Wildlife Resources Technical Report

Shasta Lake Water Resource Investigation, California

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Abbreviations and Acronyms

Bay-Delta	San Francisco Bay/Sacramento–San Joaquin River Delta
BLM	U.S. Bureau of Land Management
CALFED	CALFED Bay-Delta Program
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CVP	Central Valley Project
CWA	Clean Water Act
CEQA	California Environmental Quality Act
Delta	Sacramento–San Joaquin River Delta
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
Eagle Act	Bald and Golden Eagle Protection Act
ESA	Federal Endangered Species Act
ESL	environmental study limits
FR	Federal Register
LRMP	Land and Resource Management Plan
MBTA	Migratory Bird Treaty Act
MSCS	Multi-Species Conservation Strategy
msl	mean sea level
NMFS	National Marine Fisheries Service
NEPA	National Environmental Policy Act
NRA	National Recreation Area
NSR	North State Resources
OCAP	Operations Criteria and Plan
RBDD	Red Bluff Diversion Dam
RCD	resource conservation district
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RHJV	Riparian Habitat Joint Venture
ROD	Record of Decision
RWQCB	regional water quality control board
SB	Senate Bill
SLWRI	Shasta Lake Water Resources Investigation
SRCA	Sacramento River Conservation Area
SRNWR	Sacramento River National Wildlife Refuge

STNF	Shasta Trinity National Forest
SWAG	Sacramento Watersheds Action Group
SWP	State Water Project
TES	Threatened and Endangered Species
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Chapter 1
Affected Environment

This chapter describes the affected environment related to wildlife resources for the dam and reservoir modifications proposed under the Shasta Lake Water Resources Investigation (SLWRI).

Because of the potential influence of the proposed modification of Shasta Dam, and subsequent water deliveries over a rather large geographic area, the SLWRI includes both a primary study area and an extended study area. This chapter describes the wildlife and special-status species present within the primary study area, which includes Shasta Dam and Shasta Lake, all contributing major and minor tributaries, and the Sacramento River downstream to Red Bluff Diversion Dam (RBDD) (including contributing tributaries within this reach of the Sacramento River). Common wildlife and special-status species within the extended study area are also discussed, but in less detail. The extended study area includes the Sacramento River basin from RBDD south to the Sacramento–San Joaquin River Delta (Delta). It also includes the San Francisco Bay/Sacramento–San Joaquin River Delta (Bay-Delta) area, portions of the American and San Joaquin River Basins, and the water service areas of the Central Valley Project (CVP) and State Water Project (SWP).

Descriptions of biological resources were derived primarily from the following sources:

- Shasta Lake Water Resources Investigation Mission Statement Milestone Report (Reclamation 2003)
- Shasta Lake Water Resources Investigation Initial Alternatives Information Report (Reclamation 2004a)
- Chapter 3, “Biological Environment,” in the Draft Shasta Lake Water Resources Investigation Plan Formulation Report (Reclamation 2007)
- U.S. Fish and Wildlife Service (USFWS) Endangered Species Lists (USFWS 2007)
- The California Natural Diversity Database (CNDDB) (2007)

Several attachments to this technical report provide detailed lists and descriptions of special-status wildlife species present in the primary and extended study areas:

- Attachment 1, “Special-Status Wildlife Species Potentially Occurring in the Shasta Lake and Vicinity Portion of the Primary Study Area”
- Attachment 2, “ Species Accounts for Special-Status Wildlife in the Shasta Lake and Vicinity Portion of the Primary Study Area”
- Attachment 3, “Breeding Bird Survey Results—2007”
- Attachment 4, “Species Accounts for Special-Status Wildlife in the Primary Study Area Downstream of Shasta Dam”
- Attachment 5, “State and Federal Lists of Special-Status Wildlife Species in the Vicinity of the Primary Study Area”
- Attachment 6, “Special-Status Wildlife Species with Potential to , Occur in the Primary and Extended Study Areas by Area”
- Attachment 7, “List of All Sensitive Wildlife Species in the Extended Study Area Reported to the CNDDB”

Before the onset of field studies, North State Resources, Inc. (NSR) established project boundaries for focused surveys (Figure 1-1) in the area that would be subject to inundation under the various enlargement scenarios. The lower boundary corresponds to the full-pool elevation defined by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) (1,070-foot mean sea level (msl) contour line). Reclamation established the upper boundary using the 1,090-foot msl contour line around the entire lake.

To examine the physical and biological resources along riverine reaches that would be subject to inundation if Shasta Dam were enlarged, the Shasta Lake and vicinity portion of the primary study area also incorporates reaches of 13 streams and rivers that are tributary to Shasta Lake.

Finally, areas subject to physical disturbance as an indirect result of the proposed project (i.e., areas proposed as relocation sites for roadways, bridges, utilities, and campgrounds that would be inundated subsequent to the enlargement of Shasta Dam as well as proposed dike locations) were incorporated into the Shasta Lake and vicinity portion of the primary study area. These locations are hereafter referred to as “Relocation Areas.”

Environmental Setting

Wildlife

The primary and extended study areas support a variety of habitats including riparian forest, oak woodland, riparian scrub, chaparral, annual grassland, vernal pools, seasonal and permanent wetlands, estuaries, tidal sloughs and marshes,

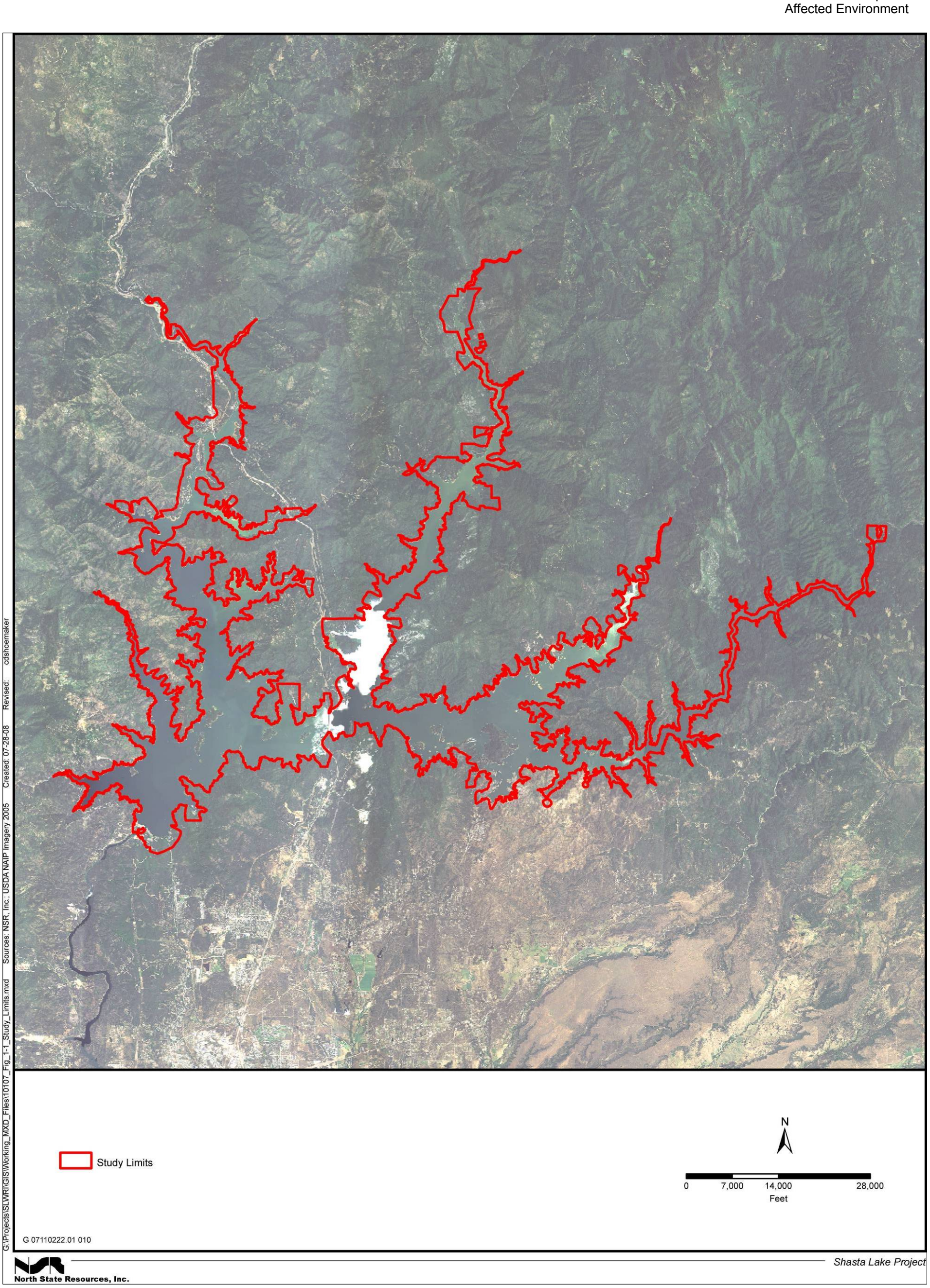

Figure 1-1. Study Limits

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and agricultural lands. Each of these habitats supports its own unique assemblage of wildlife species.

Deforestation, cattle grazing, water development, flood protection, and the expansion of agriculture and urban land uses onto historic floodplains have considerably altered the historic landscape. Much of the remaining habitat areas exist as a mosaic of fragmented upland communities or narrow strips of riparian habitat along the Sacramento River and its tributary creeks and sloughs. Although the remaining riparian habitat along the Sacramento River corridor is limited, it supports a diverse collection of wildlife and supplies shade, cover, and organic material to the adjacent streamside environment, which benefits both the floral and faunal species that are closely associated with the riparian environment.

Table 1-1 cross references between the habitat types described in this document and the types evaulated in the CALFED Bay-Delta Program's (CALFED) *Multi-Species Conservation Strategy* (MSCS) (CALFED 2000a).

Table 1-1. MSCS Cross-Reference of Habitat Types in the Project Study Area and MSCS

Plant Community and Habitat Types in Primary and Extended Study Area	MSCS Habitat Type	MSCS Goal
Sierran mixed conifer	Montane woodland and forest	Avoid, minimize, and compensate for loss where evaluated species are affected.
Ponderosa pine	Montane woodland and forest	Avoid, minimize, and compensate for loss where evaluated species are affected.
Closed-cone pine	Montane woodland and forest	Avoid, minimize, and compensate for loss where evaluated species are affected.
Montane hardwood–conifer	Montane woodland and forest	Avoid, minimize, and compensate for loss where evaluated species are affected.
Montane hardwood	Montane woodland and forest	Avoid, minimize, and compensate for loss where evaluated species are affected.
Blue oak/oak woodland	Valley/foothill woodland and forest	Avoid, minimize, and compensate for loss where evaluated species are affected.

Plant Community and Habitat Types in Primary and Extended Study Area	MSCS Habitat Type	MSCS Goal
Blue oak–gray pine	Valley/foothill woodland and forest	Avoid, minimize, and compensate for loss where evaluated species are affected.
Mixed chaparral	Upland scrub	Avoid, minimize, and compensate for loss where evaluated species are affected.
Montane riparian	Montane riparian	Substantially increase extent and quality.
Riparian woodland	Valley/foothill riparian	Substantially increase extent and quality.
Riparian scrub	Valley/foothill riparian (if woody; otherwise none)	If woody scrub, substantially increase extent and quality.
Fresh emergent wetland	Nontidal freshwater permanat emergent	Substantially increase extent and quality.
Tidal emergent wetland	Saline emergent Tidal freshwater emergent	Substantially increase extent and quality.
Tidal perennial aquatic	Tidal perennial aquatic	Substantially increase extent and quality.
Lacustrine	Lacustrine	Substantially increase extent and quality.
Riverine	Valley riverine aquatic Montane riverine aquatic	Substantially increase extent and quality.
Open water	Included in one of the following: tidal perennial aquatic, valley riverine aquatic montane riverine aquatic, or lacustrine	Substantially increase extent and quality.
Annual grassland	Grassland	*Perennial grassland:* Substantially increase extent and quality. *Annual grassland:* Avoid, minimize, and compensate for loss where evaluated species are affected.
Agriculture	Upland cropland Seasonally flooded agricultural land	Protect, enhance, or restore
Barren	Not included in ERP	--
Urban	Not included in ERP	--

Source: CALFED 2000a

ERP = Ecosystem Restoration Program

MSCS = Multi-Species Conservation Strategy

Goals for habitats were developed within the Ecosystem Restoration Program (ERP) and the Strategic Plan for Ecosystem Restoration (CALFED 1999).

Primary Study Area

Shasta Lake and Vicinity Shasta Dam and Shasta Lake are located on the upper Sacramento River in Northern California. Shasta Dam is located about 9 miles northwest of Redding, and the dam and entire reservoir are located within Shasta County. The Shasta Lake and vicinity portion of the primary study area is composed of Shasta Dam and Shasta Lake and the lower reaches of the tributaries draining into Shasta Lake. In the initial phase of the SLWRI, 13 streams and rivers were selected to represent the diverse characteristics of the rivers and streams that flow into Shasta Lake.

Wildlife resources described in this report result from the wealth and diversity of climatic and vegetative associations in and adjacent to the Shasta Lake and vicinity portion of the primary study area. Influences from the Coast Range, the southern Cascades, the northern Sierra Nevada, the Great Basin, and the Central Valley provide for a unique mix of biota. Much of this region, especially in the Central Valley, has been modified by past and present land uses.

Prior to Euro-American settlement, the area was dominated by riparian vegetation in the annual floodplains, with stands of valley oak (*Quercus lobata*) and interior live oak (*Quercus wislizenii* var. *wislizenii*) on higher ground. Herbaceous wetland bottoms and upland native grassland communities were common in this vegetation mosaic. The extensive oak forests and riparian/wetland habitats hosted a diverse and abundant wildlife community. Cattle grazing, deforestation of the oak woodlands, water development, flood protection, and expansion of agriculture onto the floodplains in the early to mid-1800s substantially altered the historical floodplain and channel vegetation.

Rural development, fire suppression, recreation, and wildfires have affected the population and distribution of wildlife in this area. Fire suppression, which has generally increased understory vegetation, has had mixed effects on wildlife. Bear, deer, and birds that prefer near-ground vegetation for food and cover have generally benefited, while birds requiring aerial foraging habitat, such as the golden eagle (*Aquila chrysaetos*), American peregrine falcon (*Falco peregrinus*), and great horned owl (*Bubo virginianus*), have declined. Species that have adapted or thrived in the altered human environment include coyotes (*Canis latrans*), raccoons (*Procyon lotor*), and various other late-successional species. The quality of potential bat habitat, found primarily in the limestone formations to the north and east of Shasta Lake, has suffered from increased use by recreational rock climbers and spelunkers. Wildlife may also be affected by a lack of contiguous travel corridors in certain portions of the area that prevent species from moving between remaining suitable habitats.

Wildlife Habitats The study area is characterized by a variety of habitats typical of transitional mixed woodland and low-elevation forest. These habitats were mapped and classified using the Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988). Habitats present in the Shasta Lake and

vicinity portion of the primary study area are summarized in Table 1-2. The wildlife species typical of each of these communities are described below.

Table 1-2. Summary of Wildlife Habitats in the Shasta Lake and Vicinity Portion of the Primary Study Area

Habitat	Area (acres)						
	Main Body of Lake	Big Backbone Creek	Sacramento River Arm	McCloud River Arm	Squaw Creek Arm	Pit River Arm	Relocation Areas
Annual grassland	0.44	0.00	3.10	0.70	0.00	0.38	48.25
Barren	2.30	0.00	10.61	3.58	0.00	1.20	265.48
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	34.66	89.72
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	3.29	0.93
Closed-cone pine–cypress	32.68	0.00	12.95	20.80	44.73	69.84	164.37
Freshwater emergent	0.0	0.00	0.00	0.00	0.00	0.00	7.21
Mixed chaparral	29.01	13.64	162.00	14.54	10.35	12.01	325.04
Montane hardwood	73.49	38.76	171.15	64.95	19.44	78.84	1,040.40
Montane hardwood–conifer	71.29	0.99	152.50	139.04	110.56	178.52	1,317.30
Montane riparian	4.16	6.67	26.65	17.56	1.53	5.07	13.08
Ponderosa pine	214.18	30.73	189.59	160.00	49.56	123.51	1,462.29
Riverine	0.00	0.88	5.24	14.31	1.41	0.00	12.25
Sierran mixed conifer	0.00	0.00	0.00	3.62	0.91	11.16	54.25
Urban	21.96	0.00	1.95	7.96	0.00	1.42	273.14
Total	**459.87**	**91.67**	**735.74**	**447.06**	**242.78**	**519.90**	**5073.71**

Source: Mayer and Laudenslayer 1988

Annual Grassland Grassland bird species such as the mourning dove (*Zenaida macroura*), savannah sparrow (*Passerculus sandwichensis*), and white-crowned sparrow (*Zonotrichia leucophrys*) as well as rodents such as the California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), and deer mouse (*Peromyscus maniculatus*) may forage on the seed crop this community provides. These species in turn attract predators

such as the gopher snake (*Pituophis melanoleucus*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), and coyote. Reptile species expected to occur here include the western fence lizard (*Sceloporus occidentalis*), western skink (*Eumeces skiltonianus*), western rattlesnake (*Crotalus viridis*), and yellow-bellied racer (*Coluber constrictor*).

Barren. The wildlife species known to use barren habitats includes many hawks and falcons, such as the American peregrine falcon, which may use rock ledges and cliffs for roosting and nesting.

Blue Oak Oak woodlands produce acorns used as forage by a variety of species, including acorn woodpeckers (*Melanerpes formicivorus*), western scrub-jays (*Aphelocoma californica*), turkey (*Meleagris gallopavo*), western gray squirrels (*Sciurus griseus*), and black-tailed deer (*Odocoileus hemonius columbianus*). Snags and live trees containing cavities provide nesting habitat for species such as the western bluebird (*Salia mexicana*), tree swallow (*Tachycineta bicolor*), American kestrel, and northern flicker (*Colaptes auratus*), as well as roost sites for bats and denning sites for mammals such as the raccoon, opossum (*Didelphis virginiana*), and gray fox (*Urocyon cinereoargenteus*). Raptors, including the red-tailed hawk and great horned owl, also nest in these woodlands. Amphibian and reptile species occurring here include the Pacific chorus frog (*Pseudacris regilla*), bullfrog (*Rana catesbeiana*), western fence lizard, southern alligator lizard (*Elgaria multicarinata*), western terrestrial garter snake (*Thamnophis elegans*), common garter snake (*Thamnophis sirtalis*), and western rattlesnake.

Blue Oak–Gray Pine The blue oak–gray pine community provides breeding habitat for a large variety of wildlife species, although no species is completely dependent on it for breeding, feeding, or cover. Many of the species found in blue oak habitat are also found here. Acorns and gray pine seeds are an important resource for many of the species using this habitat, such as the acorn woodpecker, western scrub-jay, and western gray squirrel. The newly emerged leaves of oaks in the spring support an abundance of insects that attract migrating and nesting warblers, vireos, flycatchers and other insectivorous birds. In addition, the shrubs provide habitat for birds such as spotted towhees (*Pipilo maculatus*), California towhees (*Pipilo crissalis*), wrentits (*Chamaea fasciata*), and blue-gray gnatcatchers (*Polioptila caerulea*). Characteristic reptiles and amphibians include western toads (*Bufo boreas*), a wide variety of snakes (common garter snakes, California whipsnakes (*Masticophis lateralis*), gopher snakes and western rattlesnakes), western skinks, southern alligator lizards, and western fence lizards.

Closed-Cone Pine Numerous game and nongame species make use of this habitat for feeding and cover. Steller's jays (*Cyanocitta stelleri*) and western scrub jays, downy woodpeckers (*Picoides pubescens*), and western gray squirrels extract seeds from partially opened cones. The great horned owl and

red-tailed hawk are among the few species known to use this habitat for breeding.

Fresh Emergent Wetland Fresh emergent wetlands are among the most productive wildlife habitats in California. Numerous species of birds, mammals, reptiles, and amphibians use this habitat for food, cover, and water.

Mixed Chaparral The mixed chaparral community provides habitat for a wide variety of wildlife species. It provides seeds, fruit, and protection from predators and harsh weather. In addition, it provides singing, roosting and nesting sites for many species of birds, including the California quail (*Callipepla californica*), wrentit, and Bewick's wren (*Thryomanes bewickii*). Mammals common in this habitat include the black-tailed hare (*Lepus californicus*), gray fox, coyote, and deer mouse. Reptiles that make use of this habitat include the western fence lizard and southern alligator lizard.

Montane Hardwood Mast crops provided by montane hardwood forests are an important food resource for many species, including the acorn woodpecker, Steller's jay, mountain quail (*Oreortyx pictus*), western gray squirrel, and black-tailed deer. In addition, cavities in mature trees provide nesting and denning habitat for species such as the northern flicker, western screech owl (*Otus kennicottii*), American kestrel, and opossum. In moist areas, many amphibians and reptiles are found in the detrital layer, including ensatina (*Ensatina eschscholtzii*) and western skinks.

Montane Hardwood–Conifer The variability of the canopy cover and understory vegetation makes montane hardwood–conifer habitat suitable for numerous species of wildlife. Hollow trees and logs provide denning sites for mammals such as the coyote and gray fox, while cavities in mature trees are used by cavity-dwelling species such as the acorn woodpecker, violet-green swallow (*Tachycineta thalassina*), northern flicker, great horned owl, raccoon, and California myotis (*Myotis californicus*). In addition, raptors, such as the red-tailed hawk, construct nests in the upper canopy of mature trees. Moreover, mast crops and conifer seeds are an important food source for many birds and mammals, including the Steller's jay, acorn woodpecker, California quail, black-tailed deer, and western gray squirrel. In moist areas, many amphibians and reptiles are found in the detrital layer, including ensatina and western fence lizards. Snakes, including the western rattlesnake and sharp-tailed snake (*Contia tenuis*), also occur in this habitat.

Montane Riparian Riparian woodlands represent some of the most important wildlife habitats because of their high floristic and structural diversity, high biomass (and therefore high food abundance), and high water availability. In addition to providing breeding, foraging, and roosting habitat for a diverse array of animals, riparian habitats also provide movement corridors for some species, connecting a variety of habitats throughout the region.

