentially long lifespan are characteristic of this species (Jennings et al. 1992). Potential competitive exclusion by introduced turtle species and predation on hatchlings by introduced bullfrogs, largemouth bass, and mesopredators such as raccoons are increasing threats to this species. Off-road vehicle use on streambeds and habitat destruction due to sedimentation are potential threats as well. Reasons for the decline in this species are numerous and complex; however, alteration of aquatic and adjacent upland habitats by logging and dam building are also causes for concern (Jennings et al. 1992).

The western pond turtle inhabits a wide range of fresh or brackish water habitats throughout California including ponds, lakes, slow-moving streams, ditches, pools remaining from drying of intermittent streams, and irrigation canals with muddy or rocky bottoms and emergent vegetation. Although adults are habitat generalists, hatchlings and juveniles require very specialized habitat for survival through their first few years. Habitats preferred by juveniles are relatively scarce and subject to disturbance (Jennings et al. 1992). Prime habitat for early life stages includes low-flow regions and backwater areas of rivers. Deep, still water with abundant emergent woody debris, overhanging vegetation, and rock outcrops is optimal for older life stages as basking and thermoregulation habitat. Breeding activity peaks from June to July, when females begin to search for suitable nesting sites up to 325 feet (99 m) away from the watercourse (Nussbaum et al. 1983). Egg-laying sites vary from sandy shoreline to forest soil types. In regions of California with cold winters, western pond turtles take refuge in aestivation or overwintering sites in October or November. Western pond turtles are active year-round in warmer coastal sites (Jennings and Hayes 1994). Little is known about overwintering habitat, but individuals have been recorded overwintering on land close to their summer water source, at sites up to 1,000 feet (305 m) away from water, and underwater (Rathbun et al. 1992, 1993 as cited in Jennings and Hayes 1994; Jennings and Hayes 1994).

There are verified observations of western pond turtles in Merced and adjacent counties (Jennings and Hayes 1994). Jennings and Hayes (1994) report that the western pond turtle has been documented over a half-dozen times across most portions of Stanislaus County. The CNDDB lists records for this species in San Joaquin, Stanislaus, and Merced counties (CDFG 1997). The western pond turtle has been documented in the San Luis, Kesterson, West Bear Creek, and Arena Plains units of the San Luis NWR, and the Mendota Wildlife Management Area (San Luis NWR file data, as cited in JSA et al. 2000). Two western pond turtles were observed during 2001 surveys near river milepost 202 at Mendota Pool (ESRP unpublished data, as cited in Newman et al. 2001). The species has been documented in the Delta Ranch, Firebough, Little Table Mountain, Mendota Dam, Millerton Lake West, and Tranquility quadrangles (CNDDB 2002). Restoration actions that influence lentic aquatic habitats and adjacent uplands could affect this species.

9.5.4.4. California Horned Lizard *(Phrynosoma coronatum frontale)*

The California horned lizard is considered a species of special concern by CDFG. Endemic to California, this species has a patchy distribution from Shasta County south along the edges of the Sacramento Valley into the South Coast Ranges, San Joaquin Valley, Sierra Nevada foothills to Los

Angeles, Santa Barbara, and Ventura counties (Jennings and Hayes 1994). It is found from sea level to almost 6,000 ft in elevation. The California horned lizard has been impacted by agricultural practices, housing development, and introduction of non-native predators (such as feral cats) (Jennings and Hayes 1994).

Habitats used by California horned lizards usually have some unvegetated areas near scattered shrubs with a gravelly-sandy or sandy loam substrate. Such habitats can include riparian woodlands, chamise chaparral, annual grassland, alkali flats, scattered shrubs, gravelly-sandy or sandy loam substrate, and some agricultural areas with sandy soil. California horned lizards shelter in burrows that they excavate themselves, or that are excavated by small mammals (Jennings and Hayes 1994). California horned lizards are active from April through October, and feed on ants, beetles, and other insects.

This taxon has been documented to occur in the study area, although the CNDDB contains no records for this species in study area quadrangles (CNDDB 2002). Restoration actions that influence upland, sandy habitats could affect this species.

9.5.4.5. Silvery Legless Lizard (*Anniella pulchra pulchra*)

The silvery legless lizard is considered a species of special concern by CDFG. The silvery legless lizard is a subspecies of the California legless lizard (*Anniella pulchra*). The silvery legless lizard is found in the Coast Range from the vicinity of Contra Costa County south to Mexico, and in the San Joaquin Valley (Hunt 1983, as cited in Jennings and Hayes 1994).

This lizard is found primarily in areas with sandy or loose organic soils or where there is plenty of leaf litter. It usually forages at the base of shrubs or other vegetation either on the surface or just below it in leaf litter.

Silvery legless lizard has been documented in the Arena Plains Unit of the San Luis NWR (San Luis NWR file data, as cited in JSA et al. 2000). One occurrence of this species was recorded near Reach 2A where Willow Slough meets the San Joaquin River. Restoration actions that influence upland areas with loose soils could affect this species.

9.5.4.6. San Joaquin Whipsnake (Coachwhip) (*Masticophis flagellum ruddocki*)

The San Joaquin whipsnake is a CDFG species of special concern. The range of this California endemic extends from west of Arbuckle in the Sacramento Valley southward to the Kern County portion of the San Joaquin Valley and westward into the inner South Coast Ranges.

San Joaquin whipsnake habitat includes open dry valley grassland with little or no tree cover and sandy or rocky soils (CNDDB 2002). It occurs in open terrain and is most abundant in grass desert, scrub, chaparral and pasture habitats. They seek cover in rodent burrows, bushes, trees, and rock piles, and hibernate in soil or sand approximately 0.3 m below the surface (CDFG 1988). In the western San Joaquin Valley, it occurs in valley grassland and saltbush scrub habitats (Montanucci 1965, Banta and Morafka 1968, Toflestrup 1979, Sullivan 1981, all as cited in Jennings and Hayes 1994). Whipsnakes are mainly terrestrial, but occasionally climb trees and bushes to bask, seek prey and cover (Cunningham 1959).

Little is known about nest sites. The San Joaquin whipsnake uses burrows possibly for oviposition sites and therefore may require one or more mammal associations. Although this snake probably has a high degree of dependence on mammals, the species it may depend on and the nature of such relationships are vague.

This taxon is not known to occur in study area, and no records of its occurrence near the study area are found in CNDDB (2002). Restoration actions that influence upland open habitats could affect this species if it occurs in the area.

9.5.4.7. American White Pelican (*Pelecanus erythrorhynchos*)

The American white pelican nesting colonies are considered a CDFG species of special concern. With wingspans up to 9 feet, American white pelicans are among the largest and most spectacular of North American birds. At the beginning of the 20th century, they nested at large lakes throughout California, from the Klamath Basin, through the Central Valley, to the Salton Sea. Today, most of California's breeding population is restricted to islands at Clear Lake and Tule Lake National Wildlife Refuges, near the Oregon border. During the breeding season from April to August, they are restricted to protected islands that are inaccessible to predators. They may commute more than 180 miles between their breeding and foraging grounds (Zeiner et al. 1990). From October through March, most depart their breeding grounds in northeastern California, and migrant flocks are seen throughout much of the state, including large wetlands in the San Joaquin Valley.

American white pelicans forage in water of various depths, and they dive for prey items from the water's surface. Fish are their preferred prey, but occasionally they also consume crustaceans and amphibians (Zeiner et al. 1990). Often flocks of 20 or more birds swim and wade together to herd fish into shallow water, where they can be captured more easily.

At the San Luis NWR complex, American white pelicans are fairly common visitors to large wetlands at the San Luis, West Bear Creek, and Kesterson units. They have only been recorded as a nesting species at the San Luis NWR complex since 1998 (Woolington, pers. comm., as cited in JSA et al. 2000). Restoration actions that influence fish-bearing aquatic habitats could affect this species.

9.5.4.8. Double-crested Cormorant (*Phalacrocorax auritus*)

Double-crested cormorant rookery sites are of special concern to CDFG. It is the only one of the 3 species of cormorants that occur in California that can be regularly found in freshwater habitats (Cogswell 1977). The double-crested cormorant nests along the coast from the Oregon border south to San Diego County and also inland. Coastal populations in southern California have declined significantly. The shores of the Salton Sea provide nesting areas for this species, but these populations have also declined. Large breeding populations occur on the lakes and marshes of northeastern California. Cormorants nest at 3 locations in the lower Sacramento Valley: Sacramento River near the Yolo/Colusa County border, Stone Lakes National Wildlife Refuge, and southern Yolo Bypass. Cormorants are more common from fall to spring in the Central Valley than during summer months (Cogswell 1977). Although this species is locally common, Grinnell and Miller (1944) noted that population declines were evident in the 1940s. The population of this species continued to decline in the late 1960s and 1970s but have since recovered somewhat. Their numbers, however, have not yet reached original levels (Small 1994). Many of the former nesting grounds of the San Joaquin Valley, especially in the Tulare Lake and Buena Vista Lake basins, are no longer suitable (Remsen 1978).

Along the coast, the double-crested cormorant nests along cliffs; inland, they use tall trees near water to build nests out of sticks and debris. The breeding period is from April to July, but the species may breed considerably earlier in southern rookeries. Cormorants nest in large colonies of up to several hundred pairs (Zeiner et al. 1990). Nesting sites are often in secluded areas because this species is particularly sensitive to human disturbance (Remsen 1978). The cormorant's diet consists mainly of fish, but it will also feed on amphibians and crustaceans (Zeiner et al. 1990).

Double-crested cormorants nest along with great egrets and great blue herons in at least 2 colonies at the West Bear Creek Unit of the San Luis NWR, where up to 50 nests have been counted (USFWS file data, as cited in JSA et al. 2000). Double-crested cormorants also are fairly common visitors to

managed wetlands throughout the San Luis NWR complex in the nonbreeding season (JSA et al. 2000). Restoration actions that influence the habitat at and accessibility of humans to their colonies could affect this species.

9.5.4.9. Western Least Bittern (*Ixobrychus exilis hesperis*)

The nesting western least bittern is designated as a species of special concern by CDFG. Historically, the western least bittern was a fairly locally common summer resident. It was most common in the Sacramento Valley, the San Joaquin Valley, and southern California (Grinnell and Miller 1944). The populations in the Central Valley have been much reduced and the species is now common as a breeder only at the Salton Sea and lower Colorado River (Small 1994). Elsewhere in southern California, it is a very local breeder and is rare during winter. It is a rare spring and fall transient along the coast from Santa Barbara County to Marin County and a rare summer breeder in Little Shasta Valley (Siskiyou County), Klamath Basin, and Great Basin marshes. In the Sacramento and San Joaquin valleys, this species is now an uncommon breeder and rare winter visitor (Small 1994).

Western least bitterns occupy marshes and other freshwater bodies of water, where they hide among the dense emergent vegetation. Associated plant species include tules and cattails (Zeiner et al. 1990). Individuals arrive at nesting grounds from March to May and breed from mid-April to July. They nest in tules and cattails and build nests over the water (Zeiner et al. 1990). Western least bitterns also use dense emergent vegetation to forage for small fish, invertebrates, amphibians, and small mammals (Zeiner et al. 1990).

The western least bittern has been documented to occur at the San Luis Unit of the San Luis NWR (San Luis NWR file data, , as cited in JSA et al. 2000). Restoration actions that influence wetlands could affect this species.

9.5.4.10. Great Blue Heron (*Ardea herodias*)

Colonial nesting sites of great egret are designated as sensitive by the California Department of Forestry and Fire Protection. Colonies of great blue herons were reported in Marin, Humboldt, and Placer counties in the early 1970s (Pratt 1970, Ives 1972, Wilburn 1971). They are fairly common throughout most of California year-round in shallow estuaries and fresh and saline emergent wetlands. Few rookeries have been found in southern California but many are scattered throughout the Central Valley (Zeiner et al. 1990). Knowledge of rookery locations is incomplete (Mallette 1972, Belluomini 1978, Garrett and Dunn 1981).

The species winters throughout California (Zeiner et al. 1990). The Central Valley and San Francisco Bay Area are considered a key wintering areas in North America for great blue herons (Mikuska et al. 1998).

The great blue heron arrives at breeding grounds in February. Eggs are laid in late February or March. In June or July, after breeding, individuals disperse from the nesting colonies to outlying areas, but there is little regular migration (Gill and Mewaldt 1979). Great blue heron nests are similar to and often occur in mixed colonies with great egrets (Cogswell 1977). Herons usually nest in colonies in the tops of secluded large snags or live trees, usually among the tallest trees available (Zeiner et al. 1990).

Great blue herons require habitat containing fish-bearing waters; 75% of their diet consists of fish. They also eat crustaceans, frogs, salamanders, lizards, snakes, large aquatic insects, and small rodents (Cogswell 1977). The species is active year-round and feeds both night and day, but is most active at dawn and dusk (Terres 1980).

Heronry surveys were conducted at the San Luis NWR complex from 1987 through 1998 (JSA et al. 2000). There are 3 active heronries at the West Bear Creek Unit. Site G1, located near the boundary between the West Bear Creek and San Luis units, had the highest nest count, with 152 great blue heron nests in 1998 (JSA et al. 2000). Suitable habitat for this species is found throughout the remainder of the project area. Restoration actions that influence rookeries (and human access to them), aquatic habitats, and wetlands could affect this species.

9.5.4.11. Great Egret (*Casmerodius albus*)

Colonial nesting sites of great egret are designated as sensitive by the California Department of Forestry and Fire Protection. Historically, great egret rookeries were found in Humboldt, Bolinas, and San Francisco bays; the Central Valley (south from the upper Sacramento Valley); the lower Colorado River; and the southern end of the Salton Sea (Cogswell 1977). The current distribution of rookeries includes Humboldt, Bolinas, and San Francisco bays and the Central Valley. Historical nesting sites on the lower Colorado River and the southern end of the Salton Sea are now abandoned. Many of the colonies in the San Francisco Bay and in the Central Valley have declined or disappeared (Cogswell 1977).

Great egrets nest mostly along large streams, lakes, and rivers, such as the Sacramento River, American River, Putah Creek, Yolo Bypass, Cosumnes River, and Comanche River. This species winters throughout the Central Valley, Suisun Marsh, and San Francisco Bay Area.

Great egrets are residents year-round throughout most of their California range. They nest mainly from March to July, and populations are concentrated near nesting colonies. After nesting, individuals disperse over a wide range (Zeiner et al. 1990). Great egrets require groves of trees that are suitable for nesting and roosting, are relatively isolated from human activities, and are near aquatic foraging areas. Nests are constructed from sticks and stems of marsh plants and are built in large trees. Great egrets feed and rest in fresh and saline emergent wetlands; along the margins of estuaries, lakes, and slow-moving streams; on mudflats and salt ponds; and on irrigated croplands and pastures. They eat mainly fishes, amphibians, snakes, snails, crustaceans, insects, and small mammals (Zeiner et al. 1990).

Heronry surveys were conducted at the San Luis NWR complex from 1987 through 1998 (JSA et al. 2000). There are 3 active heronries at the West Bear Creek Unit. Site G1, located near the boundary between the West Bear Creek and San Luis units, had the highest nest count, with 129 great egret nests in 1998 (JSA et al. 2000). Restoration actions that influence rookeries (and human access to them), aquatic habitats, and wetlands could affect this species.

9.5.4.12. White-Faced Ibis (*Plegadis chihi*)

The white-faced ibis rookery sites are of special concern to CDFG. The white-faced ibis was once common, but by the 1940s, the white-faced ibis' population was declining (Grinnell and Miller 1944). By the 1970s, there were virtually no breeding white-faced ibises in California (Remsen 1978). In the 1980s, after decades of decline, the population of this species began to rebound. Since 1980, rookery sites have been recorded in Colusa, Yolo, Fresno, Kings, Siskiyou, and Modoc counties (CNDDB 1998). Nesting sites have also been recorded at the Salton Sea (Imperial County), Lake Guajome (San Diego County), Piute Ponds (Los Angeles County), and in Sierra Valley (Plumas County). Some white-faced ibises in California are summer breeders that winter in Mexico; others are winter residents that breed in areas north and east of California, especially Utah. Still others are California residents that migrate between their wintering and breeding sites in California (Small 1994).

The white-faced ibis requires freshwater marshes and other wetlands for nesting sites and for winter foraging grounds. The species nests from May to July in dense freshwater marsh vegetation near foraging areas (Zeiner et al. 1990). Nests are built among tall marsh plants out of dead tules or cattails. It may also nest in very low trees (Cogswell 1977). The ibis forages in shallow waters, including seasonal wetlands and rice fields, or on muddy banks where it probes for invertebrates, small fish, and amphibians (Zeiner et al. 1990).

White-faced ibis are regularly recorded at wetlands throughout the San Luis NWR complex, including the West Bear Creek, San Luis, Kesterson, and Arena Plains units (USFWS file data, as cited in JSA et al. 2000). They have been recorded nesting within the floodplain of the Kesterson Unit (JSA et al. 2000). They have also been observed near the Chowchilla Canal east of Mendota on the San Joaquin River (Kucera et al. 2001). White-faced ibis have been observed in and adjacent to Reach 2 (M. Wolfe, pers. obs., 2000 and 2001).

Restoration actions that influence wetlands and flooded rice fields may affect this species.

9.5.4.13. Fulvous Whistling Duck (*Dendrocygna bicolor*)

The nesting fulvous whistling duck is considered a species of special concern by CDFG. It once nested along the southern California coast, in the San Joaquin Valley, in the San Francisco Bay Area. Historically a common breeding species in wetlands near Los Banos, the fulvous whistling duck has not been reported as a breeding species in San Joaquin Valley since the early 1960s. It currently nests in only a few locations in Imperial Valley. Destruction of marsh habitat has probably been the main cause for the decline.
The fulvous whistling-duck is found in fresh emergent wetlands, shallow lacustrine and quiet riverine waters; it also feeds in wet croplands and pastures (Remsen 1978, as cited in CDFG 1983). The fulvous whistling-duck feeds mostly nocturnally but also diurnally on rice, other grains, seeds, and green shoots of herbs. It searches for food by walking over wet fields or in shallow water; swimming in shallow water and taking food from the surface, as well as by tipping and making shallow dives (Palmer 1976, as cited in CDFG 1983). In California, the fulvous whistling-duck usually rests by day in dense emergent wetland, rarely perching in trees or using wooded habitats (Cogswell 1977, as cited in CDFG 1983). Nesting typically occurs between April and September (Cogswell 1977, as cited in CDFG 1983), with most of the breeding population migrating to wintering areas in Mexico between September and February (CDFG 1983).

There are no records in the CNDDB (2002) of this species in the study area, and it is believe to have been extirpated from the area. Restoration actions that influence wetlands and flooded fields could affect this species' habitat and its potential for reintroduction.

9.5.4.14. Osprey (*Pandion haliaetus*)

The nesting osprey is considered a species of special concern by CDFG, and designated a sensitive species by the California Department of Forestry and Fire Protection. Ospreys breed in northern California from the Cascades south to Lake Tahoe, and along the coast south to Marin County. Regular breeding sites include Shasta Lake, Eagle Lake, Lake Almanor, other inland lakes and reservoirs, and northwest river systems. Pesticides have caused reproductive failure through eggshell thinning in the past (Garber 1972), but reproductive success has increased since the early 1970s (Airola and Shubert 1981). Loss of breeding habitat and declining fish numbers may threaten some populations (Ehrlich et al. 1992); however, populations of this species are apparently increasing (Zeiner et al. 1990).

Ospreys are strictly associated with large fish-bearing waters, primarily in ponderosa pine and mixed conifer habitats. These birds require open, clear water for foraging, which may occur in rivers, lakes, reservoirs, bays, estuaries, and surf zones. These raptors nest on platforms of sticks at the tops of large trees, snags, dead-topped trees, cliffs, or human-made structures. Nests are usually located within one-quarter mile of fish-producing waters. Birds arrive on the nesting grounds in mid-March to early April, and breeding occurs in March through September (Zeiner et al. 1990). Osprey feed primarily on fish, though they also take a few mammals, reptiles, birds, amphibians, and invertebrates (Zeiner et al. 1990).

This species has been documented in the Kesterson, West Bear Creek, San Luis, and Arena Plains units of the San Luis NWR (San Luis NWR file data, as cited in JSA et al. 2000). CNDDB has no records for osprey rookeries in the study area quadrangles (CNDDB 2002). Restoration actions that influence fish-bearing waters and roosting trees could affect this species.