The leaf litter, fallen tree branches, and logs associated with the riparian community in the study area provide cover for the western toad and Pacific chorus frog. The western fence lizard, western skink and southern alligator lizard are also expected to occur here. Common species nesting and foraging primarily in the riparian tree canopy include the bushtit (*Psaltriparus minimus*), white-breasted nuthatch (*Sitta carolinensis*), and Nuttall's woodpecker (*Picoides nuttallii*). Other resident species, such as the spotted towhee and song sparrow (*Melospiza melodia*), nest and forage on or very close to the ground, usually in dense vegetation. A variety of mammals also occur in riparian communities, including the deer mouse, raccoon, and opossum.

Ponderosa Pine Ponderosa pine needles, cones, buds, pollen, twigs, seeds, and associated fungi and insects provide food for many species of birds and mammals, including the mountain quail, western gray squirrel, black-tailed deer, Allen's chipmunk (*Tamias senex*), and black bear (*Ursus americanus*). Mature trees provide nesting habitat for raptors such as the bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), sharp-shinned hawk, and red-tailed hawk, while snags and hollow logs provide shelter for species such as the Virginia opossum and western spotted skunk (*Spilogale gracilis*).

Riverine Riverine areas provide habitat for numerous fish, including rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), smallmouth bass (*Micropterus dolomieu*), and riffle sculpin (*Cottus gulosus*). Aquatic wildlife species include the foothill yellow-legged frog (*Rana boylii*), aquatic garter snake (*Thamnophis atratus*), and the aquatic phase of the rough-skinned newt (*Taricha granulosa granulosa*). Birds present include the American dipper (*Cinclus mexicanus*), common merganser, and belted kingfisher (*Ceryle alcyon*). Many mammals present in the surrounding upland habitats use the riverine areas, including raccoon, gray fox, and black-tailed deer.

Sierran Mixed Conifer The multilayered vegetation in the Sierran mixed conifer community supports a variety of wildlife species. A significant feature of the community is the presence of cavity-bearing trees. Mature, fire-damaged, and wind-damaged forests typically contain snags (dead trees that are still standing), which are a valuable resource for birds and mammals that prefer nest and den sites in cavities, such as the flammulated owl (*Otus flammeolus*) and northern pygmy owl (*Glaucidium gnoma*). Snags also support wood-boring insects that provide food for bark-gleaning insectivorous birds such as the brown creeper (*Certhia americana*). Other birds foraging and/or breeding in this habitat include the sharp-shinned hawk (*Accipiter striatus*), American peregrine falcon, mountain quail, western wood-pewee (*Contopus sordidulus*), and western tanager (*Piranga ludoviciana*). Mammals found in this habitat include the long-eared myotis (*Myotis evotis*), western red bat (*Lasiurus blossevillii*), northern flying squirrel (*Glaucomys sabrinus*), brush rabbit (*Sylvilagus bachmani*), and bobcat (*Lynx rufus*).

Urban The wildlife species most often associated with urban areas are those that are most tolerant of periodic human disturbances, including several introduced species, such as European starlings (*Sturnus vulgaris*), rock doves (*Columba livia*), and house mice (*Mus musculus*). Native species that are able to use these habitats include western fence lizards, American robins (*Turdus migratorius*), Brewer's blackbirds (*Euphagus cyanocephalus*), northern mockingbirds (*Mimus polyglottos*), mourning doves, house finches (*Carpodacus mexicanus*), California ground squirrels, black-tailed hares, and striped skunks (*Mephitis mephitis*). In addition, bats that forage in nearby habitats may make use of small cavities around the eaves of structures.

Upper Sacramento River (Shasta Dam to Red Bluff) The variety and availability of habitats along the Sacramento River between Shasta Dam and RBDD support a variety of waterfowl, raptors, and migratory and resident avian species, plus a variety of mammals, amphibians, and reptiles that inhabit aquatic, riparian, and upland habitats. The high diversity and abundance of animals is also caused by the presence of large tracts of land covered by habitats known to have outstanding value for wildlife, such as riparian woodland, oak woodland, marsh, and grassland. Important wildlife habitat is found throughout the upper Sacramento River portion of the primary study area, and large contiguous blocks that contain multiple habitat types have the potential to support the highest wildlife diversity and abundance. Generally, the lowest diversity of native wildlife species can be expected in densely urbanized areas. Special-status wildlife occurs in both large and small blocks of habitat, while some large mammals and secretive species are generally found only on large undisturbed parcels. Overall, however, the quantity and variety of wildlife species now inhabiting the area are fewer than before agricultural and residential development permanently removed much of the native and natural habitat. Most affected have been wildlife species associated with riparian and grassland habitats, which have been highly altered by land use, water resources development, and land management practices. Many of the wildlife species are unable to adapt to other habitat types or altered habitat conditions and are, therefore, susceptible to habitat loss and degradation. The region also supports a variety of nonnative plant and animal species, some of which are detrimental to survival of native species.

Riparian habitats are considered to be among the most productive wildlife habitats in California and typically support the most diverse wildlife communities. In addition to providing important nesting and foraging habitat, riparian habitats function as wildlife movement corridors. Riparian habitat has been designated by the California Department of Fish and Game (DFG) as a sensitive habitat in California because of its limited abundance and high value to wildlife.

Riparian Woodland Riparian woodlands along the upper Sacramento River are composed of the cottonwood willow riparian and valley oak riparian land cover types. Although the composition of dominant species differs between

these two land cover types, the riparian tree species provide similar functions and values for wildlife. Although riparian woodlands along the upper Sacramento River typically occur in narrow or discontinuous patches, this cover type provides important value for wildlife and supports a great abundance of both common and listed species of birds, mammals, reptiles, amphibians, and invertebrates. Aside from ornamental or landscape trees associated with farms or isolated trees in fields and along roadsides, riparian woodlands provide the only overstory and midstory vegetation. Overstory trees may be used for nesting and roosting by numerous raptors, including Swainson's hawk (*Buteo swainsoni*), white-tailed kite (*Elanus leucurus*), red-tailed hawk (*Buteo jamaicensis*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), and American kestrel (*Falco sparverius*). Riparian woodlands also provide important nesting and foraging cover for resident, migratory, and wintering songbirds, and they support several species of mammals and provide cover and foraging habitat for reptiles and amphibians. Elderberry shrubs, which provide habitat for the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), also may be associated with this community type.

Riparian Scrub Riparian scrub occurs throughout the upper Sacramento River portion of the primary study area. Riparian scrub is composed of three land cover types: riparian scrub, willow scrub, and stands of giant reed. Riparian scrub habitat provides value for wildlife similar to riparian woodland; however, riparian scrub habitat lacks an overstory component. Although riparian scrub habitat typically occurs in narrow or discontinuous patches, this cover type provides important food, shelter, and breeding habitat for wildlife.

Oak Woodland Oak and other hardwood habitats at low- and mid-elevations are important for many wildlife species found along the upper Sacramento River. Oak woodland is one of the most biologically diverse communities in California (Merelender and Crawford 1998). Oaks provide shelter, through shading and within trunk cavities, for a variety of wildlife in an otherwise open, dry landscape. Large acorn crops and a diverse insect fauna provide high-quality food for a wide variety of amphibians, reptiles, birds, and mammals.

Chaparral Chaparral communities are characterized by dense cover of drought-tolerant shrubs; they typically occur on dry, rocky, thin-soiled slopes that are often steep and have southern aspects. Chaparral generally has lower wildlife diversity than most forest and woodland habitats. However, chaparral does provide habitat for many wildlife species, including some that are considered rare elsewhere. Reptiles found in chaparral include western rattlesnake (*Crotalus viridis*), western fence lizard (*Sceloporus occidentalis*), and western whiptail (*Cnemidophorus tigris*). Common birds in chaparral at low elevations include California thrasher (*Toxostoma redivivum*) and California quail (*Callipepla californica*). The general trend toward more dense underbrush in foothill habitats, resulting from fire suppression, has favored species that rely on dense vegetation for cover or foraging while negatively affecting raptors and other wildlife that require open areas for foraging.

Annual Grassland Annual grasslands generally support lower wildlife diversity than woodland and shrub-dominated habitats but are invaluable to the number of grassland-dependent species found in the upper Sacramento River portion of the primary study area. A great diversity and abundance of mammals, birds, and insects rely on grasslands. The grasslands also support vernal pools and other seasonal wetlands that provide unique habitat for waterfowl, various small aquatic organisms, and breeding habitat for amphibians. Vernal pools are ephemeral communities that support an unusual flora and fauna specifically adapted to ponding during the wet season and dry conditions during summer. This circumstance is reflected by the high number of species that are endemic to vernal pools.

Agriculture Conversion of grasslands to agricultural land has favored species that have adapted to the use of agricultural fields for foraging and species that can thrive in the altered landscape. Agricultural land is not generally considered important wildlife habitat but is used by many species, particularly as foraging habitat. Wildlife found in agricultural areas varies depending upon crop type and time of year. Agricultural lands include upland cropland and seasonally flooded cropland (land that requires seasonal flooding for at least 1 week at a time as a management practice (e.g., pest control or irrigation) or to enhance habitat values for specific wildlife, particularly waterfowl). Agricultural lands, both those that are and those that are not seasonally flooded, support foraging habitat for many birds, such as Swainson's hawks, as well as garter snakes (*Thamnophis* spp.), and support other species that have adapted or thrived in the modified human environment, including coyote (*Canis latrans*), raccoon (*Preocyon lotor*), and crow (*Corvus brachyrhynchos*).

Urban Urbanized landscapes also can support many wildlife species that are adapted to disturbed environments. Wildlife found in urban areas often depends on surrounding land uses and the presence or absence of nearby natural vegetation. In densely urbanized areas, a large percentage of the wildlife can be made up of exotic species. Urban areas provide habitat for species also found in agricultural areas, such as mourning dove (*Zenaida macroura*), American robin (*Turdus migratorius*), and western gray squirrel (*Sciurus griseus*).

Extended Study Area

The extended study area extends from RBDD south (downstream along the Sacramento River) to the Delta. It also includes the Bay-Delta area and portions of the American and San Joaquin River basins. This extended study area includes CVP and SWP dams and other facilities, rivers downstream of the dams that affect Sacramento River and Delta inflows, and the water service areas. These reservoirs and tributaries include Lake Oroville, Folsom Lake, San Luis Reservoir, New Melones Reservoir, and Trinity Lake, and portions of the Trinity, Feather, American, and Stanislaus Rivers. The CVP/SWP water service areas include much of the Sacramento and San Joaquin Valleys and substantial portions of the Bay Area and of Southern California (Figure 1-2).

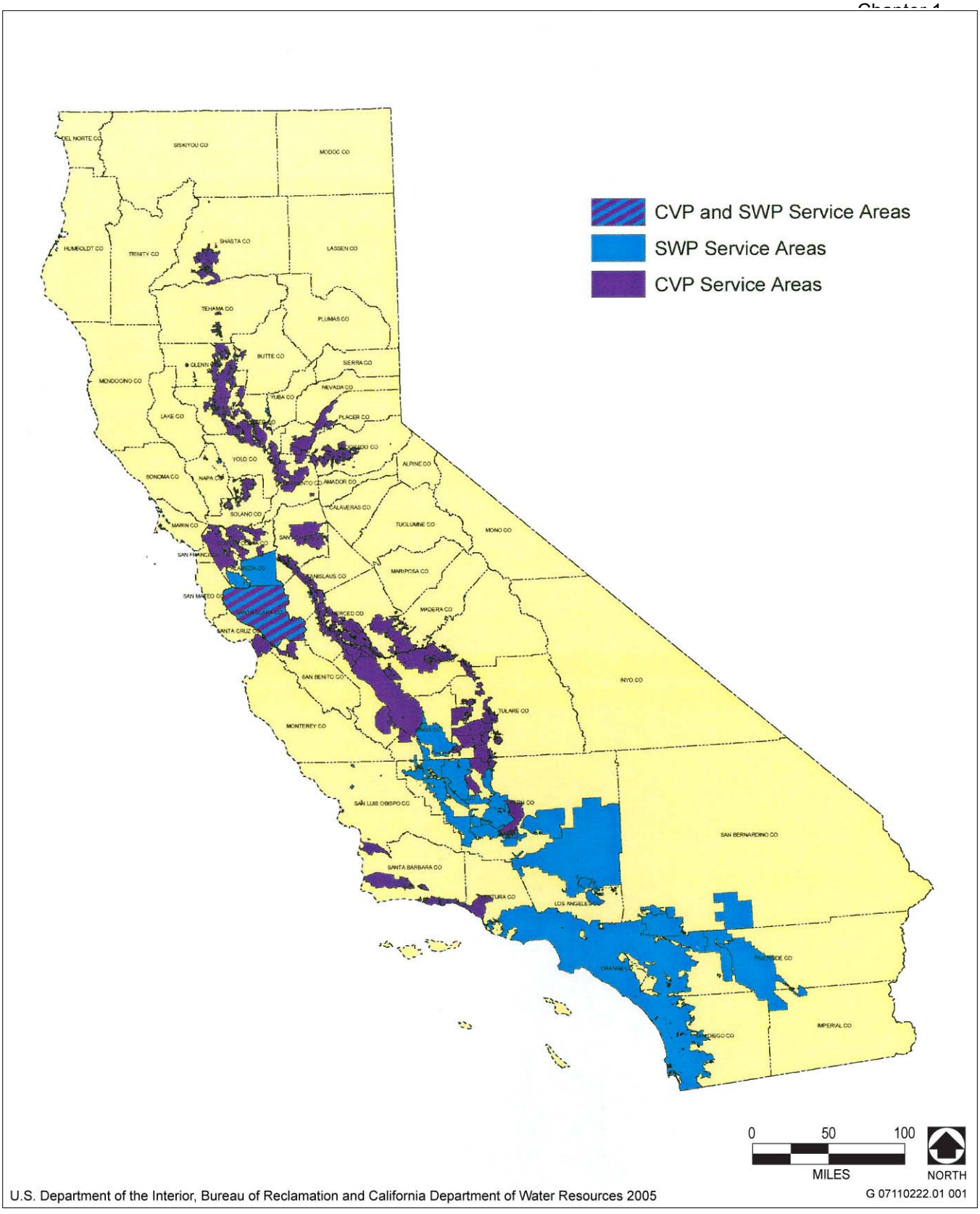

Figure 1-2. Central Valley Project and State Water Project Service Areas

Most habitat types and many of the wildlife species described above for the Sacramento River corridor have the potential to occur in the Central Valley portion of the extended study area, with additional species occurring in upland and foothill areas. The extended study area also includes tidal aquatic environments unique to the Delta, as well as seasonally flooded agriculture.

Lower Sacramento River and Delta

Sacramento River from RBDD to the Delta The segment of the extended study area between RBDD and the Delta includes a diverse array of wildlife habitats, including floodplains, basins, terraces, active and remnant channels, and oxbow sloughs. The variety and availability of habitats along the middle Sacramento River support a wide range of wildlife species including a variety of waterfowl, raptors, and migratory and resident avian species, plus a variety of mammals, amphibians, and reptiles that inhabit both aquatic and upland habitats.

The mature valley oak woodland and savanna and other mature riparian forest community types provide nesting and foraging habitat for raptors, such as Swainson's hawk, white-tailed kite, red-tailed hawk, barn owl, great horned owl, and kestrel. The riparian woodlands also function as wildlife movement corridors and provide important nesting and foraging cover for resident, migratory, and wintering songbirds; in addition, they support several species of mammals and provide cover and foraging habitat for reptiles and amphibians. Elderberry shrubs also may be associated with this community type. Although riparian woodlands in the extended study area typically occur in narrow or discontinuous patches, this cover type provides important values for wildlife and supports a great abundance of both common and listed species of birds, mammals, reptiles, amphibians, and invertebrates.

Drought conditions and conversion of natural habitats to agricultural and urban uses have contributed to declines in the numbers of waterfowl and shorebirds using the Sacramento River region. These declines were caused by unfavorable breeding ground conditions during the late 1950s and the mid-1980s. Populations recovered appreciably after these periods of decline. Today, private duck clubs and Federal and State refuges in the Sacramento River region provide essential habitat for wintering waterfowl and shorebirds in the Sacramento River region. Approximately 60 percent of the Pacific Flyway waterfowl population winters in the Sacramento River region. The Sacramento River region is particularly important to shorebirds in spring, when shorebirds use wetlands in the valley as staging areas during migration to northern breeding grounds.

Annual grasslands generally support lower wildlife diversity than woodland and shrub-dominated habitats but are invaluable to the number of grassland-dependent species found in the study area. A great diversity and abundance of mammals, insects, and birds rely on grasslands. The grasslands also support vernal pools and other seasonal wetlands that provide unique habitat for

waterfowl, various small aquatic organisms, and breeding habitat for amphibians.

Sacramento–San Joaquin River Delta Delta wetlands are considered to be among the most productive wildlife habitats in California. These wetlands include permanent saline, brackish, and freshwater marshes; seasonal freshwater wetlands; open water; tidal and nontidal marshes and emergent wetlands; and agricultural cropland (CALFED 2000b).

Tule and cattail tidal emergent wetland, herein referred to as tidal emergent wetland, includes portions of the intertidal zones of the Delta that support emergent wetland plant species. Tidal emergent wetlands include all or portions of the tidal and Delta sloughs, and in-channel islands and shoals habitats. Tidal emergent wetland occurs along all channels and most in-channel islands in the Delta. Although tidal emergent wetland does not occur in large continuous patches, this cover type provides important wildlife habitat functions and values. Tidal emergent wetland occurring on or adjacent to in-channel islands provides habitat that is relatively isolated from human disturbance and land-based predators. This land cover type provides nesting and foraging habitat for several songbirds, including red-winged blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), common yellowthroat (*Geothlypis trichas*), and marsh wren (*Cistothorus palustris*); provides foraging and nesting habitat for rails (*Laterallus* spp.), other wading birds, and waterfowl; and provides foraging and cover habitat for common reptiles and amphibians, including garter snakes and bullfrogs (*Lithobates catesbeianus*).

The tidal perennial aquatic type of land cover is present in the extended study area. Tidal perennial aquatic habitat includes deepwater, shallow aquatic, and unvegetated intertidal areas within sloughs and channels. Deepwater areas are largely unvegetated; however, beds of aquatic plants occasionally occur in shallower open-water areas. Deepwater areas provide foraging, roosting, and escape cover for a number of diving ducks (Aythyinae), cormorants (*Phalacrocorax* spp.), grebes (Podicipedidae), and other waterfowl that are permanent residents or that winter in the extended study area. Deepwater areas provide habitat for several reptiles and amphibians, including western pond turtles and garter snakes. Common mammal species in the deepwater areas include river otter (*Lontra canadensis*), which use the deepwater areas for foraging and escape cover, and muskrats (*Ondatra zibethicus*), which may use deepwater areas as migration corridors between suitable foraging areas. Shallow aquatic areas may include shallow open-water areas or areas dominated by tidal perennial aquatic plant species, such as water hyacinth (*Eichhornia* spp.) or water primrose (*Ludwigia* spp.). Colonies of these aquatic plants are generally infrequent but provide important habitat for a number of species. Shallow aquatic areas provide foraging habitat for diving ducks and dabbling ducks (Anatinae), other waterfowl species, belted kingfishers (*Megaceryle alcyon*), and wading birds. Shallow aquatic areas provide rearing, escape cover, and foraging for reptiles and amphibians and may be used as foraging habitat by

river otter and raccoon. Tidal flats provide important foraging habitat for migratory, resident, and wintering shorebirds; wading birds; and numerous other bird species. Tidal flats typically contain large concentrations of aquatic invertebrate and mollusks that serve as the primary food source of shorebirds.

Open water in the Delta region includes sloughs and channels in the Delta, flooded islands, ponds, and bays. Deep open-water areas are largely unvegetated; beds of aquatic plants occasionally occur in shallower open-water areas. Open water provides resting and foraging habitat for waterbirds, including loons, pelicans, gulls, cormorants, and diving ducks. These species forage primarily on invertebrates and fish.

Agricultural lands, both those that are and those that are not seasonally flooded, generally include irrigation and drainage ditches. These lands support foraging habitat for many birds, such the greater sandhill crane (*Grus canadensis tabida*), tricolored blackbird (*Ageluius tricolor*), and Swainson's hawks, as well as garter snakes.

Resident and migratory waterfowl and shorebirds suffered perhaps the largest declines resulting from development and agriculture in the Delta. The declines in resident and migratory waterfowl populations before the early 20th century have been attributed to hunting and the large-scale reclamation of tidal marshes that occurred between 1860 and 1910. Changes in agricultural cropping patterns since the 1970s have increased the quality of waterfowl and shorebird habitat in the Delta. As a result, populations of waterfowl and shorebirds in the Delta have been increasing. Waterfowl and shorebirds forage primarily in natural and artificial wetlands and agricultural lands. The Delta supports approximately 10 percent of the Central Valley's wintering waterfowl and shorebird populations (CALFED 2000b). Several waterfowl species are particularly dependent on the Delta, including tundra swans (*Cygnus columbianus*), white-fronted geese (*Anser albifrons*), snow geese (*Chen caerulescens*), greater sandhill cranes, northern pintails (*Anas acuta*), and mallards (*Anas platyrhynchos*). More than 30 species of shorebirds regularly use the Delta; six species nest in the Delta, and the rest overwinter there or pass through during spring and fall migration (CALFED 2000b). Important foraging habitats include permanent saline, brackish, and freshwater marshes; seasonal wetlands; and agricultural cropland. Large seasonal wetlands managed for waterfowl are located in the northwestern part of the Delta region, west of the Sacramento Deep Water Ship Channel. These seasonal freshwater wetlands are of great importance to migratory waterfowl and shorebird populations for the forage that they provide during fall, winter, and spring, when bird populations in the Delta increase dramatically.

San Joaquin River Basin to the Delta The current wildlife habitat value of this area is somewhat limited by the predominance of agricultural lands, which support a relatively low diversity of wildlife species. However, the orchards, row and field crops, and fallow fields can be used by a number of common species, and fallow fields and some crops (e.g., wheat and barley) can support a

variety of small mammals and provide high-quality foraging habitat for many species of raptors. More importantly, remnant native vegetation patches are likely to support a high diversity of wildlife species.

Waterfowl and shorebird numbers in the San Joaquin River region historically were greater than those for the Sacramento River region (CALFED 2000b). In addition to the factors that reduced waterfowl and shorebird populations in the Sacramento River region, the loss of additional wetlands in the San Joaquin River region caused by the accumulation of minerals and pesticides resulted in a compounded detrimental effect on waterfowl and shorebird numbers. Recent efforts to restore damaged wetlands, prevent harmful runoff from entering the wetlands, and manage agricultural lands to favor waterfowl and shorebirds during winter have aided the recovery of these species in the region. The San Joaquin River region supports approximately 25 percent of the Central Valley waterfowl and shorebird populations, and up to 30 percent of the wintering duck population (CALFED 2000b).

CVP/SWP Service Areas The CVP/SWP service areas contain a large diversity of both lowland and upland habitats and species, although agricultural and urban growth has reduced the area and connectivity of important habitats that are critical to sustaining a wide variety of unique plants and animals (CALFED 2000b). The agricultural land and urban development that dominate the CVP/SWP service areas, respectively, can support many wildlife species, most of which are highly adapted to these disturbed environments. Agricultural land is not generally considered important wildlife habitat but is used by many species, particularly as foraging habitat. Wildlife found in agricultural areas varies depending upon crop type and time of year. Wildlife found in urban areas is often dependent upon surrounding land uses and the presence or absence of nearby natural vegetation. In densely urbanized areas, a large percentage of the wildlife can be made up of exotic species. Urban areas provide habitat for species also found in agricultural areas, such as mourning dove, American robin, and western gray squirrel.

Special-Status Species

Special-status species addressed in this section include animals that are legally protected or are otherwise considered sensitive by Federal, State, or local resource conservation agencies and organizations. Specifically, this includes species that are Federally listed and/or State listed as rare, threatened, or endangered; those considered as candidates or proposed for listing as threatened or endangered; species identified by DFG as Species of Special Concern or by the U.S. Forest Service (USFS) as sensitive, endemic, or needing additional survey or management actions; and animals protected by the California Fish and Game Code.

Primary Study Area

Shasta Lake and Vicinity For the purposes of this evaluation, wildlife species of concern include species that are any of the following:

- Designated as threatened or endangered by the State or Federal governments
- Proposed or petitioned for Federal listing as threatened or endangered
- State or Federal candidates for listing as threatened or endangered
- Identified by DFG as Species of Special Concern
- Considered sensitive or endemic by USFS
- Considered Survey and Manage species by USFS
- Designated as MSCS Covered Species by CALFED

Special-status wildlife species with the potential to occur in the Shasta Lake and vicinity portion of the primary study area were determined using several database searches, review of USFWS and DFG special-status species lists for Shasta County, review of other appropriate literature, discussions with resource agency personnel, and professional experience in the area. All special-status wildlife species potentially occurring in the Shasta Lake and vicinity portion of the primary study area are discussed in Attachment 1, which provides a general comparison of habitat requirements for each species and the general habitats present in the primary study area above Shasta Dam. For those special-status species for which generally suitable habitat was determined to be present, results from the various vegetation habitat mapping and wildlife surveys conducted in the area by NSR since 2002 were used to determine the likelihood of their presence in the primary study area above Shasta Dam (Table 1-3). The life history of species known or potentially occurring in the Shasta Lake and vicinity portion of the primary study area are described in detail in Attachment 2. Figures 1-3 and 1-4a through 1-4f depict the known locations of special-status species in the primary study area above Shasta Dam.

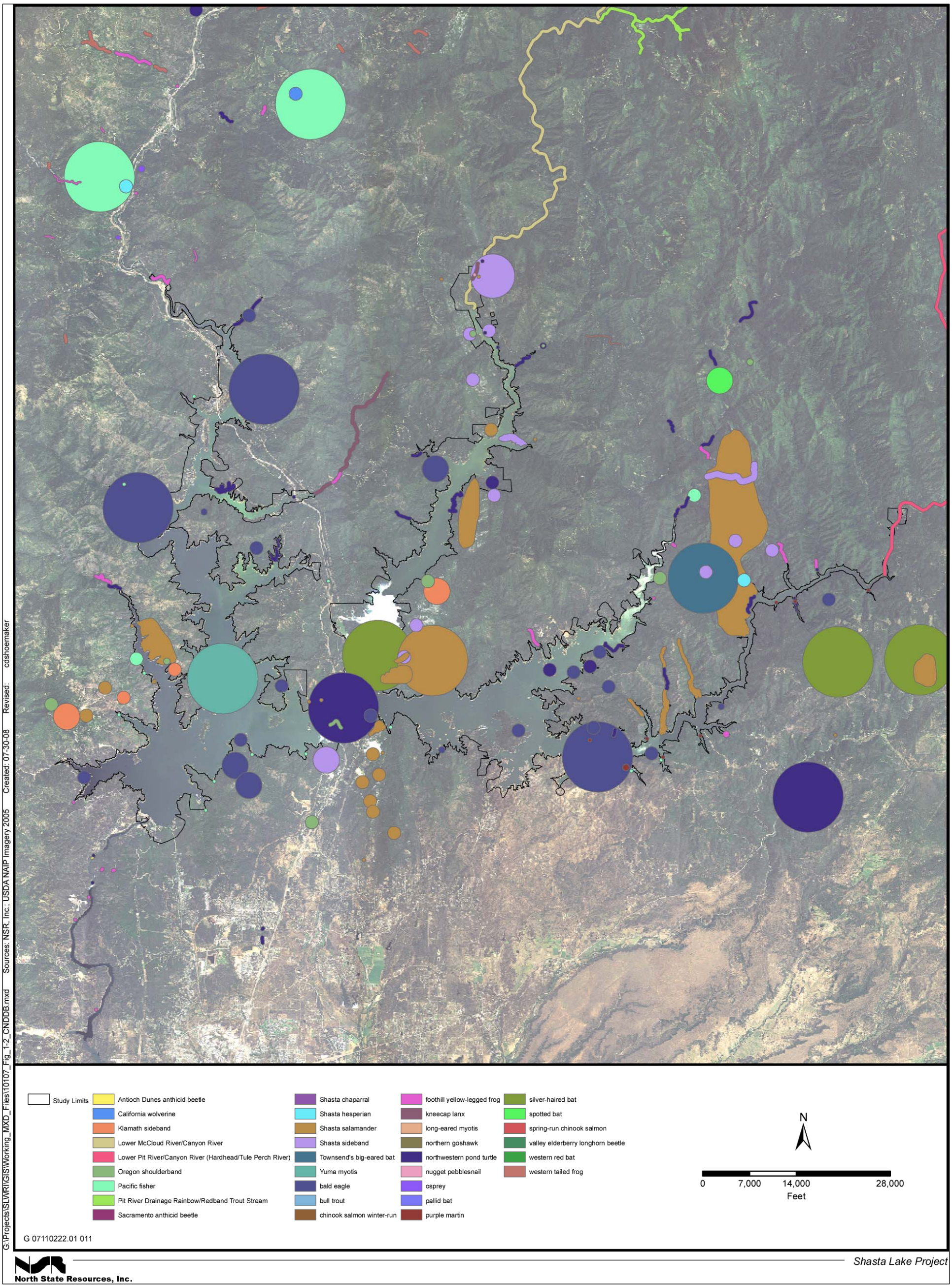

Figure 1-3. California Natural Diversity Database (CNDDB)

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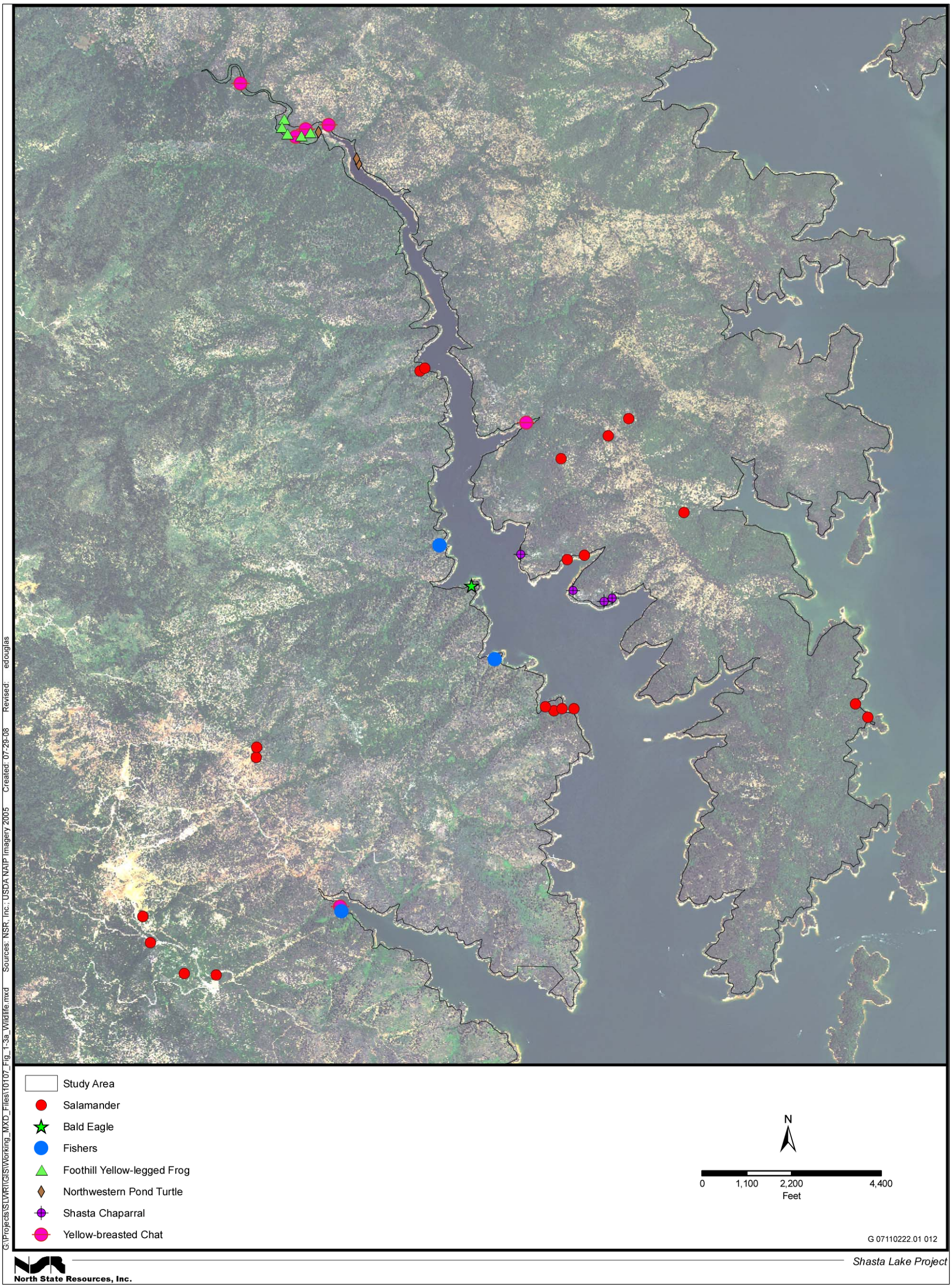

Figure 1-4a. Special-Status Wildlife Species Detected during Surveys of the Shasta Lake and Vicinity Portion of the Primary Study Area

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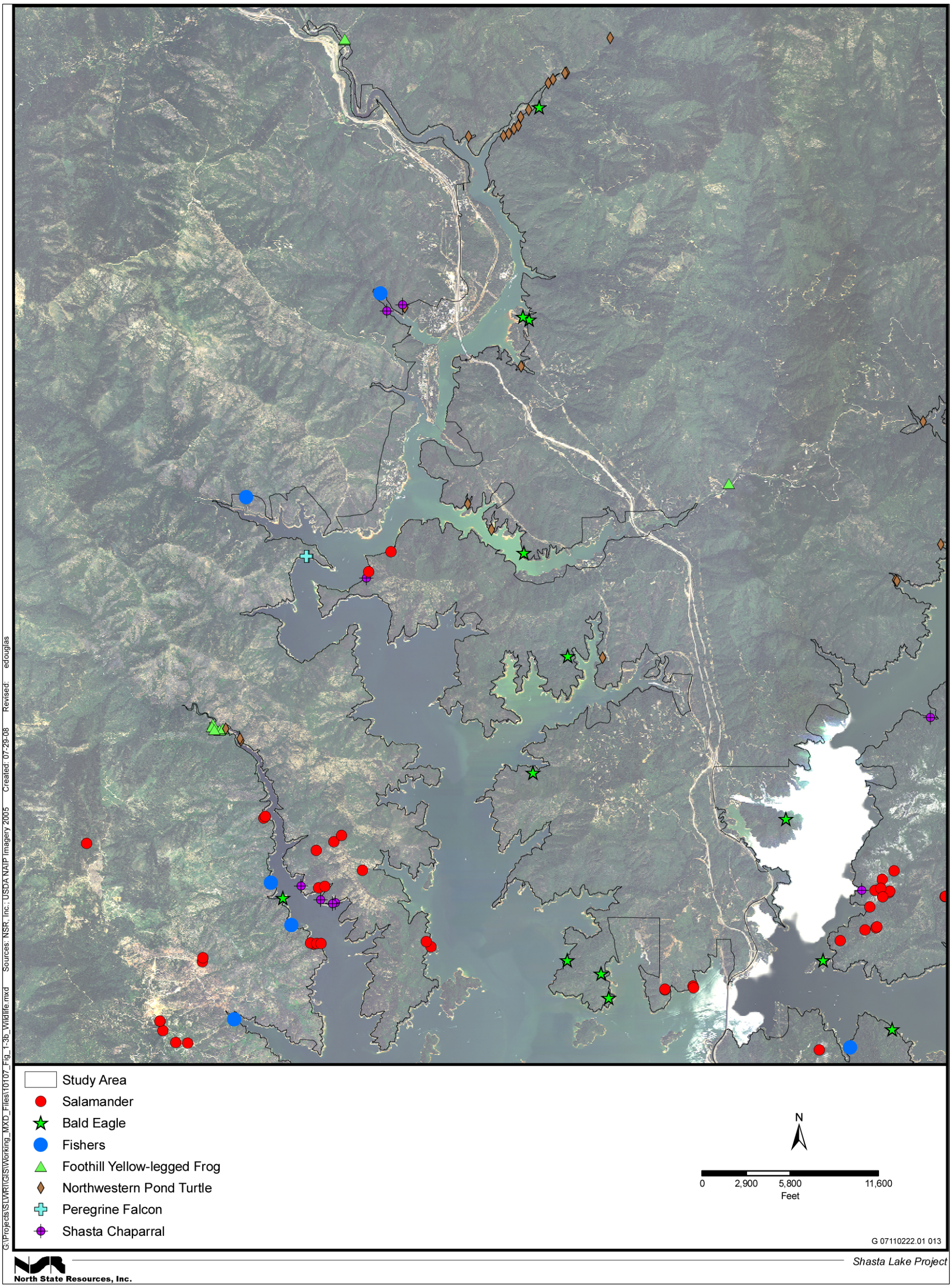

Figure 1-4b. Special-Status Wildlife Species Detected during Surveys of the Shasta Lake and Vicinity Portion of the Primary Study Area

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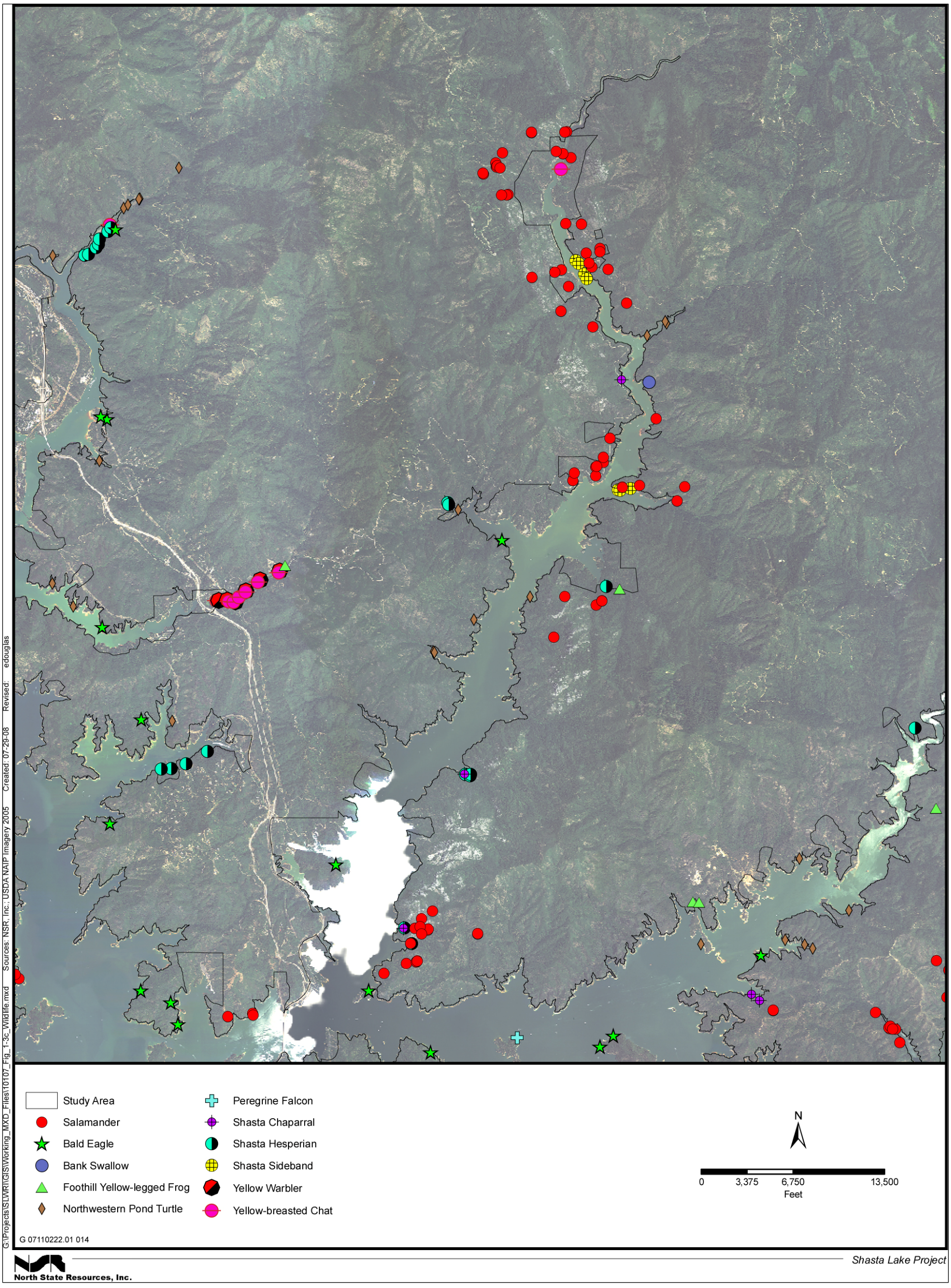

Figure 1-4c. Special-Status Wildlife Species Detected during Surveys of the Shasta Lake and Vicinity Portion of the Primary Study Area

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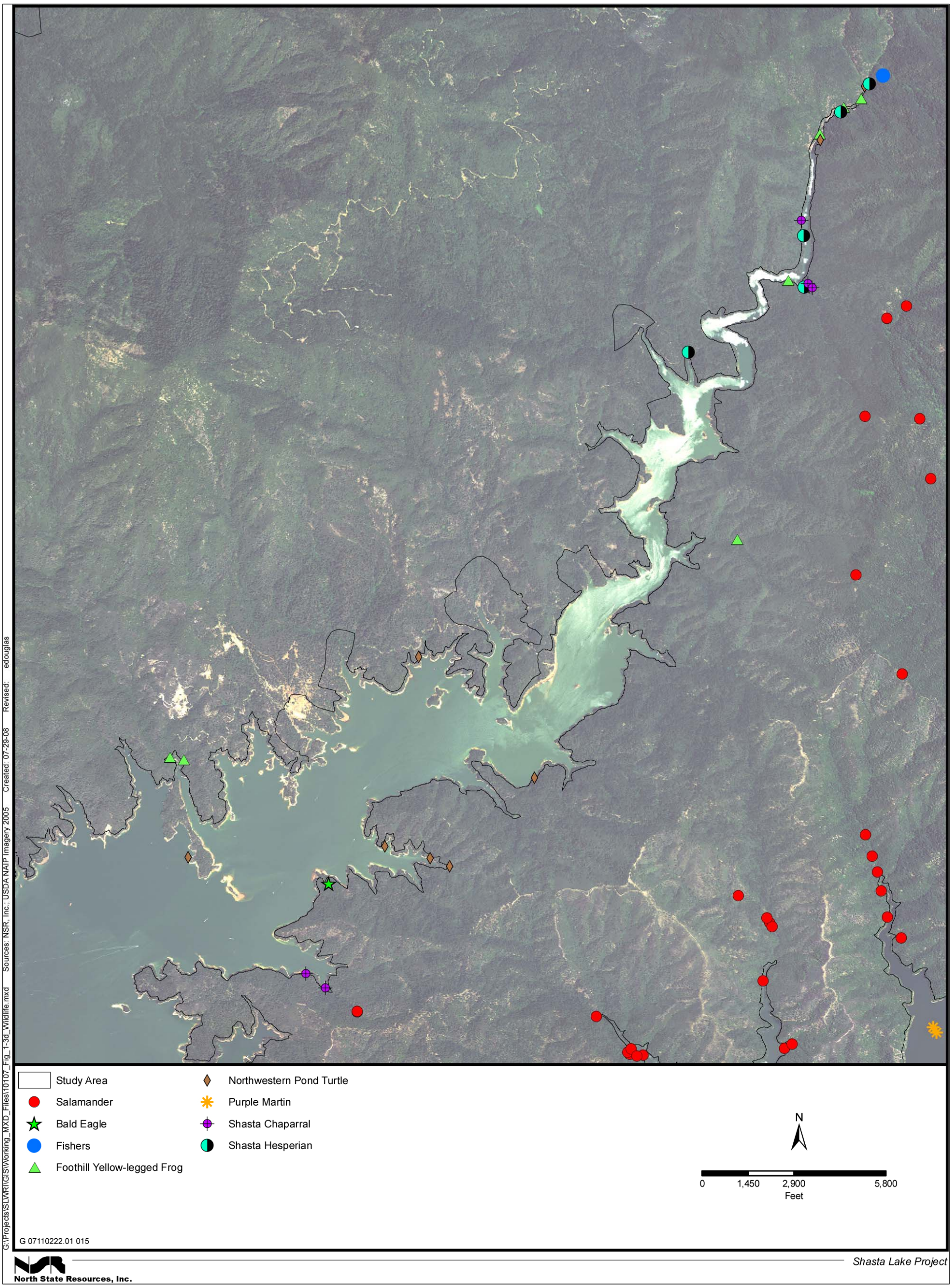

Figure 1-4d. Special-Status Wildlife Species Detected during Surveys of the Shasta Lake and Vicinity Portion of the Primary Study Area