9.5.4.15. White-tailed Kite (*Elanus leucurus*)

The white-tailed kite is listed as fully protected by CDFG. Only nesting sites are covered under the fully protected designation. This kite is a common to uncommon resident of coastal and valley lowlands west of the Sierra Nevada throughout the year. It is nonmigratory but may make slight seasonal range shifts in coastal areas (Zeiner et al. 1990). Rapid urbanization of agricultural lands in southern California resulted in declines in white-tailed kite populations in the 1980s (Small 1994). There is evidence of an upswing in the California population of this species, possibly due to increased habitat for microtine rodents (Small 1994).

White-tailed kites are found in coastal and valley lowland agricultural areas. Preferred foraging habitats include wetlands and grasslands. Prime habitat includes herbaceous lowlands with minimal tree growth and abundant small mammal prey. Groves of trees are required for perching and nesting. This raptor is generally monogamous and breeds from February to October. It nests in loosely piled sticks built near the top of dense oak or other tree stands 18–61 feet (5.5–18.6 m) above ground (Dixon et al. 1957). Breeding behavior peaks from May to August, when a single clutch of four to eight eggs is laid. This species preys on voles and other small mammals, as well as birds, insects, and reptiles. They often roost communally in winter (up to 100 or more birds) but are usually solitary hunters (Ehrlich et al. 1992).

White-tailed kites have been observed in Lost Lake Park (Stillwater Sciences, pers. obs., 2002). Restoration actions that influence wetlands, grasslands, and trees could affect this species.

9.5.4.16. Northern Harrier (*Circus cyaneus*)

Nesting northern harriers are considered a species of special concern by CDFG. The northern harrier is a fairly common winter visitor, and formerly nested throughout California. Northern harriers historically bred throughout California, except in deserts, woodlands, and forested mountains. Breeding localities in California included the interior from Siskiyou County south to western Riverside and San Bernardino counties and coastal regions from Marin County to San Diego County (Grinnell and Miller 1944). Destruction of wetlands and annual grasslands throughout California has led to a decline in northern harrier populations. In addition, grazing and agricultural practices, including plowing and burning of nesting areas during early stages of the nesting season, have contributed to the decline of this ground-nesting species (Remsen 1978). Currently, 2 main populations of northern harriers exist: one at the Klamath Basin refuges and the other in the Delta. The breeding range of the northern harrier includes most of the Central Valley, Delta, Suisun Marsh, and portions of the San Francisco Bay Area (Zeiner et al. 1990).

The northern harrier uses tall grasses and forbs in wetlands and field borders for cover (Zeiner et al. 1990). It roosts on the ground in shrubby vegetation, often near the marsh edge (Brown and Amadon 1968). The species' breeding season is between April and September, with peak activity in June and July. Harriers nest on the ground in shrubby vegetation, usually along the edge of marshes (Brown and Amadon 1968). Nests are constructed of large, loosely mounded sticks in wet areas or a small cup of woven grasses at drier sites. Preferred habitats include flat, hummocky, open areas with tall grasses, shrubs, and aquatic edges (Zeiner et al. 1990). The northern harrier feeds mostly on voles and other small mammals, birds, frogs, reptiles, and crustaceans; it occasionally takes fish as well. Grasslands, meadows, and wetlands are optimal habitat types, although harriers occur within lodgepole pine and alpine meadow habitats in some areas (Remsen 1978).

Northern harriers are fairly common nesters and residents in grasslands throughout the San Luis NWR complex, including the West Bear Creek, San Luis, Kesterson, and Arena Plains units, and throughout the region (USFWS file data, as cited in JSA et al. 2000). They were also frequently observed near the Chowchilla Canal east of Mendota on the San Joaquin River (Kucera et. al 2001) and have been documented in the Turner Ranch quadrangle (CNDDB 2002). There is suitable nesting habitat for this species throughout the study area. Restoration actions that influence wetlands, grasslands, and scrub could affect this species.

9.5.4.17. Golden Eagle (*Aquila chrysaetos*)

The golden eagle is considered a species of special concern, a fully protected species by the CDFG, and designated a sensitive species by the California Department of Forestry and Fire Protection. This species occurs throughout most of California as a resident, migrant, or wintering species (Zeiner et al. 1990). On the floor of the Central Valley, it is a winter visitor but not a breeding species. This species nests on cliff faces with suitable ledges or in large trees in open areas (Zeiner et al. 1990). Golden eagles forage over open terrain and feed primarily on rabbits and rodents.

Within the study area, golden eagles are uncommon winter visitors to the West Bear Creek, San Luis, Kesterson, and Arena Plains units of the San Luis NWR complex (JSA et al. 2000). They also have been observed at Great Valley Grasslands State Park (JSA et al. 2000). Restoration actions that influence open foraging habitats could affect this species.

9.5.4.18. Merlin (*Falco columbarius*)

The merlin is considered a species of special concern by CDFG. This species is widely distributed in North America. It breeds from Alaska and northern Canada south to Oregon, Minnesota and Nova Scotia (Ehrlich et al. 1992). In California, it is found as an uncommon wintering species and migrant from September to May, predominantly in the western half of the state (CDFG 1992). Due to its dependence on small birds for prey, the merlin is particularly susceptible to bioaccumulation of pesticides in the food chain. Massive reproductive failures in Canadian populations have been directly linked to DDT poisoning (Fox 1971). In addition, habitat loss and shooting have negatively affected populations of this species. Juvenile merlins are sometimes taken by falconers (Remsen 1978). Populations throughout the United States and Canada are believed to have declined (Remsen 1978).

This species forages along shorelines, in open grasslands, savannahs, woodlands, wetlands, and early seral stage habitats (Zeiner et al. 1990), feeding primarily on small birds, which may make up 90 percent of its diet (Ehrlich et al. 1992). It also preys on insects and some small mammals. This species is usually found at elevations below 3,900 ft (Zeiner et al. 1990).

This species is documented to occur at the Kesterson and San Luis units of the San Luis NWR (San Luis NWR file data, as cited in JSA et al. 2000). The CNDDB has no records for this species in

study area quadrangles (CNDDB 2002). Restoration actions that influence wetlands and open upland habitats could affect this species.

9.5.4.19. Prairie Falcon (*Falco mexicanus*)

Nesting prairie falcons are considered a species of special concern by CDFG. This species is an uncommon permanent resident and migrant in California, ranging from southeastern deserts northwest along the inner coast ranges and Sierra Nevada (Zeiner et al. 1990). It is vulnerable to DDT poisoning and predation by mammals and predatory birds.

The species is primarily associated with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Prairie falcons use open terrain for foraging small mammals, birds, and reptiles, and nest where there are canyons, cliffs, escarpments, or rock outcrops. Nesting usually occurs in a scrape on a sheltered ledge of a cliff overlooking a large, open area. The prairie falcon sometimes nests on old raven or eagle stick nests on cliffs, bluffs, or rock outcrops (CDFG 1983). Breeding occurs from mid-February through mid-September, peaking in April to early August. Young begin to disperse in June and July (Enderson 1969, Denton 1975, both as cited in CDFG 1983).

Prairie falcons have been documented to occur in the West Bear Creek area (San Luis NWR file data, as cited in JSA et al. 2000). The CNDDB has no records for this species in the study area quadrangles (CNDDB 2002). Restoration actions that influence open upland foraging habitat could affect this species.

9.5.4.20. Sharp-shinned Hawk (*Accipiter striatus*)

Nesting sharp-shinned hawks are considered a species of special concern by CDFG. This species occurs as a migrant or winter resident throughout most of California (Zeiner et al. 1990). Although few historical nesting sites were documented, the sharp-shinned hawk's summer distribution in California extended south from the Oregon border through the coastal mountains to Alameda and Monterey counties, and through the Cascade Range and Sierra Nevada to the mountains of southern California (Grinnell and Miller 1944). This species prefers to nest in coniferous or deciduous forest habitats. Sharp-shinned hawks prey primarily on small birds, and they forage in wooded or scrub habitats and in adjacent open areas (Zeiner et al. 1990).

Sharp-shinned hawks are fairly common, non-breeding visitors to riparian habitats at the San Luis NWR complex (JSA et al. 2000). Restoration actions that influence riparian, woodland, or scrub habitat may affect this species.

9.5.4.21. Cooper's Hawk (*Accipiter cooperii*)

Nesting Cooper's hawks are considered a species of special concern by CDFG. The historical range of the Cooper's hawk is similar to its current range, although the species is less common in the Central Valley than it was historically. Cooper's hawks are currently found throughout most of the United States as well as southern Canada and northern Mexico. Northern populations are said to be migratory and southern populations resident; however, some southern populations apparently migrate as well (Rosenfield and Bielefeldt 1993). The Cooper's hawk breeds throughout most of California in a variety of woodland habitats (Harris 1991). The highest densities probably occur in the foothill oak woodlands of the Sierra Nevada and Transverse ranges (Asay 1987).

The Cooper's hawk usually nests in deciduous, conifer, and mixed woodlands (Garrett and Dunn 1981), but also nests in urban areas and seems to be tolerant of human disturbance near the nest (Palmer 1988). The hawks nest and forage near open water or riparian vegetation. Prey comprises

small birds, a variety of small mammals, reptiles, and amphibians (Zeiner et al. 1990). The species usually breeds after 2 years (Rosenfield 1982, Henny et al. 1985, Asay 1987) and pairs generally return to the same territory year after year, but will often build a new nest in the vicinity of the existing one (Reynolds and Wight 1978).

Cooper's hawks are fairly common, non-breeding visitors to riparian habitats at the San Luis NWR (JSA et al. 2000). Restoration actions that influence aquatic and riparian habitats could affect this species.

9.5.4.22. Ferruginous Hawk (*Buteo regalis*)

The ferruginous hawk is considered a species of special concern by CDFG. This species is an uncommon winter resident and migrant in the Modoc Plateau, Central Valley, and Coast Ranges of California, as well as along the coast. It is frequently seen in grasslands and agricultural areas in southwestern California and occurs infrequently in the northeast portion of the state (Small 1994). This species is not known to breed in California, although appropriate habitat is available.

The ferruginous hawk forages in a variety of open areas. Ferruginous hawks forage over open grasslands and agricultural areas for hares and cottontails, ground squirrels, birds, and reptiles (CDFG 2000). It frequents open grasslands, agricultural lands, sagebrush flats, desert scrub, low foothills, and fringes of pinyon-juniper habitats. It roosts in open areas, typically in a lone tree or utility pole (Zeiner et al. 1990). The wintering population may be declining in California (Remsen 1978).