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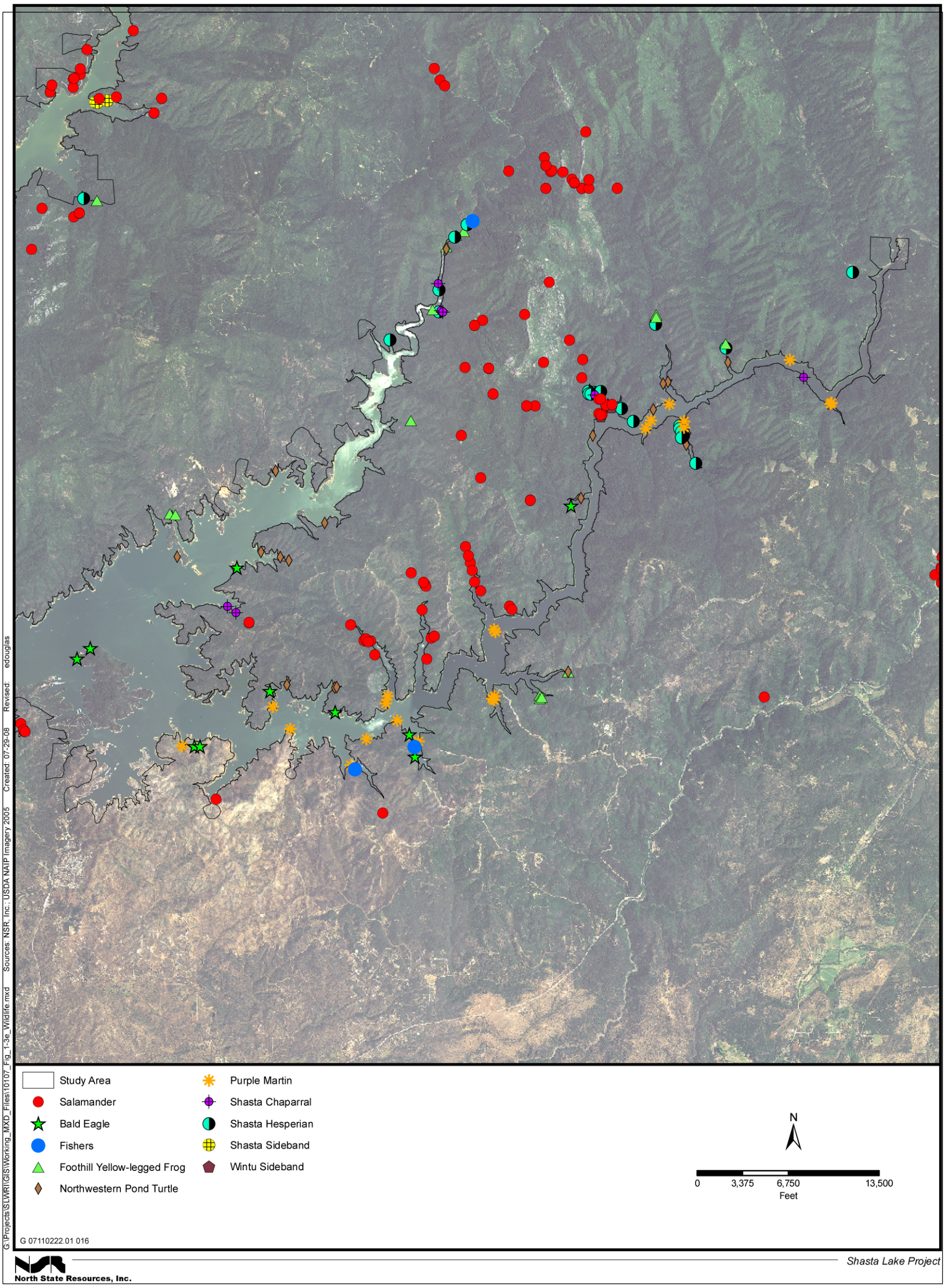

Figure 1-4e. Special-Status Wildlife Species Detected during Surveys of the Shasta Lake and Vicinity Portion of the Primary Study Area

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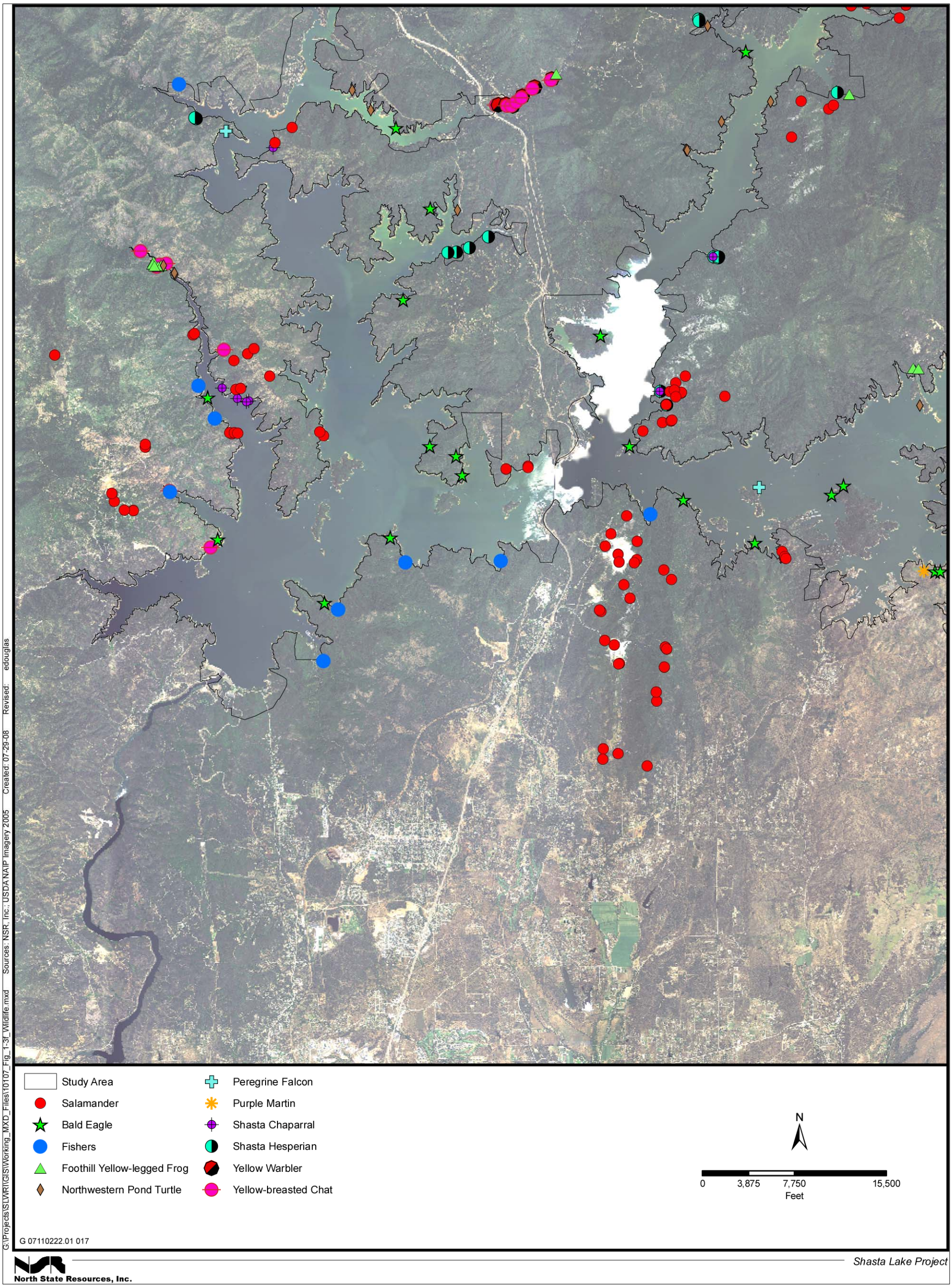

Figure 1-4f. Special-Status Wildlife Species Detected during Surveys of the Shasta Lake and Vicinity Portion of the Primary Study Area

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Table 1-3. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area

Common Name	Scientific Name	Status	Potential for Occurrence
Shasta sideband	*Monadenia troglodytes troglodytes*	USFS S, M, MSCS	Endemic to Shasta County. Potentially occurring in mixed conifer and woodland habitats, especially near limestone. Known occurrences in the Shasta Lake area.
Wintu sideband	*Monadenia troglodytes wintu*	USFS S, M	Endemic to Shasta County. Potentially occurring in mixed conifer and woodland habitats, especially near limestone. Known occurrences in the Shasta Lake area.
Shasta chaparral	*Trilobopsis roperi*	USFS S, M	Endemic to Shasta County. Potentially occurring in mixed conifer and conifer/woodland habitats. Known occurrences in the Shasta Lake area.
Shasta hesperian	*Vespericola shasta*	USFS S, M	Endemic to Klamath Province. Potentially occurring in mixed conifer and conifer/woodland habitats (riparian and/or riverine habitats). Only known from the southeastern Klamath Mountains region.
Shasta salamander	*Hydromantes shastae*	CT, USFS S, M, MSCS	Only known from the southeastern Klamath Mountains region. Potentially occurring in mixed conifer, woodland, and chaparral habitats, especially near limestone. Known occurrences within the Shasta Lake and vicinity portion of the study area.
Tailed frog	*Ascaphus truei*	CSC	Potentially occurring in stream habitats in the Shasta Lake and vicinity portion of the study area. Known occurrences in McCloud and Upper Sacramento arm tributaries outside the study area boundaries (DFG 2003).
Foothill yellow-legged frog	*Rana boylii*	CSC, USFS S, MSCS	Potentially occurring in stream habitats. Known occurrences scattered throughout the Shasta Lake and vicinity portion of the primary study area.
Northwestern pond turtle	*Clemmys marmorata marmorata*	CSC, USFS S, MSCS	Potentially occurring in stream or other wetland habitats. Adjacent upland habitats are potential nesting areas. Known occurrences scattered throughout the Shasta Lake and vicinity portion of the primary study area.
Long-eared owl	*Asio otus*	CSC, MSCS	Potentially occurring in coniferous forest habitats.
Northern goshawk	*Accipiter gentilis*	CSC, USFS S	Potentially occurring in mixed conifer habitats.
Cooper's hawk	*Accipiter cooperi*	CSC	Potentially occurring in mixed conifer and conifer/woodland habitats.
Sharp-shinned hawk	*Accipiter striatus*	CSC	Potentially occurring in mixed conifer and conifer/woodland habitats.
Great blue heron	*Ardea herodias*	MSCS	Known to breed in nearshore wooded habitat around Shasta Lake.
Willow flycatcher	*Empidonax traillii*	CE, USFS S, MSCS	Uncommon migrant in riparian habitat; unlikely to nest in the Shasta Lake and vicinity portion of the primary study area.

Common Name	Scientific Name	Status	Potential for Occurrence
Merlin	*Falco columbarius*	CSC	Frequents ocean shorelines, lake margins, and large, open river courses near tree stands for both nesting and wintering habitat. Does not breed in California.
American peregrine falcon	*Falco peregrinus*	CE, CP, MSCS	Potentially occurring in mixed conifer and conifer/woodland habitats. Nesting sites in the study area unlikely due to lack of suitable eyrie sites; however, potential eyrie sites occur adjacent to the Shasta Lake and vicinity portion of the primary study area. Known historical eyrie along McCloud River Arm, and "new" eyrie found at the Gooseneck (Sacramento River Arm).
Bald eagle	*Haliaeetus leucocephalus*	FD, CE, CP, MSCS	Potentially occurring in riverine and lacustrine habitats. Common at Shasta Lake and a substantial number of nests occur within the Shasta Lake and vicinity portion of the primary study area and vicinity. Shasta Lake has the highest density of breeding bald eagles in the continental United States.
Osprey	*Pandion haliaetus*	CSC, MSCS	Potentially occurring in riverine and lacustrine habitats. Common at Shasta Lake and many known nests occur within the Shasta Lake and vicinity portion of the primary study area and vicinity.
Northern spotted owl	*Strix occidentalis caurina*	FT, MSCS	Potentially occurring in coniferous forest habitats. The species has been recorded within 0.5 mile of the study area along the Squaw River Arm (DFG 2003).
Vaux's swift	*Chaetura vauxi*	CSC	Potentially occurring in coniferous forest and conifer/woodland habitats. Known to occur in the Shasta Lake and vicinity portion of the study area.
California yellow warbler	*Dendroica petechia*	CSC, MSCS	Potentially occurring in riparian habitats. Known occurrences in and near the Shasta Lake and vicinity portion of the primary study area.
Yellow-breasted chat	*Icteria virens*	CSC, MSCS	Potentially occurring in riparian habitats. Known occurrences in and near the Shasta Lake and vicinity portion of the primary study area.
Purple martin	*Progne subis*	CSC	Potentially occurring in conifer, woodland, and riparian habitats. Foraging habitat occurs throughout Shasta Lake and vicinity portion of the primary study area. Shasta Lake is one of the few known breeding sites in interior California.
Pallid bat	*Antrozous pallidus*	CSC, USFS S	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the study area.
Ringtail	*Bassariscus astutus*	CP, MSCS	Potentially occurring in mixed conifer and conifer/woodland habitats. Known occurrences in and near the Shasta Lake and vicinity portion of the primary study area.

Common Name	Scientific Name	Status	Potential for Occurrence
Spotted bat	*Euderma maculatum*	CSC	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the study area. Species has been recorded on Squaw Creek within approximately 6 miles of the Shasta Lake and vicinity portion of the primary study area (DFG 2003).
Western mastiff bat	*Eumops perotis*	CSC, MSCS* **californicus* subspecies only	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the Shasta Lake and vicinity portion of the primary study area.
American marten	*Martes americana*	USFS S	Mixed evergreen forests with abundant cavities for denning and nesting and open areas for foraging.
Pacific fisher	*Martes pennanti*	FC, CSC, USFS S	Potentially occurring in mixed conifer and conifer/woodland habitats. Known occurrences in and near the Shasta Lake and vicinity portion of the primary study area.
Western red bat	*Lasiurus blossevillii*	USFS S	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the Shasta Lake and vicinity portion of the primary study area.
Townsend's big-eared bat	*Plecotus townsendii*	CSC, USFS S	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the study area. The species was observed within the Shasta Lake and vicinity portion of the primary study area by NSR biologists in June 2008.

Source: DFG 2003
[1]Status Definitions
FC = Federal candidate for listing
FD = Federally delisted
FPD = Proposed for Federal delisting
FT = Federally listed as threatened
CE = State listed as endangered
CP = California fully protected
CSC = California species of special concern
CT = California Threatened
USFS S = USFS sensitive
USFS M = USFS Survey and Manage species
MSCS = Multi-Species Conservation Strategy covered species

Wildlife Surveys

Terrestrial Mollusk Surveys (Survey and Manage) In 2002 and 2003, NSR conducted surveys for USFS Survey and Manage terrestrial mollusk species along the shoreline of the Big Backbone Creek and Squaw Creek arms in accordance with USFS protocol for Survey and Manage mollusks (for survey details see the *Shasta Lake Water Resources Investigation Technical Report* (Reclamation 2004b)). Protocol-level surveys on selected portions of the shorelines of the other five arms were conducted in 2005 and 2006 (Figures 1-4a through 1-4f). Two Survey and Manage terrestrial mollusk species, Shasta chaparral (Trilobopsis roperi) and Shasta hesperian (*Vespericola shasta*), were

found during the surveys. Other terrestrial mollusk species not designated Survey and Manage found during the surveys include Church's sideband (*Monadenia churchi*), shoulderband (*Helminthogypta cypreophylla* (*hertleini*)), harpoon snail (*Haplotrema keepi*), and California megomphix (*Megomphix californicus*).

Several incidental discoveries of Survey and Manage terrestrial mollusks also occurred during the 2003 vegetation and habitat mapping and botanical surveys of the riverine reaches. These include five Shasta hesperian discovery sites along Potem, Ripgut, Flat, and Stein Creeks, which are tributaries to the Pit River Arm, and Campbell Creek, a tributary to the McCloud River Arm.

Shasta Salamander Surveys In 2003, NSR conducted surveys for the Shasta salamander along the shoreline of the Big Backbone Creek and Squaw Creek arms in accordance with USFS protocol. For survey details, see the Shasta Lake Water Resources Investigation Technical Report (Reclamation 2004b). Nonprotocol-level surveys for the Shasta salamander were conducted along selected portions of the shorelines of the other five arms in 2005, 2006, and 2007 (Figures 1-4a through 1-4f). Shasta salamanders were detected on all arms of Shasta Lake in both limestone and nonlimestone habitats.

Bald Eagle/Osprey Surveys In 2007, NSR mapped all known bald eagle and osprey nests occurring in the primary study area above Shasta Dam (see Figures 1-4a through 1-4f). Twenty-six nests were located. The diameter of the nest trees, the height of the trees, the height of the nests, the proximity of the nest trees to the nearest high-water mark, and surrounding vegetation types were also recorded.

Neotropical Bird Surveys In 2007, NSR conducted a lakewide breeding bird survey around Shasta Lake. In addition, focused surveys for purple martins and an analysis of purple martin habitat at Shasta Lake were conducted. These surveys provided information on use of the Shasta Lake and vicinity portion of the primary study area by breeding birds, including use by breeding neotropical species (see Attachment 3).

Forest Carnivore Surveys NSR conducted surveys for sensitive forest carnivore species (forest carnivores) in the Shasta Lake and vicinity portion of the primary study area in 2003–2005. For survey details, see the *Shasta Lake Water Resources Investigation Technical Report* (Reclamation 2004b). The specific sensitive forest carnivore species (i.e., "target species") surveyed were the Sierra Nevada red fox (*Vulpes vulpes necator*), American marten (*Martes americana*), Pacific fisher (*Martes pennanti*), and wolverine (*Gulo gulo*). One target forest carnivore species, the Pacific fisher, was detected during the survey; the fisher was detected at 13 locations along all arms of the lake except the McCloud Arm (see Figures 1-4a through 1-4f). In addition, the ringtail, a California Fully Protected Species, was detected on all arms of the lake.

Upper Sacramento River (Shasta Dam to Red Bluff) A list of special-status wildlife species with potential to occur within the primary study area from Shasta Dam to RBDD was compiled based on habitat suitability and known occurrences within the Shasta Dam, Redding, Enterprise, Cottonwood, Ball's Ferry, Bend, and Red Bluff East U.S. Geological Survey (USGS) 7.5-minute quadrangle maps (CNDDB 2007, USFWS 2007), as well as species considered sensitive by USFS (see Attachment 4). Species that are Federally listed or State listed are described in more detail below and listed in Table 1-4, as are other special-status species that may occur in riparian or wetland habitats that could be affected by altered flows caused by the project.

Table 1-4. Special-Status Wildlife Species Known or with Potential to Occur in the Primary Study Area, along the Sacramento River from Shasta Dam to Red Bluff Diversion Dam

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
INVERTEBRATES				
Conservancy fairy shrimp	*Branchinecta conservatio*	USFWS: Endangered Designated critical habitat MSCS goal: Maintain	Vernal pools and swales	Unlikely to occur. No suitable habitat is present within the river corridor.
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	USFWS: Threatened MSCS goal: Recovery	Elderberry shrubs, typically in riparian habitats	Known to occur. Elderberry shrubs are present within the riparian woodland community along the Sacramento River.
Vernal pool tadpole shrimp	*Lepidurus packardi*	USFWS: Endangered Designated critical habitat MSCS goal: Maintain	Vernal pools and swales	Unlikely to occur. No suitable habitat is present within the river corridor.
Vernal pool fairy shrimp	*Branchinecta lynchi*	USFWS: Threatened Designated critical habitat MSCS goal: Maintain	Vernal pools and other seasonal wetlands	Unlikely to occur. No suitable habitat is present within the river corridor.

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
AMPHIBIANS				
California red-legged frog	*Rana aurora draytonii*	USFWS: Threatened CA: Species of special concern MSCS goal: Maintain	Aquatic habitats, such as creeks, streams, and ponds	Unlikely to occur. No longer occurs on the floor of the Central Valley.
Foothill yellow-legged frog	*Rana boylii*	CA: Species of special concern USFS: Sensitive MSCS goal: Maintain	Shallow, flowing streams with some cobble-sized substrate	Unlikely to occur in the Sacramento River due to lack of suitable substrate and hydrology.
Western spadefoot toad	*Spea hammondii*	CA: Species of special concern MSCS goal: Maintain	Vernal pools and seasonal wetlands in upland with burrows and other below-ground refuge	Unlikely to occur. No suitable habitat is present within the Sacramento River corridor.
Western tailed frog	*Ascaphus truei*	CA: Species of special concern	Perennial montane streams in steep-walled valleys with dense vegetation	Unlikely to occur in mainstem of Sacramento River where flows could be altered.
REPTILES				
Giant garter snake	*Thamnophis gigas*	USFWS: Threatened CA: Threatened MSCS goal: Contribute to recovery	Streams, sloughs, ponds, and irrigation/ drainage ditches; also require upland refugia not subject to flooding during the snake's inactive season	Unlikely to occur in primary study area; however, known to occur in the extended study area.
Northwestern pond turtle	*Emys marmorata marmorata*	CA: Species of special concern USFS: Sensitive MSCS goal: Maintain	Ponds, marshes, rivers, streams, sloughs; nest in nearby uplands with suitable soils	Known to occur. Suitable habitat is present in primary study area.
BIRDS				
Aleutian Canada goose	*Branta canadensis leucopareia*	USFWS: Delisted MSCS goal: Maintain	Forage primarily in rice fields, mudflats, salt marshes, and estuaries while wintering in California.	Unlikely to occur within banks of Sacramento River where flows could be altered.
American	*Falco*	CA:	Nests on high	Unlikely to nest in

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
peregrine falcon (nesting)	*peregrinus anatum*	Endangered and fully protected USFS: Sensitive MSCS goal: Maintain	cliffs or other high structure. Forage in a variety of open habitats, particularly marshes and other wetlands	this portion of study area; however may forage in areas of open water with large concentrations of water birds
Bald eagle (nesting and wintering)	*Haliaeetus leucocephalus*	USFWS: Delisted CA: Endangered and fully protected MSCS goal: maintain	Inland waters with adjacent large, old-growth trees or snags	Known to occur along the Sacramento River within the primary study area.
Black-crowned night heron (rookery)	*Nycticorax nycticorax*	BLM: Sensitive MSCS goal: Maintain	Forages in fresh and saltwater marshes, swamps, lakes, and wooded streams. Rookeries are found in trees or other dense shrubby vegetation associated with large wetlands	Could nest in trees adjacent to Sacramento River.
California gull	*Larus californicus*	MSCS goal: Maintain	Forages in fields, pastures, and landfills. Nests on undisturbed, isolated islands in interior west.	Not within breeding range. Could occur in the study area during winter or migration.
Cooper's hawk (nesting)	*Accipiter cooperii*	MSCS goal: Maintain	Forages and nests in open woodlands and woodland margins	Could occur. Suitable nesting and foraging habitat is present in study area.
Double-crested cormorant (rookery)	*Phalacrocorax auritus*	MSCS goal: Maintain	Brackish and freshwater habitats on lakes, rivers, swamps, bays, and coasts	Could nest in trees adjacent to Sacramento River.
Golden eagle	*Aquila chrysaetos*	BLM: Sensitive CA: Fully protected MSCS goal: Maintain	Open terrain of deserts, mountains, plateaus, and steppes	No suitable nesting habitat along Sacramento River. Unlikely to forage in river corridor.
Great blue heron (rookery)	*Ardea herodius*	MSCS goal: Maintain	Forages in marshes, rivers, lakes, saltwater	Could nest in trees adjacent to Sacramento River.

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
			shores, ponds, and rice and other crop fields. Rookeries are found in the tops of large trees in addition to rock ledges and sea cliffs	
Great egret (rookery)	*Casmerodius albus*	MSCS goal: Maintain	Forages in salt and freshwater marshes, marshy ponds, rice and other crop fields, and tidal flats. Rookeries are found in large trees near these aquatic habitats	Could nest in trees adjacent to Sacramento River.
Greater sandhill crane	*Grus canadensis tabida*	CA: Threatened, fully protected MSCS goal: Contribute to recovery	Forages primarily in open freshwater wetlands, but also utilizes sedge meadows, open grasslands, and cultivated lands	Unlikely to breed in study area. Unlikely to use Sacramento River corridor during winter or migration.
Least bittern (nesting)	*Ixobrychus exilis*	CA: Species of special concern MSCS goal: Maintain	Freshwater or brackish marshes with tall, dense emergent vegetation and clumps of woody plants over deep water	Could nest along Sacramento River if suitable habitat is present.
Lesser sandhill crane (wintering)	*Grus canadensis canadensis*	CA: Species of special concern	Forages primarily in open freshwater wetlands, but also utilizes sedge meadows, open grasslands, and cultivated lands	Does not breed in California. Unlikely to use Sacramento River corridor during winter or migration.
Little willow flycatcher (nesting)	*Empidonax traillii brewsteri*	CA: Endangered USFS: Sensitive MSCS goal: Contribute to recovery	Breeds in large wet meadows with abundant willows between 2,000–8,000 feet on the western side of Sierra Nevada.	Unlikely to breed in study area due to elevation, but may use riparian woodlands during migration.
Loggerhead	*Lanius*	CA: Species of	Forages in	Likely to nest and

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
shrike (nesting)	*ludovidianus*	special concern	grasslands and agricultural fields; nests in scattered shrubs and trees	forage in woodlands and scrub habitats in the study area.
Long-billed curlew	*Numenius americanus*	MSCS goal: Maintain	Forages in shortgrass prairies, agricultural fields, wet and dry meadows, and grazed mixed-grass and scrublands. Nests in shortgrass grasslands with patches of bare ground.	Does not breed in study area. Unlikely to use Sacramento River corridor during winter or migration.
Long-eared owl (nesting)	*Asio otus*	CA: Species of special concern MSCS goal: Maintain	Conifer, oak, riparian, pinyon-juniper, and desert woodlands that are either open or are adjacent to grasslands, meadows, or shrublands	Does not nest in lowland Central Valley. Unlikely to forage along Sacramento River corridor where flows would be altered.
Mountain plover (wintering)	*Charadrius montanus*	CA: Species of special concern BLM: Sensitive MSCS goal: Maintain	Forages in fallow, grazed or burned fields with short and sparse vegetation cover.	Does not nest in Califonria. Unlikely to winter along Sacramento River where flows would be altered.
Northern goshawk (nesting)	*Accipiter gentilis*	CA: Species of special concern USFS: Sensitive	Coniferous forests with closed canopy and open understory. Red fir, lodgepole pine, □effrey pine, and aspens are typical nest trees.	Unlikely to occur along Sacramento River corridor due to lack of suitable habitat.
Northern harrier (nesting)	*Circus cyaneus*	CA: Species of special concern MSCS goal: Maintain	Forages and nests in grassland, agricultural fields, and marshes	Likely to occur. Suitable nesting and foraging habitat is present in study area.
Northern spotted owl (nesting)	*Strix occidentalis caurina*	USFWS: Threatened MSCS goal:	Forests characterized by dense	Unlikely to occur along Sacramento River corridor due

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
		Maintain	canopy closure of mature and old-growth trees, abundant logs, standing snags, and live trees with broken tops.	to lack of suitable habitat.
Osprey (nesting)	*Pandion haliaetus*	MSCS goal: Maintain	Found in riparian zones along the Sacramento River and open water areas with large trees for nesting and roosting.	Known to nest along the Sacramento River within the primary study area.
Purple martin (nesting)	*Progne subis*	CA: Species of special concern	Inhabits woodlands, low-elevation coniferous forest of douglas-fir, ponderosa pine, and monterey pine.	Could occur. Potentially suitable habitat is present in the Sacramento River corridor.
Short-eared owl (nesting)	*Asio flammeus*	CA: Species of special concern MSCS goal: Maintain	Tall (ungrazed) grasslands and marshes with dense vegetation	Could occur. Potentially suitable habitat is present within the primary study area.
Snowy egret (rookery)	*Egretta thula*	MSCS goal: Maintain	Forages in salt and freshwater marshes, marshy ponds, rice and other crop fields, and tidal flats. Rookeries are found in low growing marsh plants or trees aquatic habitats	Could nest in trees adjacent to Sacramento River.
Swainson's hawk (nesting)	*Buteo swainsoni*	CA: Threatened MSCS goal: Contribute to recovery	Forages in grasslands and agricultural fields; nests in open woodland or scattered trees	Could occur. Suitable nesting and foraging habitat is present in study area.
Tricolored blackbird (nesting)	*Agelaius tricolor*	CA: Species of special concern MSCS goal: Maintain	Forages in grasslands and agricultural fields; nests in freshwater marsh, riparian scrub, and other	Could occur. Potentially suitable habitat is present in the primary study area.

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
			dense shrubs and herbs	
Western yellow-billed cuckoo (nesting)	*Coccyzus americanus occidentalis*	USFWS: Candidate CA: Endangered USFS: Sensitive MSCS goal: Contribute to recovery	Inhabits wide, dense riparian forests with a thick understory of willows for nesting. Prefers sites with a dominant cottonwood overstory for foraging.	Likely to nest and forage in the primary study area.
Western burrowing owl (burrow sites)	*Athene cunicularia hypugea*	CA: Species of special concern MSCS goal: Maintain	Grasslands and agricultural fields	Unlikely to occur along the Sacramento River corridor due to a lack of suitable nesting habitat.
White-tailed kite (nesting)	*Elanus leucurus*	CA: Fully protected MSCS goal: Maintain	Forages in grasslands and agricultural fields; nests in isolated trees or small woodland patches	Likely to occur. Suitable nesting and foraging habitat is present in study area.
Yellow-breasted chat (nesting)	*Icteria virens*	CA: Species of special concern MSCS goal: Maintain	Dense riparian thickets of willows, vine tangles, and dense brush associated with streams, swampy ground, and the borders of small ponds	Likely to nest and forage in the primary study area
Yellow warbler (nesting)	*Dendroica petechia*	CA: Species of special concern MSCS goal: Contribute to recovery	Riparian woodlands	Could nest and forage in the primary study area. Likely to use riparian woodlands during migration.
MAMMALS				
American badger	*Taxidea taxus*	CA: Species of special concern	Found in a variety of habitats, including grasslands, savannas, and mountain meadows where soils are suitable for digging for their preferred large	Could occur along the Sacramento River corridor.

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
			rodent prey	
American marten	*Martes americana*	USFS: Sensitive	Mixed evergreen forests with more than 40% crown closure along north coast and Sierra Nevada, Klamath, and Cascade mountains.	Unlikely to occur. No suitable habitat in Sacramento River corridor.
Pacific fisher	*Martes pennanti*	USFWS: Candidate USFS: Sensitive	Old forests with high canopy closure, large trees and snags, large woody debris, large hardwoods, and multiple canopy layers	Unlikely to occur. No suitable habitat in Sacramento River corridor.
Pallid bat	*Antrozous pallidus (roosting)*	CA: Species of special concern USFS: Sensitive	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting	Could occur. Potentially suitable habitat is present in woodland in primary study area.
Ringtail	*Bassariscus astutus*	CA: Fully protected MSCS goal: Maintain	Prefers rocky mountain and canyon areas, but also occurs in country, desert, woodland, and forest habitats	Could occur. Potentially suitable habitat is present in Sacramento River corridor.
Spotted bat	*Euderma maculatum*	CA: Species of special concern	Roosts in crevices in cliffs and feeds over water and along washes in arid desert and grassland ecosystems	Unlikely to roost along Sacramento River corridor as suitable roost sites area lacking.
Townsend's big-eared bat	*Corynorhinus townsendii townsendii (roosting)*	CA: Species of special concern USFS: Sensitive	Caves, mines, and cavernous building spaces (e.g., large attics) in mesic habitats.	Unlikely to roost along Sacramento River corridor as suitable roost sites area lacking.

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Western mastiff bat	*Eumops perotis californicus* (roosting)	CA: Species of special concern MSCS goal: Maintain	Crevices on cliff faces, boulders, and buildings, usually with space for at least a 10-foot vertical drop.	Unlikely to roost along Sacramento River corridor as suitable roost sites area lacking.
Western red bat	*Lasiurus blossevillii*	CA: Species of special concern USFS: Sensitive	Roosts primarily in trees, 2–40 feet above ground, from sea level up through mixed conifer forests.	Could occur. Potentially suitable habitat is present in woodland in primary study area.

Sources: CNDDB 2007, USFWS 2007, USFS 2007, CALFED 2000a, Shuford and Gardali 2008
Key:
BLM = U.S. Bureau of Land Management
CA = California
MSCS = Multispecies Conservation Strategy for CALFED Bay-Delta Program
USFS = U.S. Forest Service
USFWS = U.S. Fish and Wildlife Service

Figures 1-5a through 1-5j show the locations of special-status wildlife species reported to the CNDDB along the Sacramento River from Shasta Dam to RBDD.

The special-status species listed in Table 1-4 were identified as having the potential to occur in the upper Sacramento River portion of the primary study area. Some species included in Table 1-4 are not expected to occur in this portion of the primary study area because of lack of suitable habitat. The following section describes special-status species that are known or are likely to occur between Shasta Dam and RBDD. Species accounts for each Federally listed or State-listed species that could occur are provided below. Species accounts for nonlisted species of special concern that could occur between Shasta Dam and RBDD are provided in Attachment 4.

The six Federally listed or State-listed species that could occur in the primary study area downstream of the reservoir are the following:

- American peregrine falcon
- Bald eagle
- Bank swallow
- Swainson's hawk
- Valley elderberry longhorn beetle
- Western yellow-billed cuckoo

American Peregrine Falcon The American peregrine falcon has been delisted from the Federal Endangered Species Act (ESA), but is still listed as endangered under the California Endangered Species Act (CESA). This species nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large prey populations; it is also established in cities where it nests on bridges and tall buildings. It is a permanent resident along the north and south Coast Ranges, and it may summer in the Cascade and Klamath Ranges and through the Sierra Nevada to Madera County. It winters in the Central Valley. It may occur in the upper Sacramento River portion of the primary study area during migration or winter, but is unlikely to nest there due to a lack of suitable nesting habitat.

Bald Eagle The bald eagle has been delisted from the ESA, but is still listed as endangered under the CESA. This species nests in tall trees or on cliffs near rivers and lakes. It nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Tahoe Basin. The species' winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierra Nevada, and east of the Sierra Nevada south of Mono County. Bald eagles are also known to nest along the riparian corridor of the primary study area.

Bank Swallow The bank swallow is State listed as threatened. This species nests in bluffs or banks, usually adjacent to water. It occurs along the Sacramento River from Tehama County to Sacramento County, along the Feather and lower American Rivers, in the Owens Valley, and in the plains east of the Cascade Range in Modoc, Lassen, and northern Siskiyou Counties. Small populations of this species are also found near the coast from San Francisco County to Monterey County. It is known to occur in at least five locations along the Sacramento River in the primary study area, and is reported in approximately 100 locations in the extended study area.

Bank swallow was identified as one of two wildlife indicator species (the other being western pond turtle) in the "Linkages Report" for the Sacramento River Ecological Flows Study (Stillwater Sciences 2007). The goal of this study was to define how flow characteristics and associated management actions influence the creation and maintenance of habitats for a number of native species that occur in the Sacramento River corridor. Bank erosion is an important habitat feature for bank swallows to find suitable nesting sites. Erosion in the winter resulting from high volume and/or velocity flows are important to create nesting habitat. However, high flows during the breeding season (beginning in late March), when bank swallow nests may be present, can cause banks to erode and result in nest destruction. Flood control and bank protection projects can also reduce bank swallow habitat availability. Below is information about bank swallow excerpted from the report:

Figure 1-5a. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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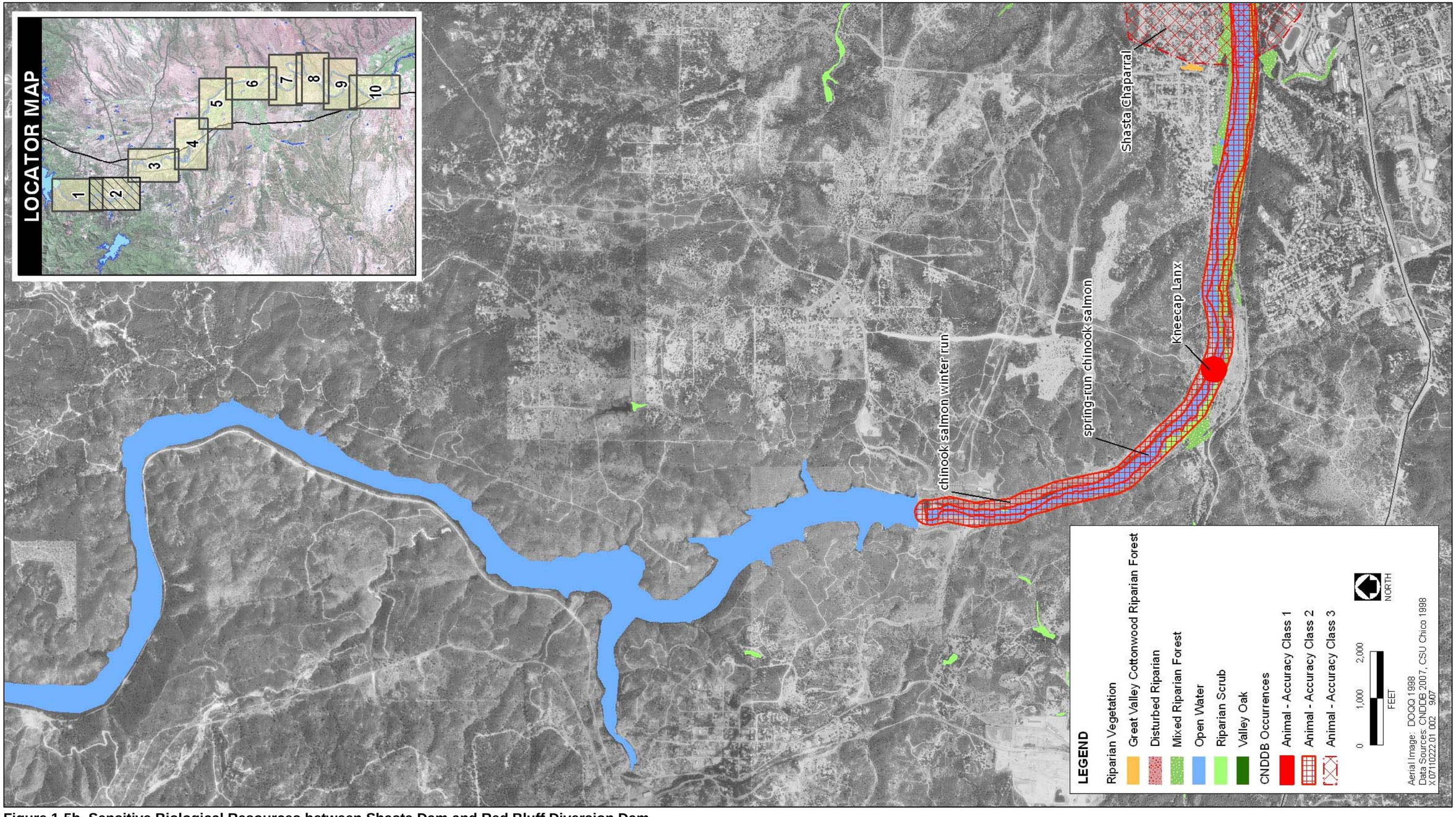

Figure 1-5b. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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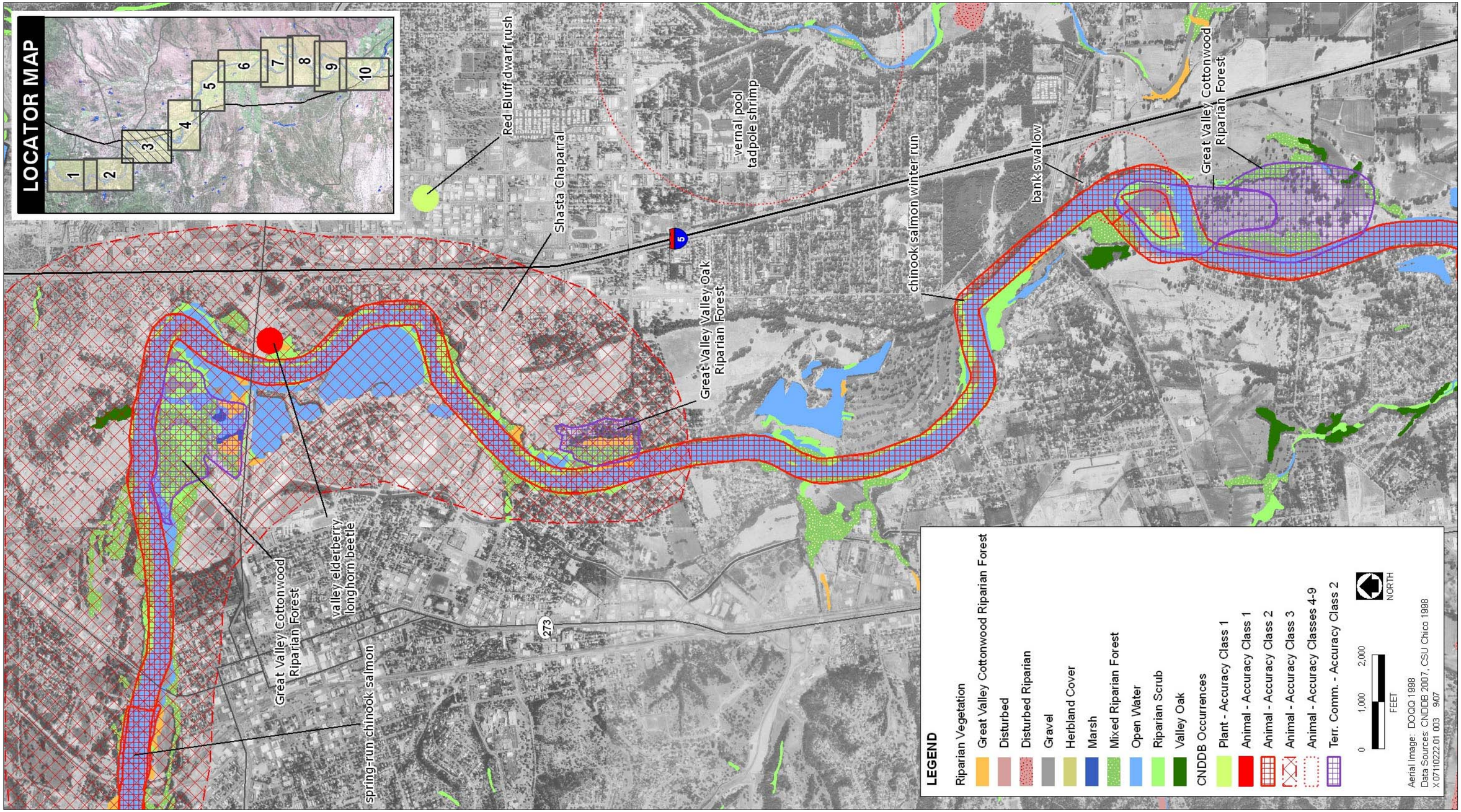