Ferruginous hawks have been documented in the West Bear Creek area (San Luis NWR file data, as cited in JSA et al. 2000). The CNDDB has no records for this species in the study area quadrangles (CNDDB 2002). Restoration actions that influence open upland habitats could affect this species.

9.5.4.23. Yellow Rail (*Coturnicops noveboracensis*)

The yellow rail is considered a species of special concern by the state of California (Remsen 1978). The species nests principally in Canada. Small numbers historically bred in California, in grassy meadows of Mono County, and probably in Plumas County and along the eastern edge of the Sierra Nevada (Grinnell and Miller 1944, as cited in Remsen 1978). Because the species is so difficult to detect, it was likely more widespread than historical records indicate. Some yellow rails may still persist in California, although thorough searches of some former breeding localities have not been successful (Stallcup and Winter 1975; T. Heindel, pers. comm., both as cited in Remsen 1978). The species has been recorded historically during the winter at 16 localities along the coast from Humboldt County to Orange County and inland in Merced County and Riverside County (Grinnell and Miller 1944, as cited in Remsen 1978). Since 1944, however, very few observations have been documented. Grazing of the wet grassy meadows may be the primary reason for the decline of the breeding population (Stallcup and Winter 1975, as cited in Remsen 1978).

Wintering habitat of the yellow rail includes freshwater and saltwater marshes, and estuaries. The species feeds in shallow water on aquatic invertebrates.

There are no records of the species for study area quadrangles (CNDDB 2002). Although yellow rails are very rare and may be extirpated from California, restoration actions that influence wetlands could affect habitat for this species in its potential for re-colonization.

9.5.4.24. Mountain Plover (*Charadrius montanus*)

The mountain plover is proposed as threatened under the ESA, and is designated as California species of special concern. The breeding range is the dry tablelands of the western Great Plains and

the Colorado Plateau. The winter range extends from northern California (rarely) through southern California, southern Arizona, and central and coastal Texas to north-central Mexico (Cogswell 1977, Knopf 1996).

Mountain plovers do not breed in California, but approximately 70% of the continental population winters in the state. The major wintering areas in California are in the Sacramento, San Joaquin, and Imperial valleys. Smaller numbers winter in the west Mojave Desert, San Jacinto Valley, Santa Maria Valley, Salinas Valley, the Carrizo Plain, Seal Beach, Tijuana River Valley, and the Lower Colorado River Valley.

After the breeding season (late March to early August), mountain plovers disperse across the southern and western Great Plains before migrating to their wintering areas. The migration of the species to and from California is more of an east-west movement than the typical north-south movement of migrating shorebirds in North America. In California, mountain plovers have been recorded rarely in late July, but most arrive in mid-October or later. Mid-November to early February is the period of peak abundance in California, and most birds are back on the breeding grounds by late March or early April. Mountain plovers forage for large insects on alkaline flats, plowed ground, and grazed pasture.

The occurrence of mountain plover has been documented at the Arena Plains Unit of the San Luis NWR. This species is likely to occur at the San Luis, West Bear Creek, and Kesterson units (San Luis NWR file data, as cited in JSA et al. 2000), and could occur in other upland habitats along the study reach. Restoration actions that influence open upland habitat could affect this species.

9.5.4.25. Long-billed Curlew (*Numenius americanus*)

Nesting long-billed curlews are considered a species of special concern by CDFG. It nests in Siskiyou, Modoc, and Lassen counties, and winters along the coast and in the Central and Imperial valleys. This species usually leaves for southern wintering grounds as early as June. Winter habitat for this species includes grasslands and croplands, where if feeds on invertebrates and berries.

Large flocks of long-billed curlews have been observed in the study area, foraging in alfalfa fields directly adjacent to the river in Reach 2 (M. Wolfe, pers. obs., 1999–2002) . CNDDB has no records for this species in the study area quadrangles (CNDDB 2002). Restoration actions that influence grasslands and croplands could affect this species.

9.5.4.26. Black Tern (*Chlidonias niger*)

The black tern is designated as a species of special concern by CDFG. The black tern was once a common and even abundant summer breeder and migrant throughout much of California (Grinnell and Miller 1944). The species has declined and now breeds only in the northeast (Siskiyou, Modoc, and Lassen counties) and Central Valley, although in much-reduced numbers (Zeiner et al. 1990). Although this species can be found in great numbers at the Salton Sea, it is not known to breed there (Small 1994).

The black tern requires freshwater habitats for breeding grounds. Nesting sites are found on lakes, ponds, marshes, and agricultural fields (Grinnell and Miller 1944). During migration, this species can be common on coastal bays, river mouths, and well offshore over pelagic waters (Cogswell 1977). Nests are built on floating mats of dead vegetation among anchored vegetation or along the shore where they are built by scraping out the soil (Zeiner et al. 1990). The black tern feeds on insects by plucking them out of the air, scooping them out of the water, or plucking them off vegetation. It also eats amphibians, fish, and crustaceans (Zeiner et al. 1990).

The occurrence of black terns has been documented at the San Luis, West Bear Creek, Kesterson, and Arena Plains units of the San Luis NWR (San Luis NWR file data, as cited in JSA et al. 2000).

Additionally, nesting has been documented at the West Bear Creek Unit (San Luis NWR file data, as cited in JSA et al. 2000). Restoration actions that influence lentic aquatic habitats, wetlands, and agricultural lands could affect this species.

9.5.4.27. Western Burrowing Owl (*Athene cunicularia hypugea*)

The western burrowing owl is considered a species of special concern by CDFG. Burrowing owl nests are also protected by California Fish and Game Code Section 3503.5. This species nests and winters in lowlands throughout California, including the Central Valley. The western burrowing owl is a ground-nesting raptor that typically uses the burrows of other species, such as ground squirrels. Suitable habitat for this species includes sparsely vegetated grasslands, deserts, and agricultural fields. Burrowing owls feed primarily on insects and small mammals, and are also known to take reptiles, amphibians, and bird prey.

Western burrowing owl has been documented at San Luis, West Bear Creek, Kesterson, and Arena Plains units of the San Luis NWR; a nesting pair was documented at the Arena Plains Unit (San Luis NWR file data, as cited in JSA et al. 2000). There is a record of a burrowing owl near Mendota Pool. Restoration actions that influence open upland habitats could affect this species.

9.5.4.28. Long-Eared Owl (*Asio otus*)

Nesting long-eared owls are designated a species of special concern by CDFG. It was once a common resident throughout California. Its numbers have been declining since the 1940s, mostly severely in the Sacramento Valley, San Joaquin Valley, and San Diego area (Remsen 1978). The species is an uncommon breeder in the northeastern part of the state, in the Owens Valley, and the foothills east of the Central Valley. It also nests in the Coast Range from Sonoma and Lake Counties south to Santa Barbara County (Small 1994). The long-eared owl winters in the Central Valley from Tehama County to Kern County (Zeiner et al. 1990).

Long-eared owls require dense tree stands near open areas for hunting (Small 1994). This species occurs in riparian habitats as well as oak thickets and conifer forests at higher elevations (Zeiner et al. 1990). Long-eared owls use old nests of crows, magpies, and hawks for nesting sites. The species' breeding season is from early March to late July (Zeiner et al. 1990). Voles, shrews, other rodents, and birds make up the majority of the long-eared owl's diet. Open grassy fields, meadows, and wetlands are preferred hunting areas (Johnsgard 1988).

Long-eared Owls have been recorded breeding in riparian habitats of the San Luis Unit of the San Luis NWR complex (San Luis NWR file data, as cited in JSA et al. 2000). Restoration actions that influence riparian and upland forest, and upland open areas, may affect this species.

9.5.4.29. Short-Eared Owl (*Asio flammeus*)

Nesting short-eared owls are designated as a species of special concern by CDFG and as a migratory non-game bird of management concern by USFWS. The short-eared owl historically bred throughout California, west of the deserts (Grinnell and Miller 1944). This species has declined dramatically throughout the state. Its numbers are greater in winter, concentrating in areas with little snow cover and abundant prey, but even those numbers have declined (Remsen 1978). Breeding populations are reported to have been extirpated from the southern coast and perhaps from the San Joaquin Valley (Remsen 1978). The species still breeds in the southern portion of the Sacramento Valley (Yolo and Solano Counties), the Delta, Suisun Marsh, northeastern portion of the state, in the Coast Ranges from Sonoma to Santa Barbara Counties, and in the Owens Valley (Small 1994, Zeiner et al. 1990).

Nests are built on the ground in tall stands of grasses in lowland habitats near hunting grounds in marshes, meadows, and agricultural fields (Grinnell and Miller 1944). The breeding season is from late March to July (Zeiner et al. 1990). Wintering habitats include grasslands, dunes, meadows, irrigated lands, and wetlands. This species feeds primarily on small mammals.

Short-eared owls probably nest in the San Luis NWR complex, and have been documented at the San Luis, West Bear Creek, and Kesterson units (San Luis NWR file data, as cited in JSA et al. 2000). This species is likely to occur at the Arena Plains Unit. Restoration actions that influence open upland and wetland habitats may affect this species.

9.5.4.30. California Horned Lark (*Eremophila alpestris actia*)

The California horned lark is considered a species of special concern by CDFG. Historically, this subspecies was a common resident of the lowlands of California; its range included the coastal region of the state from Humboldt County south to San Diego County, as well as the lowlands of the San Joaquin Valley (Grinnell and Miller 1944). Horned larks continue to be common winter residents throughout open habitats in California (Small 1994).

Wintering flocks of horned larks frequent grasslands, plowed agricultural fields, and other open habitats with low, sparse vegetation; they find cover in clumps of grasses, rocks, and other surface irregularities. Horned larks eat mostly insects and seeds in the nonbreeding season.

California horned larks annually use grazed and burned upland habitats in the West Bear Creek area of the San Luis NWR (JSA et al. 2000). Restoration actions that influence open upland habitats could affect this species.

9.5.4.31. Loggerhead Shrike (*Lanius ludovicianus*)

The loggerhead shrike is considered a species of special concern by CDFG. It occurs in the Central Valley, northeastern plateau, Great Basin, and southern California. Fairly common residents and winter visitors in lowlands and foothills throughout California, loggerhead shrikes prefer open habitats with scattered shrubs, trees, posts, fences, utility lines, and other perches (Zeiner et al. 1990).