Figure 1-5c. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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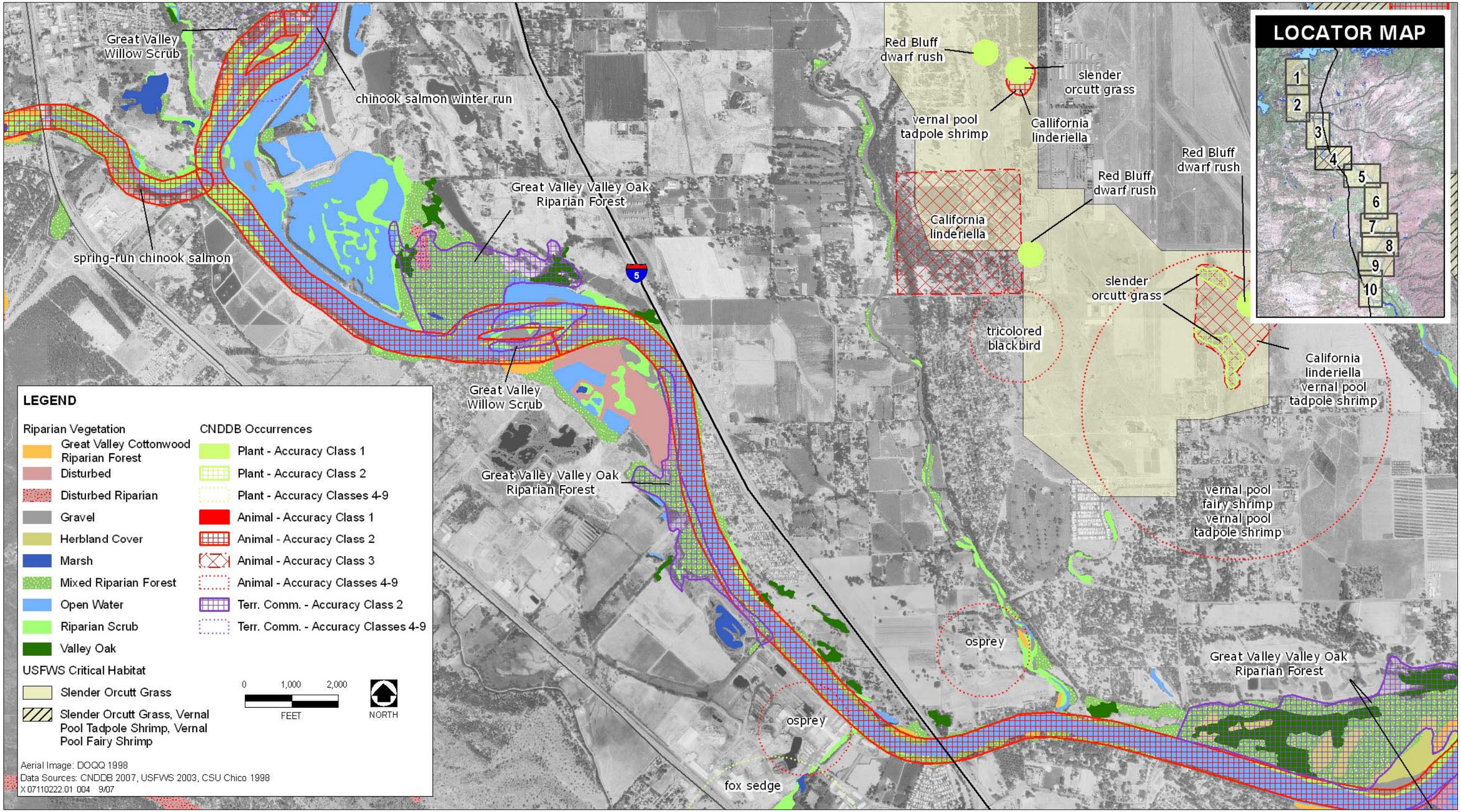

Figure 1-5d. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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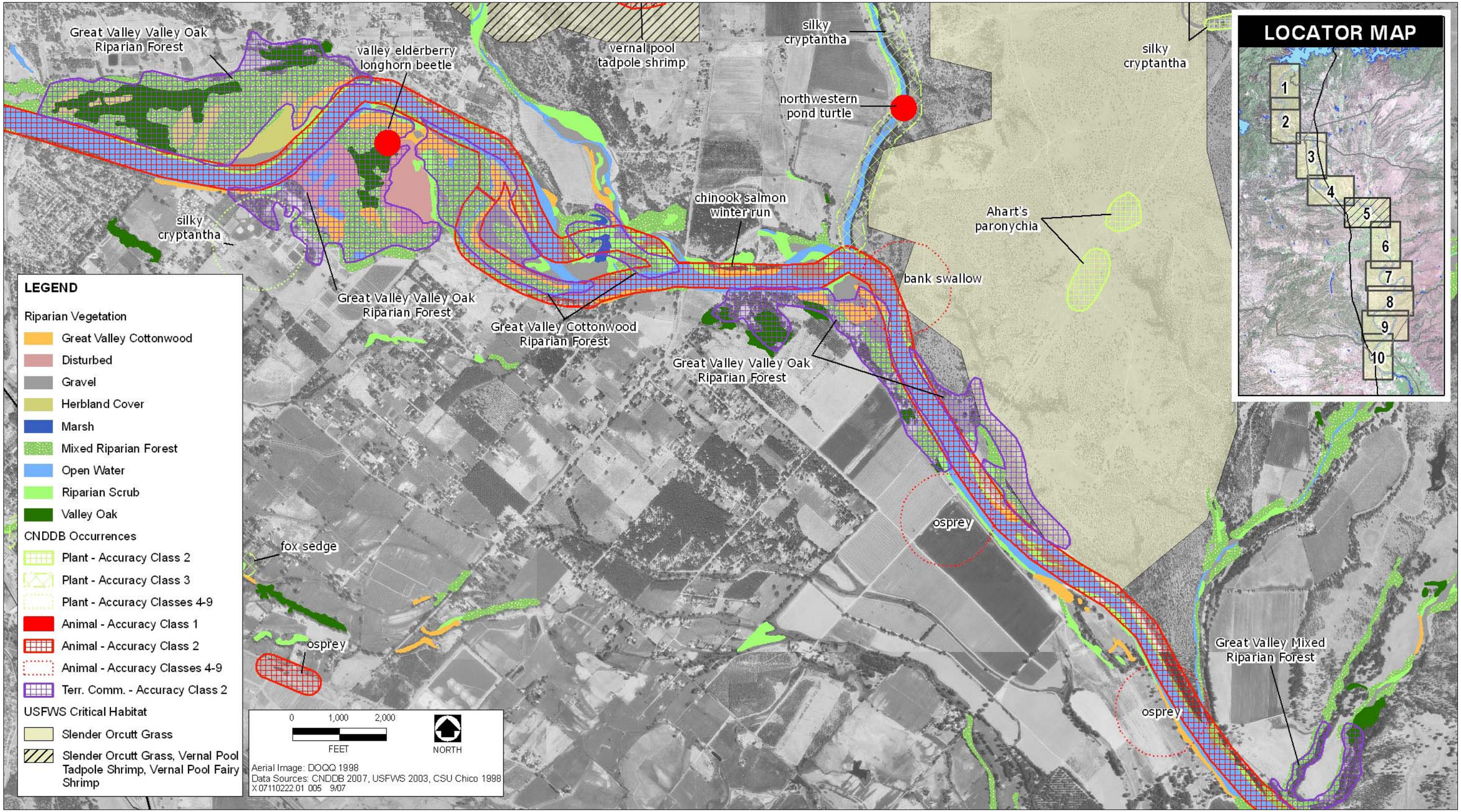

Figure 1-5e. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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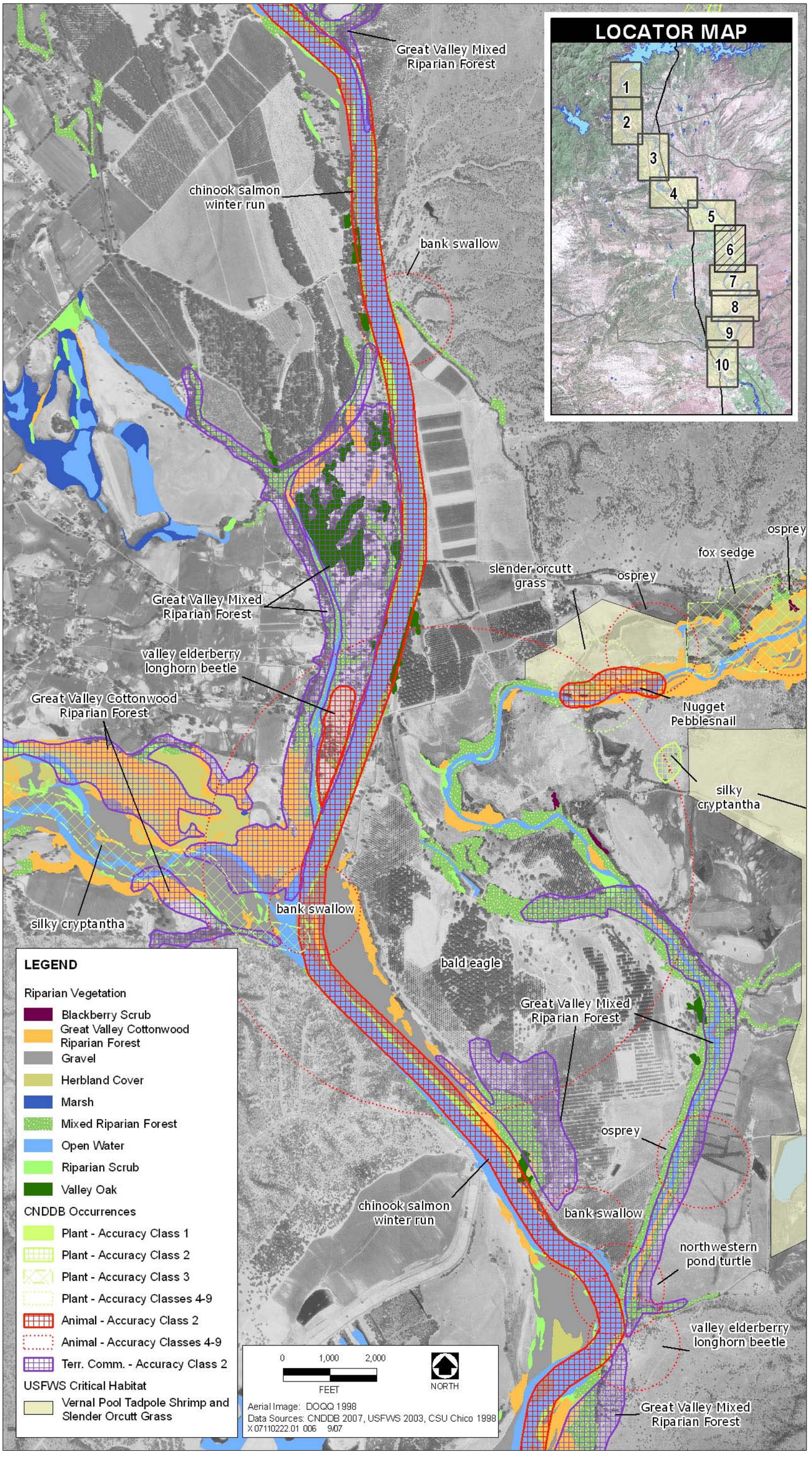

Figure 1-5f. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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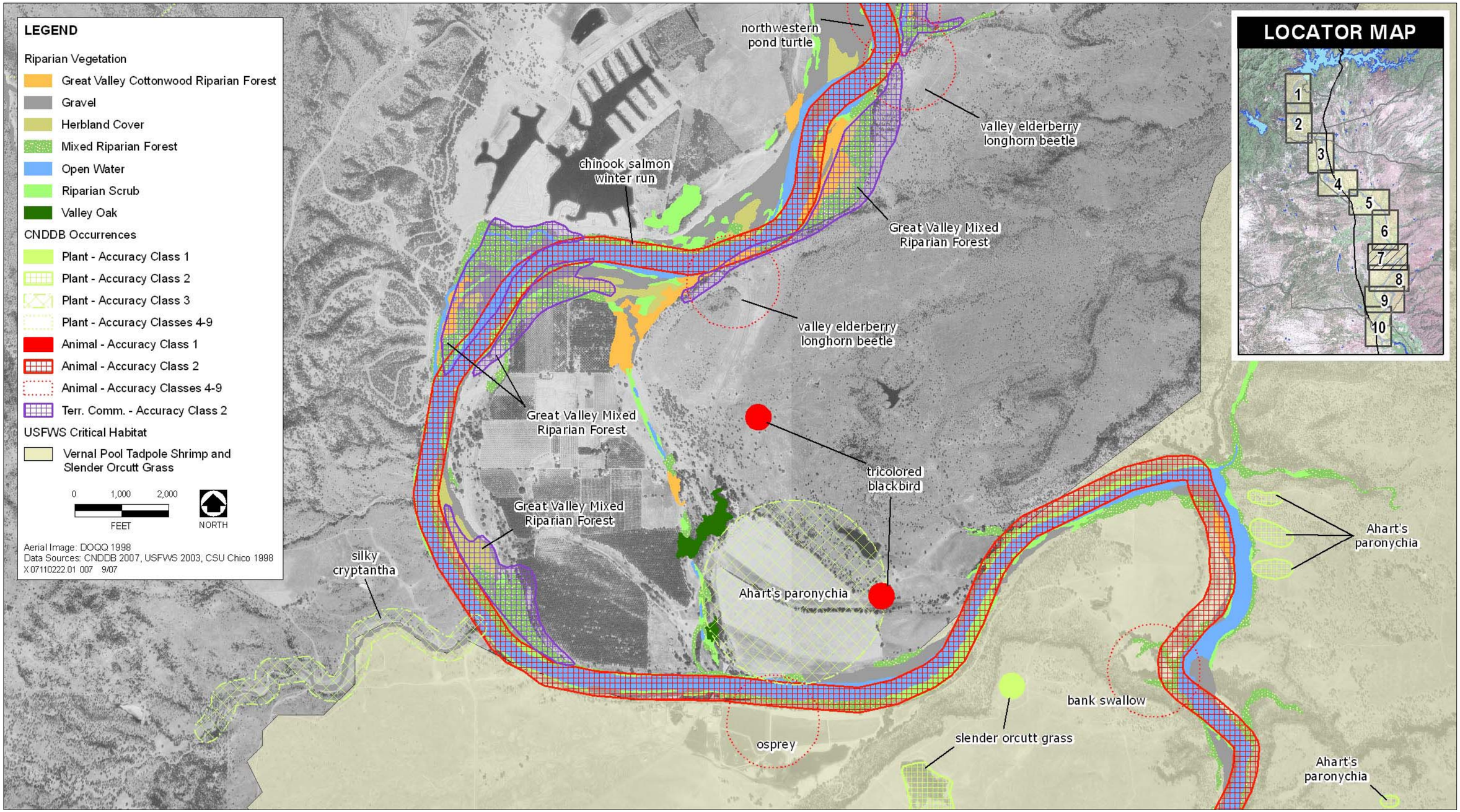

Figure 1-5g. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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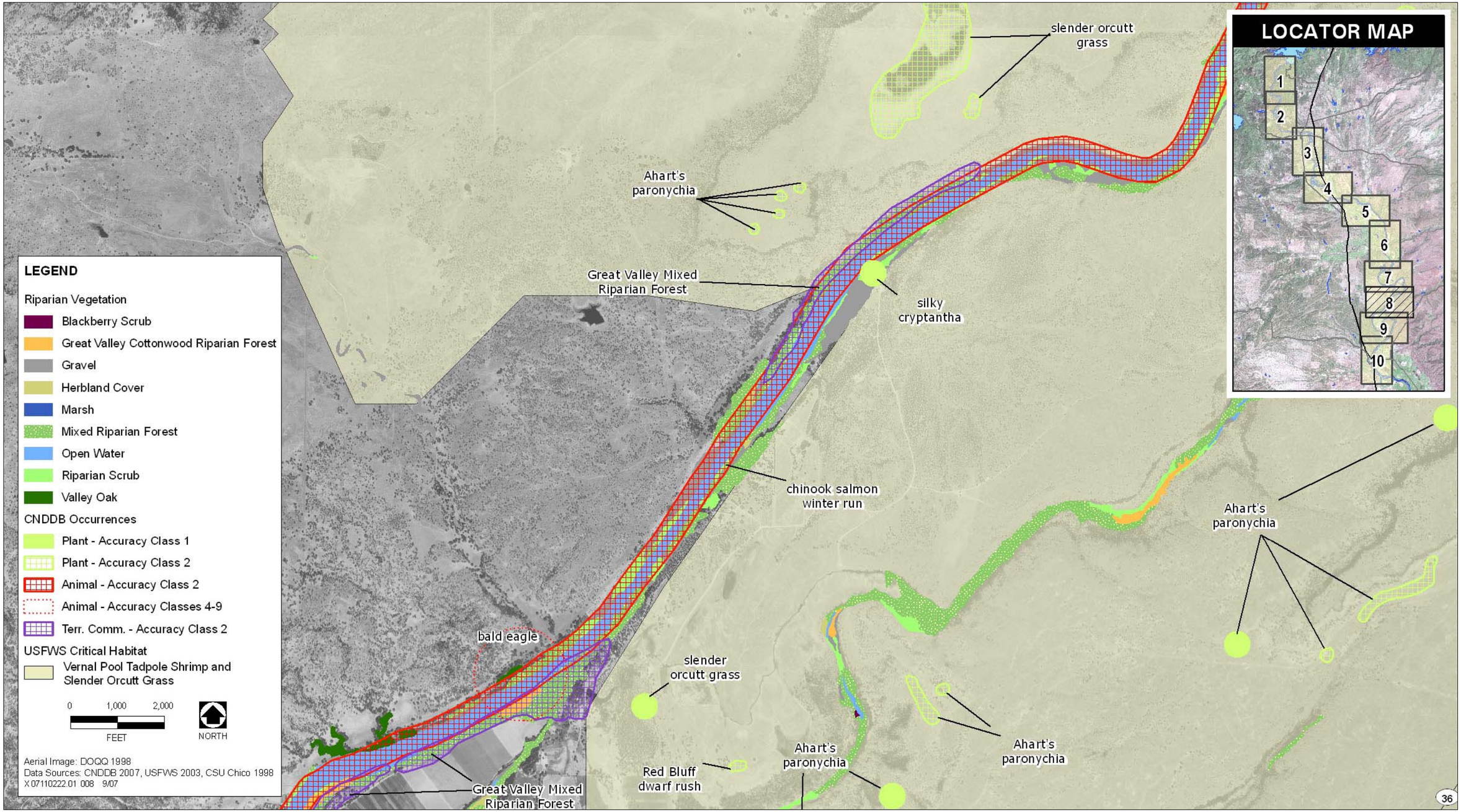

Figure 1-5h. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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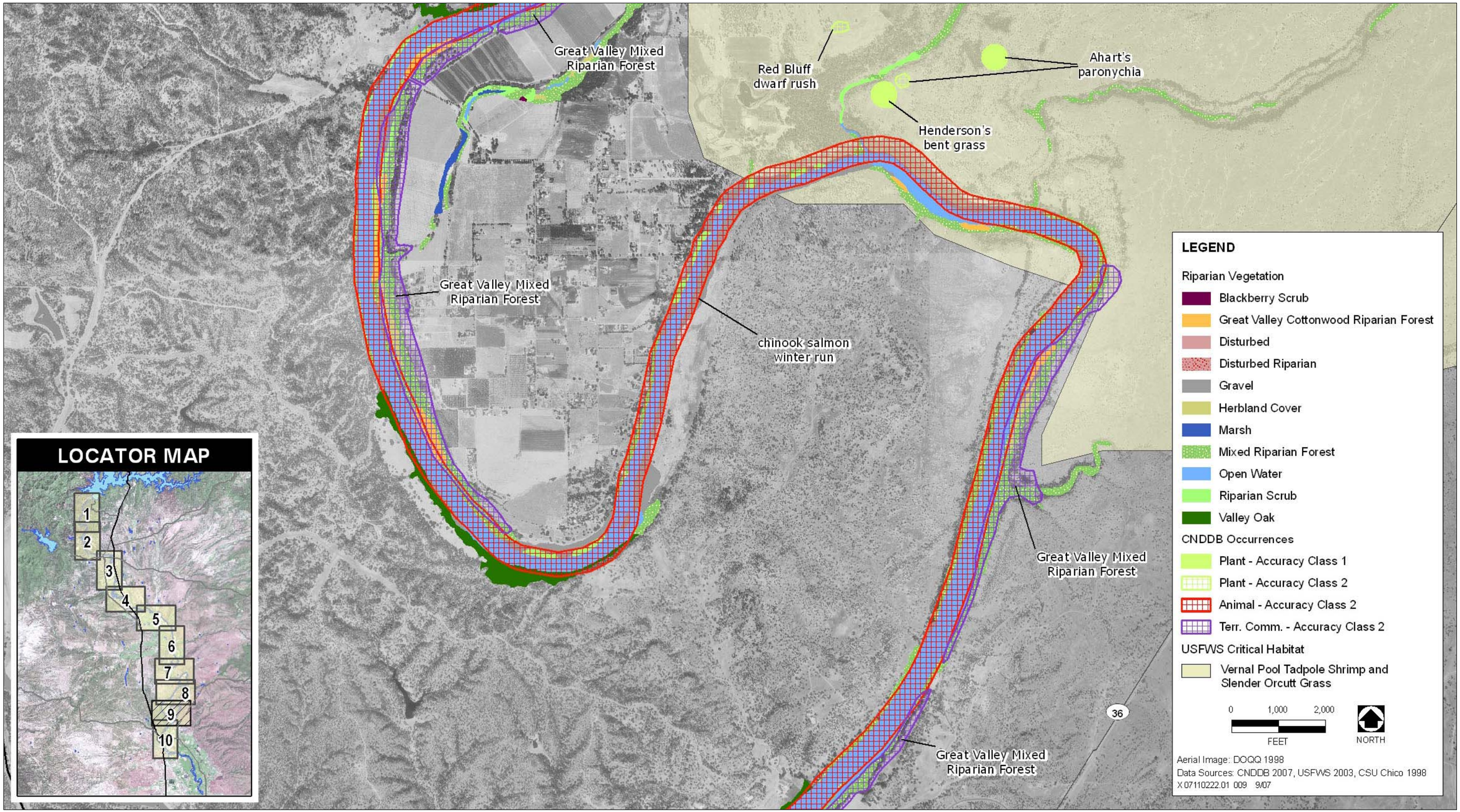

Figure 1-5i. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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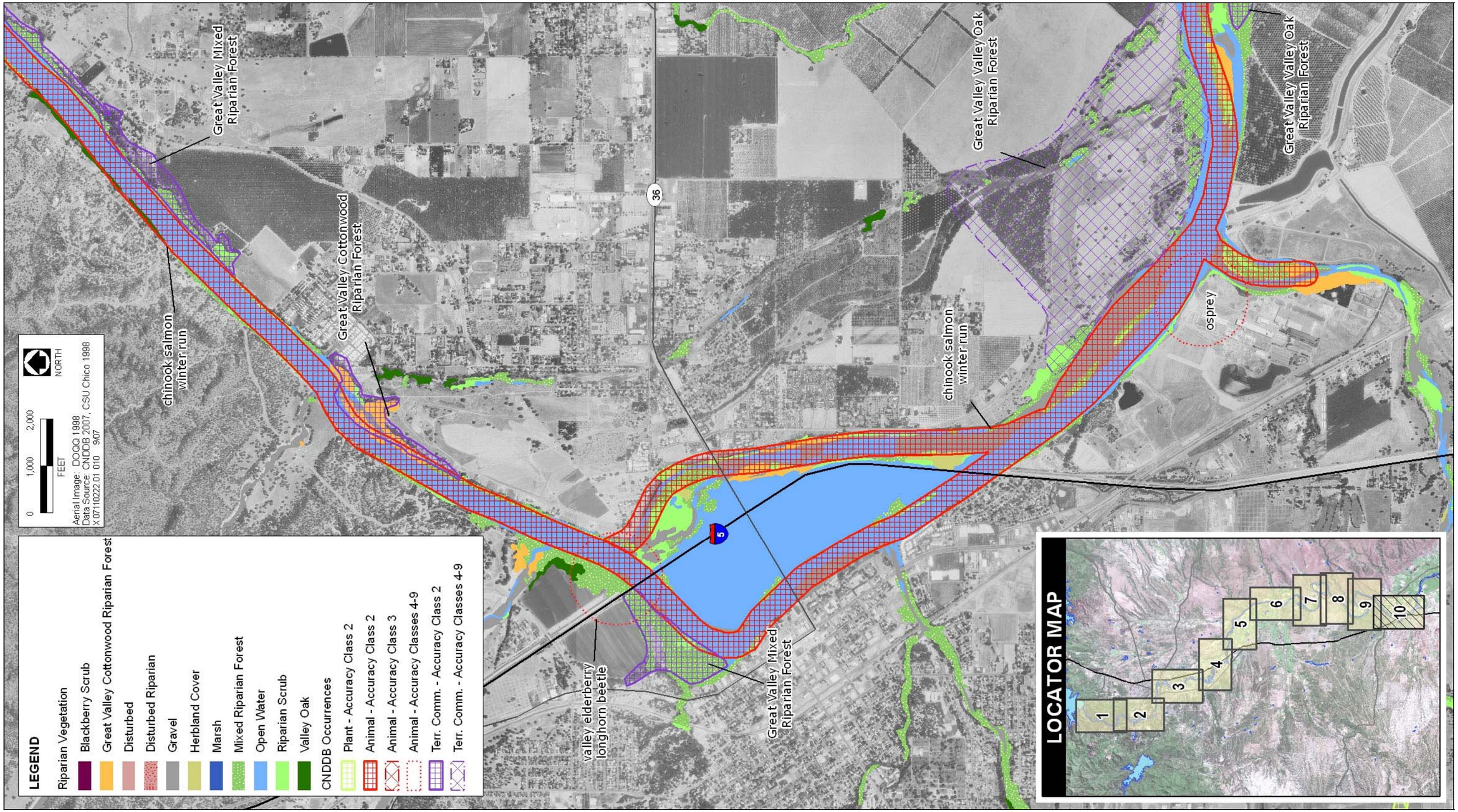

Figure 1-5j. Sensitive Biological Resources between Shasta Dam and Red Bluff Diversion Dam

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> There has been a general decline in the total number of bank swallow burrows, colonies, and estimated breeding pairs found between Redding and Verona (RM [River Mile] 292–81) since 1986. The Sacramento River and its tributaries harbor approximately 70% of California's bank swallow nesting locations (Hight 2000)…
>
> …High flows during nesting season are generally infrequent in the Sacramento River but nevertheless have the potential to adversely affect bank swallow colonies. Although there is general disagreement on the exact magnitude of the flow required to initiate substantial bank erosion, growing evidence suggests that flows in the 20,000–25,000 cfs [cubic feet per second] range will typically erode some banks, causing partial bank collapse that can result in localized nest failure if swallows are present. Flows above 50,000–60,000 cfs are almost certain to cause widespread bank erosion. This can lead to partial or complete colony failure at many sites if breeding bank swallows are present.