In California, loggerhead shrikes lay eggs from March into May, and the young are independent of the adults by July or August (Zeiner et al. 1990). Loggerhead shrikes eat mostly large insects, but they also take small birds, mammals, amphibians, reptiles, fish, carrion, and various other large invertebrates. They frequently impale prey on thorns, twigs, or barb wire to cache for later feeding. Loggerhead shrikes are fairly common residents in the West Bear Creek area of the San Luis NWR (JSA et al. 2000). Restoration actions that influence open upland habitats may affect this species.

9.5.4.32. California Yellow Warbler (*Dendroica petechia brewsteri*)

The nesting California yellow warbler is considered a species of special concern by CDFG. The California yellow warbler was once common throughout the entire northern portion of California, the Coast Ranges from the Oregon border to the Mexican border, the Central Valley, the Lower Colorado River Valley, the western and eastern slopes of the Sierra Nevada, and the foothills of the Transverse and Peninsular Ranges (Small 1994). This species has virtually disappeared as a nester from the Sacramento and San Joaquin valleys, with only 5% of available habitat being occupied in the upper Sacramento Valley (Remsen 1978). There are still breeding populations in the Sierra Nevada, coastal mountains, Owens Valley (Mono and Inyo Counties), and along the Mojave River (San Bernardino County). The largest breeding populations in southern California are in the Santa Ynez River Valley (San Bernardino County) and South Kern River Preserve (Kern County) (Small 1994).

The California yellow warbler is a migratory bird that arrives in California to breed in April. By October, this warbler has left the state for wintering grounds (Zeiner et al. 1990). The species' breeding season is mid-April to early August, peaking in June (Zeiner et al. 1990). It nests in riparian habitats of the lowlands and foothill canyons but will also nest in chaparral habitats with scattered trees and in montane coniferous forest below an elevation of 9,000 feet (Small 1994). During migration, it uses woodland, forest, and scrub habitats (Zeiner et al. 1990). The California yellow warbler feeds on insects and spiders (Zeiner et al. 1990).

Yellow warblers are fairly common spring and fall migrants in riparian habitats of the San Luis and West Bear Creek units of the San Luis NWR complex (JSA et al. 2000). The Point Reyes Bird Observatory banded migrant yellow warblers in riparian habitats of the San Joaquin River in spring and fall (Ballard and Geupel 1999). Restoration actions that influence riparian and upland woodland, forests, and scrub may affect this species.

9.5.4.33. Tricolored Blackbird (*Agelaius tricolor*)

Tricolored blackbird nesting colonies are considered a species of special concern by CDFG. Historically, tricolored blackbirds nested throughout much of California west of the Sierra Nevada, in coastal southern California, and in portions of northeastern California (Beedy and Hamilton 1999). Breeding colonies were observed in the Shasta region, Suisun Valley, and Solano County and near Stockton, San Diego, Los Angeles, Santa Barbara, Glenn County, Sacramento County, Butte County, Colusa County, Yolo County, and Yuba County (Heermann 1853, Belding 1890, Baird 1870, Neff 1937, Orians 1961, Payne 1969). Extensive marshes and uplands that provided ample breeding habitat for tricolored blackbirds in the Central Valley from overflowing river systems had been reduced by 90% by the mid-1980s (Frayer et al. 1989). Additionally, native perennial grasslands, which are primary foraging habitat, have been reduced by more than 99% in the Central Valley and surrounding foothills (Kreissman 1991). Currently, tricolored blackbirds primarily breed in the Sacramento Valley, San Joaquin Valley, along the central coast, southern California, and the northeast interior of California; however, sizes of populations in many of these areas have been greatly reduced (Beedy and Hamilton 1999).

Tricolored blackbirds leave wintering areas in the Delta and along coastal central California in late March and early April. The species' breeding season is from mid-April to late July. Breeding colonies will return to the same area year after year if the site continues to provide adequate nesting sites, water, and suitable foraging habitat (Dehaven et al. 1975).

For breeding-colony sites, tricolored blackbirds require open accessible water, a protected nesting substrate that is usually flooded or has thorny or spiny vegetation, and a foraging area that provides adequate insect prey within a few kilometers of the nesting colony (Beedy and Hamilton 1999). Types of vegetation necessary in the colony area include cattails, tules, willow, blackberry, wild rose, and tall herbs. In addition to consuming insects, the tricolored blackbird also eats seeds and cultivated grains, such as rice and oats. They often forage in croplands, pastures, grassy fields, and in flooded fields (Beedy and Hamilton 1999).

Since 1970, tricolored blackbird colonies have been documented at the West Bear Creek, San Luis, Kesterson, Freitas, and Arena Plains units, and nonbreeding flocks of this species forage and roost throughout wetlands of the San Luis NWR complex (JSA et al. 2000). At the West Bear Creek Unit, a colony of approximately 900 adults was documented in 1991, and in 1994 a colony of approximately 80,000 adults nested in a silage field (JSA et al. 2000). The 1994 colony appeared to be a one-time event and may have been in response to optimal foraging conditions that existed in adjacent native grasslands (Woolington, pers. comm., as cited in JSA et al. 2000). Tricolored blackbirds have not

been reported nesting in this area since the new wetlands were created (JSA et al. 2000). Tricolored blackbirds are annually found foraging and drinking/bathing in the native grasslands/vernal pool complex on the West Bear Creek Unit (JSA et al. 2000). Tricolored blackbirds also use West Bear Creek Unit riparian habitat for midday roosting. Tricolored blackbirds could also occur in Reaches 2–5 where there is suitable habitat (JSA et al. 2000). Restoration actions that influence wetland and open upland habitat could affect this species.

9.5.4.34. Pale and Pacific Townsend's (Western) Big-eared Bat (*Corynorhinus townsendii pallescens* and *townsendii*)

There are two subspecies of Townsend's (western) big-eared bats: pale Townsend's big-eared bat (*Corynorhinus (=Plecotus) townsendii townsendii*), and Pacific Townsend's big-eared bat (*C.t. townsendii*). Both are considered species of special concern by CDFG. These sub-species are treated here as a group because there is little subspecies-specific information available on distribution and habitat requirements. Townsend's big-eared bats are an insectivorous species found from humid coastal regions of northern and central California to arid grassland and desert. The species is considered to be a resident species that prefers mesic habitats, and hibernates for all or part of the winter months. These bats are relatively sedentary and make only short movements to hibernation sites. In California, bats have been declining due to timber harvest, oak woodland conversion, pest control exclusion, renewed hard rock mining, bridge replacement, disturbance at roost sites, building demolition, agricultural spraying, recreational caving, and/or pest control (Brown and Pierson 1996). Roosting sites are a limiting factor for this species. They are extremely sensitive to disturbance.

Roost sites generally include rock outcrops, mines, caves, hollow trees, buildings, bridges, cracks in cliffs and boulders, or trees (especially large hollow trees or snags, or trees with big slabs of broken bark). These bats will only roost in the open, hanging from walls and ceilings. Townsend's big-eared bats consume small moths as their principal food source, capturing their prey in flight using echolocation, or by gleaning from foliage.

There are no records for either sub-species in the CNDDB for study area quadrangles (CNDDB 2002). Restoration actions that influence large roosting trees, bridges, and buildings could affect this species.

9.6. SUMMARY

Future restoration activities may impact the numerous special-status plant and animal species in various ways, either positively or negatively. While it is beyond the scope of this chapter to speculate on the myriad of potential restoration actions that may be recommended, and assess the benefits and impacts of these potential actions on the numerous species discussed in the previous sections, a simplified matrix has been prepared to predict general trends. Table 9-3 (fish species), Table 9-4 (invertebrate, amphibian, reptile, mammal species), Table 9-5 (bird species), and Table 9-6 (plant species) shows the possible effects (positive, negative, or neutral) on these species from a number of restoration activities being considered in the Restoration Study planning process. Because these restoration actions have not been precisely defined and in most cases are not site-specific, they are intended to provide only a very general indication of possible effects.

Some generalizations of impacts and benefits of restoration actions can be made. First, the temporal scale of impact and benefit can vary. Large-scale reconstruction projects, such as levee setbacks, gravel pit filling, or channel reconstruction can cause significant short-term impacts to species; however, the goal of most of these projects is to provide long-term improvement to species. For certain species, care must be given during the restoration process to ensure that the short-term impacts

of the project do not impair the ability of the project to achieve long-term restoration goals (e.g., restoration causes mortality of the target species to the point where reproduction can no longer occur). Second, restoration projects that (1) increase the diversity of habitats, (2) increase the scale of the riparian corridor, and (3) improve natural physical and biological processes should provide benefits to the greatest number of species. Third, restoration efforts within the riparian corridor will likely benefit those species that have longer residency times in habitats supported by the riparian corridor than those species that have a more transient or seasonal use of riparian habitat.

Although the special-status species that occur in the project area exhibit a wide range of life history strategies and require a wide variety of habitats, a few generalizations can be made about important habitat types. The broad group of habitat types historically found along the San Joaquin River corridor includes alkaline grasslands, riparian/cottonwood forests, riparian scrub/willow thickets, tule marshes, sloughs, exposed gravel bars, exposed sand bars, vernal pools, and instream aquatic habitat with large wood structure. Many of the sensitive plant, invertebrate, and amphibian species are associated with vernal pools, a rare habitat type that occurs outside of the river channel, typically in grasslands. In addition, a number of the sensitive plants are specially adapted to alkaline soils. Many of the sensitive wildlife species are associated with riparian scrub and forest, emergent wetlands, or fish-bearing waters, all of which could be directly affected by restoration actions. Restoration of valley oak woodlands and cottonwood forests would greatly benefit cavity nesting birds, raptors, as well as herons and egrets. Restoration of riparian scrub and associated understory vegetation would greatly benefit migratory songbirds. Improving the flow regime along the entire length of the San Joaquin River would increase the amount of habitat available to sensitive fish species; rehabilitation of this habitat through reconstruction efforts and/or addition of wood structure would further benefit fish species, amphibians, and herptefauna. Upland habitat adjacent to the riparian corridor should also be integrated into restoration planning due the large number of special-status wildlife species dependent on this habitat for breeding or foraging, especially in grasslands, agricultural fields, and other open habitats adjacent to the riparian corridor. Incorporating these upland areas into the planning process for the San Joaquin River could greatly benefit a wide range of sensitive native species.

The Restoration Study will be evaluating specific habitat needs for many of these sensitive species, and will be incorporating these habitat needs into draft restoration objectives for the San Joaquin River. The Restoration Study and subsequent site-specific restoration project design/environmental assessment will be providing more detailed consideration of the benefits and impacts of future restoration activities to sensitive species.

Table 9-3. Special-status fish species with potential to occur in the study area.

Potential benefits/impacts ●●● Large benefit ●● Moderate benefit ● Minor bemefit 0 No benefit ○ Minor impact ○○ Moderate impact ○○○ Large impact	White Sturgeon (*Acipenser transmontanus*)	Green Sturgeion (*Acipenser medirostris*)	Sacramento sucker (*Catostomus occidentalis*)	Sacramento perch (*Archoplites interrruptus*)	Prickly sculpin (*Cottus asper*)	Riffle sculpin (*Cottus gulosus*)	California roach (*Lavinia symmetricus*)	Hardhead (*Mylopharodon conocephalus*)	Hitch (*Lavinia exilicauda exilicauda*)	Sacramento blackfish (*Orthodon microlepidotus*)	Sacramento pikeminnow (*Ptychocheilus grandis*)	Speckled dace (*Rhinichthys osculus*)	Sacramento splittail (*Pogonichthys macrolepidotus*)	Thicktail chub (*Gila crassicauda*)	Tule perch (*Hysterocarpus traski traski*)	Threespine stickleback (*Gasterosteus aculeatus*)	Kern brook lamprey (*Lampetra hubbsi*)	Pacific lamprey (*Lampetra tridentata*)	River lamprey (*Lampetra ayresi*)	Western brook lamprey (*Lampetra richardsoni*)	Chinook salmon (*Oncorhynchus tshawytscha*)	Rainbow trout (*Onchorhynchus mykiss*)	Steelhead (*Oncorhynchus mykiss*)
Modify dam releases to improve fish habitat	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●	●	●	●	●●●	●●●	●●●
Modify dam releases to inundate bars and secondary channels	0	0	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●●	●●	●●
Modify dam releases to mobilize existing gravel sources	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●●	●●	●●	●●	●●●	●●●	●●●
Remove or disturb armor layer on gravel bars and banks	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●●	●●	●●	●●	●●●	●●●	●●●
Remove vegetation from gravel bars and banks	0	0	○	○	○	○	○	○	○	○	○	○	○○	○	○	○	○	○	○	○	●	●	●
Import gravel	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●●	●●	●●	●●	●●	●●	●●
Fill gravel pits	0	0	○○	○○	0	0	○○	○○	○○	○○	○	○○	0	○○	○○	○○	0	0	0	0	●●	●	●●
Bypass gravel pits	0	0	○○	○○	0	0	○○	○○	○○	○○	○	○○	0	○○	○○	○○	0	0	0	0	●●	●	●●
Construct hydraulic controls	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●	●	●	●	●	●	●
Place large woody material in the channel	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●	●	●	●	●●	●●●	●●●
Modify dam releases to inhibit warm○water fish species	0	0	○○	○○	○○	○○	○○	○○	○○	○○	○○	○○	0	○○	○○	○○	0	0	0	0	●	●●	●●
Remove non○native warm○water predatory fish species	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●	●	●	●	●●	●●	●●
Increase turbidity to reduce salmonid predation during outmigration	0	0	0	○	○	○	○	○	○	○	○○	○	0	○	○	○	0	0	0	0	●●	0	●
Install fish screens on water diversions	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●	●	●	●	●●	●	●●
Dredge sand from channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●●	●	●●
Minimize structural fish passage barriers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●●	●●	0	●●●	●	●●●
Bypass Mendota Pool	0	0	○	○	○	○	○	○	○	○	○	○	0	○	○	○	0	●	●	0	●●	0	●●
Reconstruct fish ladder on Mendota Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	0	●●●	0	●●●
Provide spawning habitat on Little Dry Creek	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●	●	●	●	●	●	●
Route flow to Lone Willow Slough as alternate fish pathway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	0	●●	0	●●
Route flow to Salt Slough as alternate fish pathway	0	0	0	0	0	0	0	0	0	0	0	0	●	0	0	0	0	●	●	0	●●	0	●●
Route flow to Cowchilla Bypass as alternate fish pathway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	0	●●	0	●●

Table 9-3. continued

Potential benefits/impacts ●●● Large benefit ●● Moderate benefit ● Minor bemefit 0 No benefit ○ Minor impact ○○ Moderate impact ○○○ Large impact	White Sturgeon (*Acipenser transmontanus*)	Green Sturgeion (*Acipenser medirostris*)	Sacramento sucker (*Catostomus occidentalis*)	Sacramento perch (*Archoplites interrruptus*)	Prickly sculpin (*Cottus asper*)	Riffle sculpin (*Cottus gulosus*)	California roach (*Lavinia symmetricus*)	Hardhead (*Mylopharodon conocephalus*)	Hitch (*Lavinia exilicauda exilicauda*)	Sacramento blackfish (*Orthodon microlepidotus*)	Sacramento pikeminnow (*Ptychocheilus grandis*)	Speckled dace (*Rhinichthys osculus*)	Sacramento splittail (*Pogonichthys macrolepidotus*)	Thicktail chub (*Gila crassicauda*)	Tule perch (*Hysterocarpus traski traski*)	Threespine stickleback (*Gasterosteus aculeatus*)	Kern brook lamprey (*Lampetra hubbsi*)	Pacific lamprey (*Lampetra tridentata*)	River lamprey (*Lampetra ayresi*)	Western brook lamprey (*Lampetra richardsoni*)	Chinook salmon (*Oncorhynchus tshawytscha*)	Rainbow trout (*Onchorhynchus mykiss*)	Steelhead (*Oncorhynchus mykiss*)
Divert water from San Luis Reservoir at Mendota Pool	0	0	●	●	●	●	●	●	●	●	●	●	0	●	●	●	●	●	●	●	○	0	○
Modify dam releases for dispersal and establishment of riparian vegetation	0	0	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●●	●●	●●
Modify dam releases for sustenance of riparian vegetation	0	0	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●●	●●	●●
Remove invasive exotic riparian plant species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	●
Grade floodplain to facilitate wetland and riparian hydrology	0	0	●●	●●	●	●	●●	●●	●●	●●	●●	●●	●	●●	●●	●●	●●	●●	●●	●●	●	0	●
Plant riparian and wetland plant species	0	0	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●●	●●	●●
Construct set○back levees	0	0	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●●	●●	●●
Remove internal, private levees	0	0	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●●	●	●●
Create levee breaches, overflow structures, or regulated inflows	0	0	●●	●●	●●	●●	●●	●●	●●	●●	●●	●●	●	●●	●●	●●	●●	●●	●●	●●	●●	●	●
Purchase conservation easements	0	0	●●	●●	●●	●●	●●	●●	●●	●●	●●	●●	●	●●	●●	●●	●	●	●	●	●●	●●	●●
Purchase flood easements	0	0	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Flood○proof existing infrastructure	0	0	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●	●
Route flow to Fresno Slough as alternate flood pathway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	0	●●	●●	●●

Table 9-4. Special-status invertebrate, amphibian, reptile, and mammal species with potential to occur in the study area.

Potential benefits/impacts ●●● Large benefit ●● Moderate benefit ● Minor bemefit 0 No benefit ○ Minor impact ○○ Moderate impact ○○○ Large impact	Invertebrates					Amphibians			Reptiles						Mammals						
	Conservancy fairy shrimp *Branchinecta conservatio*	Longhorn fairy shrimp *Branchinecta longiantenna*	Vernal pool fairy shrimp *Branchinecta lynchi*	Vernal pool tadpole shrimp *Lepidurus packardi*	Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	California tiger salamander *Ambystoma californiense* (= *A. tigrinum c.*)	Western spadefoot *Scaphiopus hammondii*	California red-legged frog *Rana aurora draytoni*	Western pond turtle *Clemmys marmorata*	Blunt-nosed leopard lizard *Gambelia*(= *Crotaphytus*) *silus*	California horned lizard *Phrynosoma coronatum frontale*	Silvery legless lizard *Anniella pulchra pulchra*	San Joaquin whipsnake (= coachwhip) *Masticophis flagellum ruddocki*	Giant garter snake *Thamnophis gigas*	Pale Townsend's (= western) big-eared bat *Corynorhinus townsendii pallescens*	Pacific Townsend's (=western) big-eared bat *Corynorhinus townsendii townsendii*	Riparian brush rabbit *Sylvilagus bachmani riparius*	San Joaquin (Nelson's) antelope ground squirrel *Ammospermophilus nelsoni*	Fresno kangaroo rat *Dipodomys nitratoides exilis*	San Joaquin Valley (Riparian) woodrat *Neotoma fuscipes riparia*	San Joaquin kit fox Vulpes macrotis mutica
Modify dam releases to improve fish habitat	0	0	0	0	0	0	0	●●●	●●	0	0	●●	0	●●●	●	●	0	0	0	0	0
Modify dam releases to inundate bars and secondary channels	0	0	0	0	0	0	0	●●●	●●	○○	○○	●●●	0	●●●	●	●	○○	0	0	0	0
Modify dam releases to mobilize existing gravel sources	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Remove or disturb armor layer on gravel bars and banks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Remove vegetation from gravel bars and banks	0	0	0	0	0	0	0	●	0	●	0	○○	0	○	0	0	0	0	0	0	0
Import gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fill gravel pits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bypass gravel pits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construct hydraulic controls	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Place large woody material in the channel	0	0	0	0	0	0	0	●●●	●●●	0	0	●	0	●	●	●	0	0	0	0	0
Modify dam releases to inhibit warm-water fish species	0	0	0	0	0	0	0	●●	●	0	0	●●	0	0	0	0	0	0	0	0	0
Remove non-native warm-water predatory fish species	●●	●●	●●	●●	0	0	0	●●●	●●	0	0	●●●	0	●●	0	0	0	0	0	0	0
Increase turbidity to reduce salmonid predation during outmigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Install fish screens on water diversions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dredge sand from channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimize structural fish passage barriers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bypass Mendota Pool	0	0	0	0	0	0	0	○	○○	0	0	○○	0	○○	0	0	○○	0	0	0	0
Reconstruct fish ladder on Mendota Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Provide spawning habitat on Little Dry Creek	0	0	0	0	0	0	0	●	0	0	0	0	0	0	0	0	0	0	0	0	0
Route flow to Lone Willow Slough as alternate fish pathway	0	0	0	0	●	0	0	●	●	0	0	●	0	●●	●●	●●	●●	0	0	●	0
Route flow to Salt Slough as alternate fish pathway	0	0	0	0	●	0	0	●	●	0	0	●	0	●●	●●	●●	●●	0	0	●	0