The installation of riprap and concrete in bank armoring activities can have the immediate effect of reducing the availability of sufficiently steep, suitably textured habitat for bank swallow nesting colonies. Overall, an estimated 48% of the channel from Red Bluff to Colusa (RM 243– 143) is now covered by riprap on at least one side (Larsen and Greco 2002; S. Greco, unpublished data). However, bank revetment has been preferentially applied to actively migrating bends which would otherwise be among the most suitable sites for bank swallow nests. Hence, it is likely that bank revetment has eliminated substantially more than 48% of potential nesting sites between Red Bluff and Colusa. Plans for new bank revetment projects on the Sacramento River continue to be developed. If implemented, these projects would further reduce available habitat, and thus add to the already high overall effect of bank revetment on the bank swallow population (Schlorff 2004).

A levee-removal project was completed on the mainstem Sacramento River at RM 233 in late fall 1999 (Golet et al. 2003). Erosion in the mid 1990s had already damaged and washed out the rip rap that had been installed at the site by the landowner. Further erosion in the winter of 2000 expanded the existing cut bank, and a swallow colony was established there in the following spring. The newly established colony, with 2,770 burrows, was the largest on the river that year. It represented a substantial expansion for bank swallows at the site, which had supported just 930 burrows in the previous year.

Swainson's Hawk Swainson's hawk is State listed as a threatened species. This species nests in oaks or cottonwoods in or near riparian habitats, and it

forages in grasslands, irrigated pastures, and grain fields. This species occurs throughout the lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley. Potential nest trees for this species occur along the riparian corridor of the primary study area.

Valley Elderberry Longhorn Beetle The valley elderberry longhorn beetle is Federally listed as threatened. Its obligate host plant, the elderberry (Sambucus sp.), occurs in riparian and oak savanna habitats below 3,000 feet throughout the Central Valley. This species is known to occur in several locations along the riparian corridor of the primary study area. Potential habitat (i.e., the elderberry shrub) is a common component of riparian communities in the study area.

Western Yellow-Billed Cuckoo The western yellow-billed cuckoo is a candidate species for Federal listing and is State listed as endangered. It inhabits wide, dense riparian forest and scrub where there is a thick understory of willows for nesting. It prefers sites with a dominant cottonwood overstory for foraging. It may avoid valley-oak riparian habitats where scrub jays are abundant. This species nests along the upper Sacramento, lower Feather, south fork of the Kern, Amargosa, Santa Ana, and Colorado Rivers.

State Species of Special Concern Several State species of special concern—purple martin, yellow warbler, and yellow-breasted chat—are likely or are known to occur in riparian habitats in the primary study area. Other State species of special concern—least bittern, northern harrier,, short-eared owl, tricolored blackbird, northwestern pond turtle—are likely or known to be found in emergent wetlands and marsh habitats adjacent to the riparian corridor of the primary study area. Open woodlands or scrub vegetation could provide nesting habitat for loggerhead shrike and white-tailed kite and denning or roosting habitat for American badger, pallid bat, ringtail, and western red bat.

Of particular importance along the Sacramento River corridor is the northwestern pond turtle, which serves as an indicator species because it uses many of the habitat types along the river corridor (Stillwater Sciences 2007). The northwestern pond turtle is California's only native freshwater turtle. The habitat needs of this species are diverse. Along major alluvial river systems, such as the Sacramento River, it uses oxbow lakes, sloughs, and other off-channel water bodies for foraging and rearing. Main-channel habitats are used for aquatic dispersal and at least occasionally for foraging and basking. Upland areas, including grasslands, oak woodlands, and gaps in riparian forests, also are used for nesting, dispersal, and overwintering. Thus, the habitats of northwestern pond turtles are used by many species, which together contribute to the overall diversity of wildlife along the Sacramento River corridor. Northwestern pond turtle habitats have likely been reduced in extent and quality from historical conditions as a function of land use changes that have converted habitat to agriculture and urban development. They have also likely been reduced as a result of dam construction and operations; by altering flow and sediment regimes, dam construction and operations have reduced bank erosion

and meander migration, thereby affecting the formation of off-channel habitats that appear to provide the majority of the aquatic habitat for northwestern pond turtle in the Sacramento River corridor (Stillwater Sciences 2007).

Extended Study Area

The extended study area consists of the lower Sacramento River and Delta, major tributaries and floodplain bypasses, and the CVP/SWP service areas. Habitats in each of these areas are described below. Special-status wildlife species associated with habitat in these areas are also discussed.

Lower Sacramento River and Delta The roughly 300 miles of the Sacramento River can be subdivided into distinct reaches. These reaches are discussed separately below because of differences in morphology, riparian vegetation, and habitat functions. This section focuses on the reaches of the mainstem Sacramento River from RBDD to Colusa, from Colusa to the Delta, and in the Delta. Each of these reaches is discussed individually along with the main tributaries and floodplain bypasses to the Sacramento River. (See the Fisheries and Aquatic Ecosystem technical report for more information.)

Lower Sacramento River

Red Bluff Diversion Dam to Colusa In this reach, the Sacramento River is classified as a meandering river, where relatively stable, straight sections alternate with more sinuous, dynamic sections (SRCAF 2003). The active channel is fairly wide in some stretches and the river splits into multiple forks at many different locations, creating gravel islands often with riparian vegetation. Historic bends in the river are visible throughout this reach and appear as scars of the historic channel locations with the riparian corridor and oxbow lakes still present in many locations. Well-developed riparian woodland occurs in many locations. The channel remains active and has the potential to migrate in times of high water. Point bars, islands, high and low terraces, instream woody cover, early successional riparian plant growth, and other evidence of river meander and erosion are common in this reach.

Colusa to the Delta The general character of the Sacramento River changes quite drastically downstream of Colusa from a dynamic and active meandering channel to a confined, narrow channel restricted from migration. Surrounding agricultural lands encroach directly adjacent to the levees, which have cut the river off from the majority of its riparian corridor, especially on the eastern side of the river. The majority of the levees in this reach are lined with riprap, allowing the river no erodible substrate and limiting the extent of riparian vegetation.

Primary Tributaries to the Lower Sacramento River Primary tributaries to the lower Sacramento River are the Feather and American Rivers; each is described separately below.

Lower Feather River The aquatic and riparian ecosystems of the lower Feather River are influenced by the California Department of Water Resources (DWR) Oroville Facilities down to the confluence with the Sacramento River at Verona. The upper extent is fairly confined by levees as it flows through the city of Oroville. Downstream of Oroville, the Feather River is fairly active and meanders its way south to Marysville. However, this stretch is bordered by active farmland, which confines the river into an incised channel in certain stretches and limits the width of riparian woodland. Relatively large areas of adjacent farmlands are in the process of being restored to floodplain habitat with the relocation of levees to become setback levees.

Lower American River The lower American River (below Folsom and Nimbus Dams) is fairly low gradient and provides a variety of aquatic and riparian habitats. The majority of the lower American River is surrounded by the American River Parkway, preserving the surrounding riparian zone. The river channel does not migrate to a large degree because of the geologic composition that has allowed the river to incise deep into sediments, leaving tall cliffs and bluffs adjacent to the river.

Sacramento River Floodplain Bypasses There are multiple water diversion structures in the lower Sacramento River that move floodwaters into floodplain bypass areas during high-flow events. Primary floodplain bypass areas include the Butte Basin, Sutter Bypass, and Yolo Bypass. These bypasses provide broad, inundated floodplain habitat during wet years. Unlike other Sacramento River and Delta habitats, floodplains and floodplain bypasses are seasonally dewatered (as high flows recede) during late spring through autumn and provide important habitat for migrating waterfowl and shorebirds.

Lower San Joaquin and Stanislaus Rivers The lower San Joaquin River is characterized by a relatively wide (approximately 300 feet) channel with little canopy or overhead vegetation and minimal bank cover. Aquatic habitat in the San Joaquin River is characterized primarily by slow-moving flow and has limited water clarity and habitat diversity. Aquatic and riparian habitats of the lower Stanislaus River are more varied, in association with the development of levees and encroachment of agriculture and urban uses. Flows in both river systems are highly altered and are managed for flood control and water supply purposes.

Special-Status Species Most of the special-status wildlife species listed in Table 1-4 have the potential to occur within the extended study area. Numerous additional special-status wildlife species could occur in the extended study area in plant communities that are not present in the primary study area. The potential occurrence of special-status wildlife species is given for each section of the primary and extended study areas in Attachment 6. Additional species that are endemic to the Bay-Delta area, the Delta proper, or the Coast Range, as well as other species whose distribution ranges do not extend into the primary study area could occur in the extended study area. Attachment 7 contains a

comprehensive list of all sensitive wildlife species in the extended study area that have been reported to the CNDDB.

Sacramento River from RBDD to the Delta Many of the special-status wildlife species described above for the upper Sacramento River corridor have the potential to occur in the middle and lower reaches of the Sacramento River.

Before the habitat and community changes that resulted from settlement and development along the Sacramento River, several animals were present that have since been extirpated from the region. However, numerous special-status wildlife still occur along the Sacramento River from RBDD to the Delta. The majority of the special-status wildlife species are associated with grasslands, freshwater emergent wetlands, lakes, rivers, and riparian vegetation on the valley floor. Many of these species have been listed by Federal and State wildlife agencies because of habitat loss associated with agricultural development and water projects. Wildlife species listed under the Federal Endangered Species Act (ESA) and/or California Endangered Species Act (CESA) that have potential to occur in a portion of the extended study area from RBDD to the Delta include valley elderberry longhorn beetle, giant garter snake (*Thamnophis gigas*), bald eagle, Swainson's hawk, western yellow-billed cuckoo, willow flycatcher, and bank swallow. Information about these and other special-status species is provided in the CALFED MSCS (CALFED 2000a).

Sacramento–San Joaquin River Delta Many special-status species are known or are likely to occur in the Delta because of the presence of unique wetland habitats there. Generally, the existing distribution of wildlife species in the Delta is closely linked with the distribution of one or more habitat types on which a species depends. Dozens of special-status wildlife occur in the Delta region. Most of the special-status wildlife species are associated with freshwater emergent wetlands, marshes, open water, and agricultural lands. Tidal marshes and emergent wetlands support several special-status wildlife species, including the California black rail (*Laterallus jamaicensis coturniculus*), California clapper rail (*Rallus longirostris obsoletus*), greater sandhill crane, salt marsh common yellowthroat (*Geothlypis trichas sinuosa*), salt marsh harvest mouse (*Reithrodontomys raviventris*), Suisun ornate shrew (*Sorex ornatus sinuosus*), Suisun song sparrow (*Melospiza melodia maxillaris*), and tricolored blackbird. The giant garter snake is known to inhabit sloughs, canals, and low-gradient streams and freshwater marshes in the Delta. Vernal pools and other freshwater seasonal wetlands support several special-status crustaceans, including vernal pool tadpole shrimp and vernal pool fairy shrimp. Although it is severely declining because of a dramatic shrinkage of suitable habitat, the valley elderberry longhorn beetle has been found in the Delta region on McCormack-Williamson and New Hope Tracts. Information about these and other special-status species is provided in the CALFED MSCS and *Ecosystem Restoration Program Plan* (CALFED 2000a, 2000b) and the *Baylands Ecosystem Species and Community Profiles* (Goals Project 2000).

San Joaquin River Basin to the Delta Changes in the natural landscape of the San Joaquin River region have substantially affected plant and wildlife species. Thus, the current wildlife habitat value of this area is somewhat limited by the predominance of agricultural lands, which support a relatively low diversity of wildlife species. Because animals are highly dependent on specific habitats, changes in the quality and quantity of various habitat types have affected the area of habitat for many wildlife species. Conversion of grasslands to row crops has favored species that have adapted to the use of agricultural fields for foraging and species that can thrive in the altered landscape; however, many special-status wildlife species live in the periphery of these areas.

Remnant native vegetation patches are likely to support a high diversity of wildlife species. More than 100 special-status wildlife and plants occur in the San Joaquin River region. The largest number of special-status plant species occurs in grassland and valley foothill woodland. Most of the special-status wildlife species are associated with grasslands, freshwater emergent wetlands, lakes, and rivers that occur on the valley floor. Many of these special-status species have been listed by Federal and State wildlife agencies because of habitat losses associated with agricultural development and water projects. Information on these and other special-status species is provided in the CALFED MSCS (CALFED 2000a).

CVP/SWP Service Areas The CVP/SWP service areas are dominated by agricultural land and urban development, which can support many wildlife species, most of which are highly adapted to these disturbed environments. The conflict between urban growth and conservation of native habitat has resulted in the listing of a number of wildlife species that have been threatened with extinction. Many of these special-status wildlife species are unable to adapt to other habitat types or altered habitat conditions. The region also supports a variety of nonnative species, some of which are detrimental to survival of native species. Generally, the lowest diversity of native wildlife species is in densely urbanized areas. Special-status wildlife occurs in both large and small blocks of habitat, while some large mammals and secretive species are generally found only on large undisturbed parcels.

Changes in the natural landscape in the CVP/SWP service areas greatly reduced the distribution and abundance of wildlife species. The California condor (*Gymnogyps californianus*), lightfooted clapper rail (*Rallus longirostris levipes*), California least tern (*Sternula antillarum brownie*), least Bell's vireo (*Vireo bellii pusillus*), Belding's Savannah sparrow (*Passerculus sandwichensis beldingi*), southwestern willow flycatcher (*Empidonax traillii extimus*), California gnatcatcher (*Polioptila californica*), Mohave ground squirrel (*Spermophilus mohavensis*), and Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*) are examples of species that have been listed as threatened or endangered under the ESA and could occur within the CVP/SWP service areas. Attachments 6 and 7 provide tables listing the special-status

animal species with potential to occur in, or reported to the CNDDB from, the CVP/SWP service areas.

Regulatory Setting

Biological resources in California are protected and/or regulated by a variety of Federal and State laws and policies. Key regulatory and conservation planning issues applicable to the project and alternatives under consideration are discussed below.

Federal

Federal Endangered Species Act

Pursuant to the ESA, USFWS and the National Marine Fisheries Service (NMFS) have authority over projects that may result in "take" of a Federally listed species. In general, ESA Section 7 prohibits persons (including private parties) from "taking" listed endangered or threatened fish and wildlife species on private property, and from "taking" listed endangered or threatened plant species in areas under Federal jurisdiction or in violation of State law (16 United States Code (USC) 1532, 50 Code of Federal Regulations (CFR) 17.3). Under the ESA, the definition of "take" is to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" as part of an intentional or negligent act or omission. The term "harm" includes acts that result in death or injury to wildlife. Such acts may include significant habitat modification or degradation if it results in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Section 7(a) of the ESA, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed for listing or is listed as endangered or threatened. Section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with USFWS.

As defined in the ESA, critical habitat is a specific geographic area that is essential for the conservation of a threatened or endangered species and that may require special management and protection. It may include an area that is not currently occupied by the species but that will be needed for its recovery. Critical habitats are designated to ensure that actions authorized by Federal agencies will not destroy or adversely modify critical habitat, thereby protecting areas necessary for the conservation of the species.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act provides the basic authority for the involvement of USFWS in evaluating impacts on fish and wildlife from

proposed water resource development projects. It requires that fish and wildlife resources receive consideration equal to that of other project features. It also requires Federal agencies that construct, license, or permit water resource development projects to first consult with USFWS (and NFMS in some instances) and State fish and wildlife agencies regarding the impacts of the proposed action on fish and wildlife resources and measures to mitigate these impacts.

Bald Eagle Protection Act

The bald eagle and golden eagle are Federally protected under the Bald Eagle Protection Act (16 USC 668–668c). It is illegal to take, possess, sell, purchase, barter, offer to sell or purchase or barter, transport, export, or import a live or dead bald or golden eagle or any eagle part, nest, or egg unless authorized by the Secretary of the Interior. The Bald Eagle Protection Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" (16 USC 668–668d). USFWS has defined "disturb" under the act as follows (72 Federal Register (FR) 31132–31140 (June 5, 2007)):

> Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle; (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

Active nest sites are also protected from disturbance during the breeding season.

USFWS has proposed new permit regulations to authorize the take of bald and golden eagles under the Bald Eagle Protection Act, generally where the take to be authorized is associated with otherwise lawful activities (72 FR 31141–31155 (June 5, 2007). With the delisting of the bald eagle in 2007, this act is the primary law protecting bald eagles and golden eagles. Violators are subject to fines and/or imprisonment for up to 1 year.

Migratory Bird Treaty Act

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703–711). The MBTA makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in 50 CFR Part 10, including feathers or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 CFR 21). This prohibition includes direct and indirect acts, although harassment and habitat modifications are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA, which can be found in Title 50, Section 10.13 of the Code of Federal Regulations, includes several hundred species, essentially all native birds. Loss of nonnative species, such as house sparrows, European starlings, and rock pigeons, is not covered by this statute.

U.S. Forest Service Sensitive Species

The National Forest Management Act requires USFS to "provide for a diversity of plant and animal communities" (16 USC 1604(g)(3)(B)) as part of its multiple-use mandate. USFS must maintain "viable populations of existing native and desired nonnative species in the planning area" (36 CFR 219.19). The Sensitive Species program is designed to meet this mandate and to demonstrate USFS's commitment to maintaining biodiversity on National Forest System lands. The program is a proactive approach to conserving species to prevent a trend toward listing under the ESA and to ensure the continued existence of viable, well-distributed populations. A "Sensitive Species" is any species of plant or animal that has been recognized by the Regional Forester to need special management to prevent the species from becoming threatened or endangered.

Shasta-Trinity National Forest Land and Resource Management Plan

The *Shasta-Trinity National Forest Land and Resource Management Plan* (STNF LRMP) contains forest goals, standards, and guidelines designed to guide the management of the STNF. The following goals, standards, and guidelines related to wildlife resource issues associated with the study area were excerpted from the STNF LRMP (USFS 1995).

U.S. Forest Service Survey and Manage In 1994, the U.S. Bureau of Land Management (BLM) and USFS adopted standards and guidelines developed as part of the *Northwest Forest Plan*. These standards and guidelines address management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. The *Northwest Forest Plan* was designed to address human and environmental needs served by the Federal forests of the western part of the Pacific Northwest and Northern California. The development of the *Northwest Forest Plan* was triggered in the early 1990s by the listing of the northern spotted owl and marbled murrelet as threatened under the ESA.

To mitigate potential impacts on plant and wildlife species that have the potential to occur within the range of the northern spotted owl, surveys are required for species thought to be rare, or whose status is unknown because of a lack of information. These species became known as the Survey and Manage species. The *Northwest Forest Plan* has gone through several revisions since its implementation in 1994, including the elimination of the Survey and Manage Mitigation Measure Standards and Guidelines in 2004. However, these guidelines were reinstated in January 2006 as the result of a court order.

Biological Diversity

Goals (LRMP, p. 4-4) Integrate multiple resource management on a landscape level to provide and maintain diversity and quality of habitats that support viable populations of plants, fish, and wildlife.

Standards and Guidelines (LRMP, p. 4-14)

- Natural Openings—Management of natural openings will be determined at the project level consistent with desired future conditions.

- Snags—Over time, provide the necessary number of replacement snags to meet density requirements as prescribed for each land allocation and/or management prescription. Live, green culls and trees exhibiting decadence and/or active wildlife use are preferred.