Table 9-4. continued

Potential benefits/impacts ●●● Large benefit ●● Moderate benefit ● Minor bemefit 0 No benefit ○ Minor impact ○○ Moderate impact ○○○ Large impact	Invertebrates					Amphibians			Reptiles						Mammals						
	Conservancy fairy shrimp *Branchinecta conservatio*	Longhorn fairy shrimp *Branchinecta longiantenna*	Vernal pool fairy shrimp *Branchinecta lynchi*	Vernal pool tadpole shrimp *Lepidurus packardi*	Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	California tiger salamander *Ambystoma californiense* (= *A. tigrimum c.*)	Western spadefoot *Scaphiopus hammondii*	California red-legged frog *Rana aurora draytoni*	Western pond turtle *Clemmys marmorata*	Blunt-nosed leopard lizard *Gambelia(= Crotaphytus) silus*	California horned lizard *Phrynosoma coronatum frontale*	Silvery legless lizard *Anniella pulchra pulchra*	San Joaquin whipsnake (= coachwhip) *Masticophis flagellum ruddocki*	Giant garter snake *Thamnophis gigas*	Pale Townsend's (= western) big-eared bat *Corynorhinus townsendii pallescens*	Pacific Townsend's (=western) big-eared bat *Corynorhinus townsendii townsendii*	Riparian brush rabbit *Sylvilagus bachmani riparius*	San Joaquin (Nelson's) antelope ground squirrel *Ammospermophilus nelsoni*	Fresno kangaroo rat *Dipodomys nitratoides exilis*	San Joaquin Valley (Riparian) woodrat *Neotoma fuscipes riparia*	San Joaquin kit fox Vulpes macrotis mutica
Route flow to Cowchilla Bypass as alternate fish pathway	0	0	0	0	●	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Divert water from San Luis Reservoir at Mendota Pool	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modify dam releases for dispersal and establishment of riparian vegetation	0	0	0	0	●●	0	0	●●●	●●	0	0	●●	0	●●●	●●●	●●●	●●●	0	0	●●●	0
Modify dam releases for sustenance of riparian vegetation	0	0	0	0	●●	0	0	●●●	●●	0	0	●●	0	●●●	●●●	●●●	●●●	0	0	●●●	0
Remove invasive exotic riparian plant species	0	0	0	0	●●	0	0	0	0	0	0	0	0	●	●●	●●	0	0	0	●●	0
Grade floodplain to facilitate wetland and riparian hydrology	0	0	0	0	0	0	0	●●●	●●	○	○	0	0	●●●	●●●	●●●	●●●	0	0	●●●	0
Plant riparian and wetland plant species	0	0	0	0	●●●	0	0	●●●	●●	0	0	0	0	●●●	●●●	●●●	●●●	0	0	●●●	0
Construct set-back levees	●	●	●	●	●●	0	0	●●●	0	0	0	●	0	●●●	●	●	0	0	0	●	0
Remove internal, private levees	●	●	●	●	●●	0	0	●●	0	0	0	●	0	●●●	●	●	0	0	0	●	0
Create levee breaches, overflow structures, or regulated inflows	●	●	●	●	●●	0	0	●●●	0	0	0	●	0	●●●	●●	●●	0	0	0	●	0
Purchase conservation easements	●●●	●●●	●●●	●●●	● ● ●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●	●●	●●	●●	●●●	●●
Purchase flood easements	●	●	●	●	●	0	0	●●	●	0	0	●●	0	●●	0	0	0	0	0	●●	0
Flood-proof existing infrastructure	○○	○○	○○	○○	○○	0	0	0	0	0	0	0	0	0	0	0	0	0	0	○○	0
Route flow to Fresno Slough as alternate flood pathway	0	0	0	0	0	0	0	●	●	0	0	●	0	●●	●●	●●	●●	0	0	0	0

Table 9-5. Special-status bird species with potential to occur in the study area.

Potential benefits/impacts ●●● Large benefit ●● Moderate benefit ● Minor bemefit 0 No benefit ○ Minor impact ○○ Moderate impact ○○○ Large impact	Birds																																	
	American white pelican (nesting colony) *Pelecanus erythrorhynchos*	Double-crested cormorant (rookery site) *Phalacrocorax auritus*	Western least bittern (nesting) *Ixobrychus exilis hesperis*	Great blue heron (nesting colonies) *Ardea herodias*	Great egret (nesting colonies) *Ardea alba*	White-faced ibis (rookery site) *Plegadis chihi*	Fulvous whistling duck (nesting) *Dendrocygna bicolor*	Osprey (nesting sites) *Pandion haliaetus*	White-tailed kite (nesting) *Elanus leucurus*	Bald eagle *Haliaeetus leucocephalus*	Northern harrier (nesting) *Circus cyaneus*	Golden eagle *Aquila chrysaetos*	Merlin (wintering) *Falco columbarius*	American peregrine falcon *Falco peregrinus anatum*	Prairie falcon (nesting) *Falco mexicanus*	Sharp-shinned hawk (nesting) *Accipiter striatus*	Cooper's hawk (nesting) *Accipiter cooperii*	Swainson's hawk *Buteo swainsoni*	Ferruginous hawk (wintering) *Buteo regalis*	Yellow rail *Coturnicops noveboracensis*	Greater sandhill crane *Grus canadensis tabida*	Western snowy plover (inland population) *Charadrius alexandrinus nivosus*	Mountain plover *Charadrius montanus*	Long-billed curlew (nesting) *Numenius americanus*	Black tern (nesting colony) *Chlidonias niger*	Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Western burrowing owl *Athene cunicularia*	Long-eared owl (nesting) *Asio otus*	Short-eared owl (nesting) *Asio flammeus*	Willow flycatcher *Empidonax traillii*	California horned lark *Eremophila alpestris actia*	Bank swallow *Riparia riparia*	Loggerhead shrike *Lanius ludovicianus*	Least Bell's vireo *Vireo bellii pusillus*	California yellow warbler (nesting) *Dendroica petechia brewsteri*	Tricolored blackbird (nesting colony) *Agelaius tricolor*
Modify dam releases to improve fish habitat	●	●●●	●	●	●	●	●●	●●●	●●	●●●	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●●	0	0	0	0	0	0	●●	0	0
Modify dam releases to inundate bars and secondary channels	●●●	●●	●●	●●●	●●●	●●●	●●●	●●●	●●	●●●	0	0	0	0	0	0	0	0	0	●	0	0	0	0	●	●●	0	●●	●●	0	0	0	0	0	0
Modify dam releases to mobilize existing gravel sources	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	0	0	0	0	0	0	0	0
Remove or disturb armor layer on gravel bars and banks	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	0	0	0	0	0	0	0	0	0
Remove vegetation from gravel bars and banks	●●●	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	0	0
Import gravel	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	0	0	0	0	0	0	0	0	0
Fill gravel pits	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	0	0	0	0	0	0	0	0	0
Bypass gravel pits	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	0	0	0	0	0	0	0	0	0
Construct hydraulic controls	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	0	0	0	0	0	0	0	0	0
Place large woody material in the channel	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	0	●	0	0	0	0	0
Modify dam releases to inhibit warm-water fish species	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	0	0	0	0	0	0	0	0	0
Remove non-native warm-water predatory fish species	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	0	0	0	0	0	0	0	0	0
Increase turbidity to reduce salmonid predation during outmigration	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	0	0	0	0	0	0	0	0	0
Install fish screens on water diversions	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	0	0	0	0	0	0	0	0	0
Dredge sand from channel	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	0	0	0	0	0	0	0	0	0
Minimize structural fish passage barriers	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	0	0	0	0	0	0	0
Bypass Mendota Pool	0	0	○○	○	○	○	○	0	○○○	○○	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	○○○	0	○	○	0	0	0	0	0	○○
Reconstruct fish ladder on Mendota Dam	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	0	0	0	0
Provide spawning habitat on Little Dry Creek	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	●	0	0
Route flow to Lone Willow Slough as alternate fish pathway	0	0	●●	●●	●●	●●	●●	●●	●	●●	●	0	●	●	●	●	●	●	●	●	●	0	0	0	●	●●	0	●●	●●	●	0	0	0	●	●	●
Route flow to Salt Slough as alternate fish pathway	0	0	●●	●●	●●	●●	●●	●●	●	●●	●	0	●	●	●	●	●	●	●	●	●	0	0	0	●	●●	0	●●	●●	●	0	0	0	●	●	●
Route flow to Cowchilla Bypass as alternate fish pathway	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	0	0

Table 9-5. continued

Potential benefits/impacts ●●● Large benefit ●● Moderate benefit ● Minor bemefit 0 No benefit ○ Minor impact ○○ Moderate impact ○○○ Large impact	Birds																																
	American white pelican (nesting colony) *Pelecanus erythrorhynchos*	Double-crested cormorant (rookery site) *Phalacrocorax auritus*	Western least bittern (nesting) *Ixobrychus exilis hesperis*	Great blue heron (nesting colonies) *Ardea herodias*	Great egret (nesting colonies) *Ardea alba*	White-faced ibis (rookery site) *Plegadis chihi*	Fulvous whistling duck (nesting) *Dendrocygna bicolor*	Osprey (nesting sites) *Pandion haliaetus*	White-tailed kite (nesting) *Elanus leucurus*	Bald eagle *Haliaeetus leucocephalus*	Northern harrier (nesting) *Circus cyaneus*	Golden eagle *Aquila chrysaetos*	Merlin (wintering) *Falco columbarius*	American peregrine falcon *Falco peregrinus anatum*	Prairie falcon (nesting) *Falco mexicanus*	Sharp-shinned hawk (nesting) *Accipiter striatus*	Cooper's hawk (nesting) *Accipiter cooperii*	Swainson's hawk *Buteo swainsoni*	Ferruginous hawk (wintering) *Buteo regalis*	Yellow rail *Coturnicops noveboracensis*	Greater sandhill crane *Grus canadensis tabida*	Western snowy plover (inland population) *Charadrius alexandrinus nivosus*	Mountain plover *Charadrius montanus*	Long-billed curlew (nesting) *Numenius americanus*	Black tern (nesting colony) *Chlidonias niger*	Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Western burrowing owl *Athene cunicularia*	Long-eared owl (nesting) *Asio otus*	Short-eared owl (nesting) *Asio flammeus*	Willow flycatcher *Empidonax traillii*	California horned lark *Eremophila alpestris actia*	Bank swallow *Riparia riparia*	Loggerhead shrike *Lanius ludovicianus*	Least Bell's vireo Vireo bellii pusillus	California yellow warbler (nesting) Dendroica petechia brewsteri	Tricolored blackbird (nesting colony) *Agelaius tricolor*
Divert water from San Luis Reservoir at Mendota Pool	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	0	0	0	0	0	0	0
Modify dam releases for dispersal and establishment of riparian vegetation	0	●●●	●●●	0	0	0	●●●	●●	●●●	●●●	0	0	●●	●●	●●	●●	●●	●●	●●●	●	●	0	0	0	●	0	0	●●	●●	●●●	0	●●	0	●●●	●●●	●●
Modify dam releases for sustenance of riparian vegetation	0	●●●	●●●	●●	●●	●●	●●●	●●●	●●●	●●●	0	0	●●	●●	●●	●●	●●	●●	●●	●	●	0	0	0	●	0	0	●●	●●	●●●	0	●●	0	●●●	●●●	●●
Remove invasive exotic riparian plant species	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	●●●	●●	0
Grade floodplain to facilitate wetland and riparian hydrology	●●●	●●●	●●●	●●●	●●●	●●	●●	●●●	●●	●●●	●●	0	●●	●●	●●	●●	●●	●●	0	●●●	●●●	●●	●●	●	●●●	●●●	0	●●	●●	●●●	0	●●	0	●●	●●	●●●
Plant riparian and wetland plant species	●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	0	0	●	●	●	●	●	●	0	●●●	●●●	0	0	0	●●●	●●●	0	●●	●●	●●●	0	●●	0	●●●	●●●	●●●
Construct set-back levees	0	0	●●●	●●●	●●●	●●●	●●●	0	●●	●	●●●	0	●	●	●	●	●	●●	0	●●●	●●●	0	0	●●	●●●	●●●	0	0	0	0	0	0	0	●●●	●●	●●●
Remove internal, private levees	0	0	●●●	●●	●●	●●	●●●	0	●●	●	●●●	0	●	●	●	●	●	●●	0	●●●	●●	0	0	●●	●●●	0	0	0	0	0	0	0	0	●●	●●
Create levee breaches, overflow structures, or regulated inflows	0	0	●●●	●●●	●●●	●●●	●●●	0	●●	●	●●●	0	●	●	●	●	●	●●	0	●●●	●●●	0	0	●●	●●●	0	0	0	0	0	0	0	0	●●	●●●
Purchase conservation easements	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
Purchase flood easements	0	0	●●●	●	●	●	0	●	●●	0	●●	0	●	●	●	●	●	●●●	●	●●●	●●●	●	●	●●	●●●	0	0	0	0	0	0	0	0	●●●	0
Flood-proof existing infrastructure	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	0	0	○○	0	0	0	○○	○○
Route flow to Fresno Slough as alternate flood pathway	0	●	●	●●	●●	●●	●●	●	●	●●	●	0	●●	●●	●●	●●	●●	●●	●●	●	●	0	0	●	●	●	0	●●	●●	●	0	0	0	0	●	●

Table 9-6. Special-status plant species with potential to occur in the study area.

Potential benefits/impacts ●●● Large benefit ●● Moderate benefit ● Minor bemefit 0 No benefit ○ Minor impact ○○ Moderate impact ○○○ Large impact	Alkali milk-vetch *Astragalus tener* var. *tener*	Heartscale *Atriplex cordulata*	Crownscale *Atriplex coronata* var. *coronata*	Brittlescale *Atriplex depressa*	San Joaquin spearscale *Atriplex joaquiniana*	Lesser saltscale *Atriplex minuscula*	Vernal pool smallscale *Atriplex persistens*	Subtle orache *Atriplex subtilis*	Lost Hills crownscale *Atriplex vallicola*	Succulent (Fleshy) owl's-clover *Castilleja campestris* ssp. *succulenta*	Hoover's spurge *Chamaesyce hooveri*	Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus*	Palmate-bracted bird's-beak *Cordylanthus palmatus*	Recurved larkspur *Delphinium recurvatum*	Four-angled spikerush *Eleocharis quadrangulata*	Round-leaved filaree *Erodium macrophyllum*	Delta button-celery *Eryngium racemosum*	Spiny-sepaled button celery *Eryngium spinosepalum*	Munz's tidy-tips *Layia munzii*	Madera linanthus *Linanthus serrulatus*	Prostrate navarretia *Navarretia prostrata*	Colusa grass *Neostapfia colusana*	San Joaquin Valley Orcutt grass *Orcuttia inaequalis*	Hairy Orcutt grass *Orcuttia pilosa*	Slender-leaved pondweed *Potamogeton filiformis*	Hartweg's golden sunburst *Pseudobahia bahiifolia*	Sanford's arrowhead *Sagittaria sanfordii*	Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*
Modify dam releases to improve fish habitat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	0	0	0	0	0	0	0	0	●	0	●	0
Modify dam releases to inundate bars and secondary channels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●●	0	●	0	0	0	0	0	0	●●	0	●●	0
Modify dam releases to mobilize existing gravel sources	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	0
Remove or disturb armor layer on gravel bars and banks	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	0
Remove vegetation from gravel bars and banks	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	0
Import gravel	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	0
Fill gravel pits	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	0
Bypass gravel pits	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	0
Construct hydraulic controls	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	0
Place large woody material in the channel	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
Modify dam releases to inhibit warm-water fish species	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	0
Remove non-native warm-water predatory fish species	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	0
Increase turbidity to reduce salmonid predation during outmigration	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	0
Install fish screens on water diversions	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	0
Dredge sand from channel	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	0
Minimize structural fish passage barriers	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	0
Bypass Mendota Pool	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	0
Reconstruct fish ladder on Mendota Dam	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	0
Provide spawning habitat on Little Dry Creek	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	0

Table 9-6. continued

Potential benefits/impacts ●●● Large benefit ●● Moderate benefit ● Minor bemefit 0 No benefit ○ Minor impact ○○ Moderate impact ○○○ Large impact	Alkali milk-vetch *Astragalus tener* var. *tener*	Heartscale *Atriplex cordulata*	Crownscale *Atriplex coronata* var. *coronata*	Brittlescale *Atriplex depressa*	San Joaquin spearscale *Atriplex joaquiniana*	Lesser saltscale *Atriplex minuscula*	Vernal pool smallscale *Atriplex persistens*	Subtle orache *Atriplex subtilis*	Lost Hills crownscale *Atriplex vallicola*	Succulent (Fleshy) owl's-clover *Castilleja campestris* ssp. *succulenta*	Hoover's spurge *Chamaesyce hooveri*	Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus*	Palmate-bracted bird's-beak *Cordylanthus palmatus*	Recurved larkspur *Delphinium recurvatum*	Four-angled spikerush *Eleocharis quadrangulata*	Round-leaved filaree *Erodium macrophyllum*	Delta button-celery *Eryngium racemosum*	Spiny-sepaled button celery *Eryngium spinosepalum*	Munz's tidy-tips *Layia munzii*	Madera linanthus *Linanthus serrulatus*	Prostrate navarretia *Navarretia prostrata*	Colusa grass *Neostapfia colusana*	San Joaquin Valley Orcutt grass *Orcuttia inaequalis*	Hairy Orcutt grass *Orcuttia pilosa*	Slender-leaved pondweed *Potamogeton filiformis*	Hartweg's golden sunburst *Pseudobahia bahiifolia*	Sanford's arrowhead *Sagittaria sanfordii*	Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*
Route flow to Lone Willow Slough as alternate fish pathway	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	0	0	●	0	0	0	0	0	0	●	0	●	0
Route flow to Salt Slough as alternate fish pathway	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	0	●	●	0	0	0	0	0	0	●	0	●	0
Route flow to Cowchilla Bypass as alternate fish pathway	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	0	●	●	0	0	0	0	0	0	●	0	●	0
Divert water from San Luis Reservoir at Mendota Pool	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	0	0
Modify dam releases for dispersal and establishment of riparian vegetation	0	0	0	0	0	0	0	0	0	0	0	0	0	●	●	0	●●	●●	0	0	0	0	0	0	●	0	●	●
Modify dam releases for sustenance of riparian vegetation	0	0	0	0	0	0	0	0	0	0	0	●	●	●●	●●●	0	●●●	●●	0	0	0	0	0	0	●●●	0	●●●	●
Remove invasive exotic riparian plant species	0	0	0	0	0	0	0	0	0	0	0	0	0	●●	●●	0	●●	●●	0	0	0	0	0	0	●●	0	●●	●●
Grade floodplain to facilitate wetland and riparian hydrology	●	0	0	0	0	0	0	0	0	0	0	●●	●●	●●●	●●●	0	●●●	●●●	0	0	0	0	0	0	●●●	0	●●●	●●●
Plant riparian and wetland plant species	●	0	0	0	0	0	0	0	0	0	0	●●●	●●●	●●●	●●●	0	●●●	●●	0	0	0	●	●	●	●●●	0	●●●	●●●
Construct set-back levees	●●	0	0	0	0	0	0	0	0	0	0	●●●	●●●	●●●	●●●	0	●●●	●●●	0	0	0	●●●	●●●	●●●	●●	0	●●	●●
Remove internal, private levees	●●	0	0	0	0	0	0	0	0	0	0	●●	●●	●●	●●	0	●●	●	0	0	0	●●	●●	●●	●	0	●	●●
Create levee breaches, overflow structures, or regulated inflows	●●	●	●	●	0	●	0	0	●	0	0	●●●	●●●	●●	●●	0	●●	●●	0	0	0	●●	●●	●●	●●	0	●●	●●●
Purchase conservation easements	●●●	●●●	●●●	●●●	0	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●
Purchase flood easements	●	●●●	●●●	●●●	0	●●●	●●	0	●●●	●	●	●	●	●	●	0	●●●	●●●	0	0	0	●	●	●	●	0	●	●●
Flood-proof existing infrastructure	○○	○○	○○	○○	0	○○	0	0	○○	○	○	○○	○○	○○	○○	0	●●●	●	0	0	0	○○	○○	○○	○○	0	○○	○○
Route flow to Fresno Slough as alternate flood pathway	0	0	0	0	0	0	0	0	0	0	0	0	0	●●	●●	0	●●	●●	0	0	0	0	0	0	●●	0	●●	●●

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