- Hardwood—Apply the following standards in existing hardwood types:

  - Manage hardwood types for sustainability.
  - Conversion to conifers will only take place to meet desired future ecosystem conditions.
  - Where hardwoods occur naturally within existing conifer types on suitable timber lands, manage for a desired future condition for hardwoods as identified during ecosystem analysis consistent with management prescription standards and guidelines. Retain groups of hardwoods over single trees.

- Threatened, Endangered, and Sensitive Species (Plants and Animals)

Goals (LRMP, p. 4-5)

- Monitor and protect habitat for Federally listed Threatened and Endangered and candidate species. Assist in recovery efforts for Threatened and Endangered species. Cooperate with the State to meet objectives for state listed species.

- Manage habitat for sensitive plants and animals in a manner that will prevent any species from becoming a candidate for Threatened and Endangered status.

Goals (LRMP, p. 4-6)

- Meet habitat or population objectives established for management indicators.

- Cooperate with Federal, State, and local agencies to maintain or improve wildlife habitat.

- Maintain natural wildlife species diversity by continuing to provide special habitat elements within Forest ecosystems.

Standards and Guidelines (LRMP, pp. 4-29 through 4-30):

- Minimize accidental electrocution of raptors by ensuring that newly constructed overhead power lines meet safe design standards.

- Consider transplants, introductions, or reintroductions of wildlife species only after ecosystem analysis and coordination with other agencies and the public.

- Manage habitat for Neotropical migrant birds to maintain viable population levels.

- Develop interpretation/view sites for wildlife viewing, photography, and study. Provide pamphlets, slide shows, and other educational material that enhance the watchable wildlife and other interpretive programs.

- Maintain and/or enhance habitat for federally listed threatened and endangered or Forest Service Sensitive species consistent with individual species recovery plans.

Management Guide for the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area The *Management Guide for the Whiskeytown-Shasta-Trinity National Recreation Area*, including the Shasta Unit of the National Recreation Area (NRA), contains management strategies intended to achieve or maintain a desired condition. These strategies take into account opportunities, management recommendations for specific projects, and mitigation measures needed to achieve specific goals. The following strategies relative to wildlife resource issues associated with the project site were excerpted from the management guide (American Whitewater 2000, USFS 1996).

Vegetation (Management Guide, pp. IV-18 through IV-19)

- Prescribed burning, fuel break construction, and other forms of vegetation manipulation will be used to reduce fire hazards and improve forest health.

- Recreation sites will be inventoried and vegetative management plans will be developed to ensure healthy and safe vegetation complexes are maintained over time.

- Bald eagle nest territories will be inventoried and vegetation management plans will be developed to ensure that suitable nest and perch trees are maintained over time.

- Chaparral and woodland habitat management will occur to meet wildlife objectives.

- Interpretive materials will address the need to conserve rare plant communities in accordance with the NRA Interpretive Plan.

- Diversity of native species will be emphasized. Eradication program will be implemented for nonnative, introduced species in areas where healthy, botanically diverse plant communities are necessary to meet ecosystem management objectives.

Wildlife (Management Guide, pp. IV-19 through IV-20)

- Management activities will assure population viability for all native and nonnative desirable species. Management to insure viability will occur within occupied habitat for bald eagle, peregrine falcon, northern spotted owl, northern goshawk, willow flycatcher, northwestern pond turtle, Pacific fisher, Shasta salamander, and candidate species in accordance with species and/or territory management plans, Forest Orders, and appropriate laws and policy.

- Surveys will continue within potential suitable habitats to determine occupancy status for Threatened, Endangered, sensitive, and candidate species.

- Cooperation will continue with the CDFG and the USFWS regarding habitat management of wildlife species inhabiting the NRA. Consultation with USFWS will continue regarding habitat management for threatened and endangered species.

Section 404 of the Clean Water Act

The U.S. Army Corps of Engineers regulates discharges of dredged or fill materials into waters of the United States under Section 404 of the Clean Water Act. Waters of the United States include lakes, rivers, streams, and relatively permanent tributaries and adjacent wetlands. Wetlands are defined under Section 404 as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support (and that do support under normal circumstances) a prevalence of vegetation typically adapted for life in saturated soil conditions. Activities that require a permit under Section 404 include, but are not limited to, placing fill or riprap, grading, mechanized land clearing, and dredging. Any activity that results in the deposit of dredged or fill material below the ordinary high-water mark of waters of the United States or within a jurisdictional wetland usually requires a Section 404 permit, even if the area is dry at the time the activity takes place.

Executive Order 11312: Invasive Species

Executive Order 13112 directs Federal agencies to use relevant programs and authorities to do all of the following:

- Prevent the introduction of invasive species

- Detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner

- Monitor invasive species populations accurately and reliably
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species
- Promote public education on invasive species and the means to address them
- Refrain from authorizing, funding, or carrying out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

Executive Order 11312 established a national Invasive Species Council made up of Federal agencies and departments and a supporting Invasive Species Advisory Committee composed of State, local, and private entities. The Invasive Species Council and Advisory Committee oversee and facilitate implementation of the executive order, including preparation of a national invasive species management plan.

Executive Order 11990: Protection of Wetlands

Executive Order 11990 established the protection of wetlands and riparian systems as the official policy of the Federal government. It requires all Federal agencies to consider wetland protection as an important part of their policies and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

Executive Order 13186: Migratory Birds

Executive Order 13186 directs executive departments and agencies to take certain actions to further implement the MBTA. It requires that each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations develop and implement a memorandum of understanding (MOU) with USFWS that shall promote the conservation of migratory bird populations.

Executive Order 13443 (Facilitation of Hunting Heritage and Wildlife Conservation)

Executive Order 13443 directs Federal agencies that have programs and activities that have a measurable effect on public land management, outdoor

recreation, and wildlife management, including the U.S. Department of the Interior and the U.S. Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

State

California Endangered Species Act

Under the CESA, DFG has the responsibility for maintaining a list of endangered and threatened species (California Fish and Game Code, Section 2070). DFG also maintains a list of "candidate species," which are species for which DFG has issued a formal notice that they are under review for addition to the list of endangered or threatened species. In addition, DFG maintains lists of "species of special concern," which serve as species "watch lists." Pursuant to the requirements of CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any State-listed endangered or threatened species may be present in the project study area and, if so, whether the proposed project would have a potentially significant impact on any of these species. In addition, DFG encourages informal consultation on any proposed project that may affect a species that is a candidate for state listing.

Project-related impacts on species listed as endangered or threatened under the CESA would be considered significant. State-listed species are fully protected under the mandates of the CESA. "Take" of protected species incidental to otherwise lawful management activities may be authorized under Section 2081 of the California Fish and Game Code. Under the CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species, but the definition does not include "harm" or "harass," as the Federal act does. As a result, the threshold for take under the CESA is higher than that under the ESA.

Authorization from DFG would be in the form of an incidental take permit or as a consistency determination (Section 2080.1[a] of the Fish and Game Code). Section 2080.1[a] of the Fish and Game Code authorizes DFG to accept a Federal biological opinion as the take authorization for a state-listed species when a species is listed under both the ESA and the CESA.

Sections 3503 and 3513 of the California Fish and Game Code—Protection of Birds of Prey

Under Section 3503 of the California Fish and Game Code, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Section 3503.5 specifically states that it is unlawful to take, possess, or destroy any raptors (birds in the order of Falconiformes or Strigiformes (birds of prey)—i.e., eagles, hawks, owls, and falcons), including their nests or eggs. Section 3513 provides for adoption of the MBTA's provisions. It states that it is unlawful to take or possess any migratory nongame bird as designated in the MBTA or any part of such migratory nongame bird. These State codes offer no statutory or regulatory mechanism for obtaining an incidental take permit for the loss of nongame,

migratory birds. Typical violations include destruction of active raptor nests resulting from removal of vegetation in which the nests are located. Violation of Sections 3503.5 and 3513 could also include disturbance of nesting pairs that results in failure of an active raptor nest.

Fully Protected Species under the Fish and Game Code

Protection of fully protected species is described in four sections of the Fish and Game Code (Sections 3511, 4700, 5050, and 5515) that list 37 fully protected species. These statutes prohibit take or possession at any time of fully protected species. DFG is unable to authorize incidental take of fully protected species when activities are proposed in areas inhabited by those species. DFG has informed non-Federal agencies and private parties that they must avoid take of any fully protected species in carrying out projects.

Section 1602 of the California Fish and Game Code—Streambed Alteration

Diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by DFG, pursuant to Section 1602 of the California Fish and Game Code. The regulatory definition of a stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports wildlife, fish, or other aquatic life. This includes watercourses that have a surface or subsurface flow that supports or has supported riparian vegetation. DFG's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife. A DFG streambed alteration agreement must be obtained for a project that would result in an impact on a river, stream, or lake.

Section 401 Water Quality Certification/Porter-Cologne Water Quality Control Act

Under Section 401 of the Clean Water Act, an applicant for a Section 404 permit must obtain a certificate from the appropriate State agency stating that the intended dredging or filling activity is consistent with the State's water quality standards and criteria. In California, the authority to grant water quality certification is delegated by the State Water Resources Control Board to the nine regional water quality control boards (RWQCB). Each of the RWQCBs must prepare and periodically update basin plans for water quality control in accordance with the Porter-Cologne Water Quality Control Act. Each basin plan sets forth water quality standards for surface water and groundwater, as well as actions to control nonpoint and point sources of pollution to achieve and maintain these standards. Basin plans offer an opportunity to protect wetlands through the establishment of water quality objectives. The RWQCB's jurisdiction includes federally protected waters as well as areas that meet the definition of "waters of the state." A water of the State is defined as any surface water or groundwater, including saline waters, within the boundaries of California. The RWQCB has the discretion to take jurisdiction over areas not Federally protected under Section 401, provided that those areas meet the

definition of waters of the State. Mitigation requiring no net loss of wetlands functions and values of waters of the State is typically required by the RWQCB.

California Department of Fish and Game Species Designations

DFG maintains an informal list of species called "species of special concern." These are broadly defined as plant and wildlife species that are of concern to DFG because of population declines and restricted distributions, and/or because they are associated with habitats that are declining in California. These species are inventoried in the CNDDB regardless of their legal status. Impacts on species of special concern may be considered significant.

Local

Shasta, Tehama, Glenn, Sutter, Sacramento, and Yolo Counties and the Cities of Redding, Colusa, and Sacramento have established codes and policies that address protection of natural resources, including vegetation, sensitive species, and trees, and are applicable to the project.

Shasta County's general plan emphasizes that the maintenance and enhancement of quality fish and wildlife habitat is critical to the recreation and tourism industry, and acknowledges that any adverse and prolonged decline of these resources could result in negative impacts on an otherwise vibrant industry. The general plan identifies efforts to protect and restore these habitats to sustain the long-term viability of the tourism and recreation industry (Shasta County 2004).

The City of Redding's general plan strives to strike a balance between development and conservation by implementing several measures such as creek-corridor protection, sensitive hillside development, habitat protection, and protection of prominent ridge lines that provide a backdrop to the city (City of Redding 2000).

Tehama County's general plan update provides an overarching guide to future development and establishes goals, policies, and implementation measures designed to address potential changes in county land use and development. The general plan identifies the importance of retaining agriculture as one of the primary uses of land in Tehama County.

Glenn County's general plan provides a comprehensive plan for growth and development in Glenn County for the next 20 years (2007–2027). This plan recognizes that public lands purchased for wildlife preservation generate economic activity as scientists and members of the public come to view and study remnant ecosystems (Glenn County 1993).

The City of Colusa's general plan seeks to promote its natural resources through increased awareness and improved public access (City of Colusa 2007).

Sutter County's general plan contains policies that generally address preservation of natural vegetation, including wetlands. It requires that new development mitigate the loss of Federally protected wetlands to achieve "no net loss," but it does not include any other specific requirements.

Sacramento County's general plan contains policies that promote protection of marsh and riparian areas, including specification of setbacks and "no net loss" of riparian woodland or marsh acreage (Sacramento County 1993). It also addresses the need to conserve vernal pools and ephemeral wetlands to ensure no net loss of vernal pool acreage. Several policies specifically promote protection of native oak trees, and, in some areas of the county, seek to ensure that there is no net loss of canopy area. The general plan for the County of Sacramento is currently under revision.

The City of Sacramento Municipal Code addresses the protection of trees within the city boundaries, including general protection of all trees on city property and specific protection of heritage trees.

Yolo County's general plan aims to provide an active and productive buffer of farmland and open space separating the Bay Area from Sacramento, and integrating green spaces into its communities.

Federal, State, and Local Programs and Projects

Butte Creek Watershed Conservancy

The Butte Creek Watershed Conservancy was formed in September 2005 to encourage the preservation and management of the Butte Creek watershed through cooperation between landowners, water users, recreational users, conservation groups, and Federal, State, and local agencies. The Butte Creek Watershed Conservancy received nonprofit status in November 1996 and shortly after prepared a memorandum of understanding with 24 signatories to establish a voluntary and cooperative agreement to create the Butte Creek Watershed Management Strategy. The Butte Creek Watershed Conservancy, working with Ducks Unlimited, the California Waterfowl Association, and other stakeholders, developed alternatives to improve fish passage in the Butte Sink, Butte Slough, and Sutter Bypass sections of Butte Creek while maintaining the viability of agriculture, seasonal wetlands, and other habitats.

California Bay-Delta Authority

The California Bay-Delta Authority was established as a State agency in 2003 to oversee implementation of CALFED for the 25 Federal and State agencies working cooperatively to improve the quality and reliability of California's water supplies while restoring the Bay-Delta ecosystem. The CALFED Ecosystem Restoration Program has provided a funding source for projects that include those involving acquisition of lands within the Sacramento River Conservation Area, initial baseline monitoring and preliminary restoration

planning, and preparation of long-term habitat restoration management and monitoring plans.

Cantara Trustee Council

The Cantara Trustee Council administers a grant program that has provided funding for numerous environmental restoration projects in the primary study area, including programs in the Fall River watershed, Sulphur Creek, the upper Sacramento River, Middle Creek, lower Clear Creek, Battle Creek, Salt Creek, and Olney Creek. The Cantara Trustee Council is a potential local sponsor for future restoration actions in the primary study area. The Cantara Trustee Council includes representatives from DFG, USFWS, the Central Valley Regional Water Quality Control Board, the California Sportfishing Protection Alliance, and the Shasta Cascade Wonderland Association.

Resource Conservation Districts

There are numerous resource conservation districts (RCD) within the study area. Once known as soil conservation districts, RCDs were established under California law with a primary purpose to implement local conservation measures. Although RCDs are locally governed agencies with locally appointed, independent boards of directors, they often have close ties to county agencies and the National Resources Conservation Service. RCDs are empowered to conserve resources within their districts by implementing projects on public and private lands and to educate landowners and the public about resource conservation. They are often involved in the formation and coordination of watershed working groups and other conservation alliances. In the Shasta Lake and upper Sacramento River vicinity, districts include the Western Shasta County RCD and the Tehama County RCD. To the east are the Fall River and Pit River RCDs, and to the west and north are the Trinity County and Shasta Valley RCDs.

Riparian Habitat Joint Venture

The Riparian Habitat Joint Venture (RHJV) was initiated in 1994 and includes signatories from 18 Federal, State, and private agencies. The RHJV promotes conservation and the restoration of riparian habitat to support native bird population through three goals:

- Promote an understanding of the issues affecting riparian habitat through data collection and analysis.
- Double riparian habitat in California by funding and promoting on-the-ground conservation projects.
- Guide land managers and organizations to prioritize conservation actions.

RHJV conservation and action plans are documented in *The Riparian Bird Conservation Plan* (RHJV 2004). The conservation plan targets 14 “indicator”

species of riparian-associated birds and provides recommendations for habitat protection, restoration, management, monitoring, and policy. The report notes habitat loss and degradation as one of the most important factors causing the decline of riparian birds in California. The RHJV has participated in monitoring efforts within the Sacramento National Wildlife Refuge Complex and other conservation areas. The RHJV's conservation plan identifies lower Clear Creek as a prime breeding area for yellow warblers and song sparrows, advocating a continuous riparian corridor along lower Clear Creek. Other recommendations of the conservation plan apply to the North Delta Offstream Storage Investigation study area in general.

Sacramento River Advisory Council

In 1986 the California Legislature passed Senate Bill (SB) 1086, which called for a management plan for the Sacramento River and its tributaries to protect, restore, and enhance fisheries and riparian habitat in an area stretching from the confluence of the Sacramento River with the Feather River and continuing northward to Keswick Dam, about 4 miles north of Redding. The law established an advisory council that included representatives of Federal and State agencies, county supervisors, and representatives of landowners, water contractors, commercial and sport fisheries, and general wildlife and conservation interests. Responsibilities of the advisory council included development of the *Sacramento River Conservation Area Forum Handbook* to guide management of riparian habitat and agricultural uses along the river (SRCAF 2003). This action also resulted in formation in May 2000 of the SRCA Forum, a nonprofit, public benefit corporation with a board of directors that includes private landowners and public interest representatives from a seven-county area, an appointee of the California Resources Agency, and ex-officio members from six Federal and State resource agencies. The work of the organization is generally focused on planning actions and river management within the SRCA planning area.

Sacramento River Conservation Area Program

SB 1086 called for a management plan for the Sacramento River and its tributaries to protect, restore, and enhance both fisheries and riparian habitat. The SRCA Program has an overall goal of preserving remaining riparian habitat and reestablishing a continuous riparian ecosystem along the Sacramento River between Redding and Chico, and reestablishing riparian vegetation along the river from Chico to Verona. The program is to be accomplished through an incentive-based, voluntary river management plan. The *Upper Sacramento River Fisheries and Riparian Habitat Management Plan*, January 1989 (Resources Agency 1989), identifies specific actions to help restore the Sacramento River fishery and riparian habitat between the Feather River and Keswick Dam. The *Sacramento River Conservation Area Forum Handbook* (SRCAF 2003) is a guide to implementing the program. The Keswick Dam–to–Red Bluff portion of the conservation area includes areas within the 100-year floodplain, existing riparian bottomlands, and areas of contiguous valley oak

woodland, totaling approximately 22,000 acres. The 1989 fisheries restoration plan recommended several actions specific to the study area:

- Fish passage improvements at RBDD (under way; project draft environmental impact statement/environmental impact report released August 2002)
- Modification of the Spring Creek Tunnel intake for temperature control (completed)
- Spawning gravel replacement program (ongoing)
- Development of side-channel spawning areas, such as those at Turtle Bay in Redding (ongoing)
- Structural modifications to the Anderson-Cottonwood Irrigation District Dam to eliminate short-term flow fluctuations (completed)
- Maintaining instream flows through coordinated operation of water facilities (ongoing)
- Improvements at the Coleman National Fish Hatchery (partially complete)
- Measures to reduce acute toxicity caused by acid mine drainage and heavy metals (ongoing)
- Various fisheries improvements on Clear Creek (partially complete)
- Flow increases, fish screens, and revised gravel removal practices on Battle Creek (beginning summer 2006)
- Control of gravel mining, improvements of spawning areas, improvements of land management practices in the watershed, and protection and restoration of riparian vegetation along Cottonwood Creek

Sacramento River National Wildlife Refuge

The Sacramento River National Wildlife Reserve (SRNWR) is composed of many units between the cities of Red Bluff and Princeton. The SRNWR along the middle Sacramento River is part of the Sacramento National Wildlife Refuge Complex, consisting of five refuges and three wildlife management areas within the Sacramento Valley. Reaches and subreaches of the river are delineated based generally on transitions in fluvial geomorphic riverine conditions, although county boundaries were considered as well. The middle Sacramento River region between Red Bluff and Colusa includes three units within the Chico Landing Subreach that contain restoration project sites

addressed in the *Sacramento River–Chico Landing Subreach Habitat Restoration Draft Environmental Impact Report* (CBDA 2005). In addition, three areas proposed for restoration in this area occur within the larger SRNWR units that were evaluated in the *Final Environmental Assessment for Proposed Restoration Activities on the Sacramento River National Wildlife Refuge* (USFWS 2002, CBDA 2005).

In June 2005, USFWS issued the *Sacramento River National Wildlife Refuge Final Comprehensive Conservation Plan and Environmental Assessment and Finding of No Significant Impact* (USFWS 2005) to serve as an integrated management plan for land that it acquires and manages for inclusion in the SRNWR. The SRNWR final comprehensive conservation plan includes goals, objectives, and strategies to guide management of lands within the SRNWR. It also includes assessments of and establishes parameters for "compatible uses," which are uses that are considered compatible with the primary purposes for which the area was established. Riparian habitat restoration projects are being implemented under cooperative agreements between USFWS and other entities such as The Nature Conservancy (TNC) in accordance with the SRNWR final comprehensive conservation plan.

Sacramento River Wildlife Area

The Sacramento River Wildlife Area is managed by DFG and consists of approximately 3,770 acres of important riparian habitat located along a 70-mile reach of the lower Sacramento River. These lands are managed to protect and enhance habitat for wildlife species, and to provide the public with compatible, wildlife-related recreational uses. This management is guided by the *Sacramento River Comprehensive Management Plan.*

Sacramento River Preservation Trust

The Sacramento River Preservation Trust is a private, nonprofit organization active in environmental education and advocacy to preserve the natural environmental values of the Sacramento River. The trust has participated in various conservation and land acquisition projects, including securing lands for the SRNWR. The group is pursuing designation of a portion of the Sacramento River between Redding and Red Bluff as a national conservation area.

Sacramento River Watershed Program

The Sacramento River Watershed Program is an effort to bring stakeholders together to share information and work together to address water quality and other water-related issues within the Sacramento River watershed. The group is funded congressionally through the U.S. Environmental Protection Agency. The program's primary goal is "to ensure that current and potential uses of Sacramento River watershed resources are sustained, restored, and where possible, enhanced while promoting the long-term social and economic vitality of the region." The Sacramento River Watershed Program manages grants for the Sacramento River Toxic Pollutants Control Program; performs extensive water quality monitoring, data collection, and data management for the

watershed; and is instrumental in the study and monitoring of toxic pollutants. Although the program does not implement restoration projects, it is a potential partner for coordinating research and monitoring through consensus-based collaborative partnerships and promoting mutual education among the stakeholders of the Sacramento River watershed.

Sacramento Watersheds Action Group

The Sacramento Watersheds Action Group (SWAG) is a nonprofit corporation that secures funding for, designs, and implements projects that provide watershed restoration, streambank and slope stabilization, erosion control, watershed analysis, and road removal. SWAG has successfully worked with local groups, agencies, and organizations to fund and complete restoration projects on the Sacramento River and tributaries downstream of Keswick Dam. Their projects include development of the *Sulphur Creek Watershed Analysis and Action Plan*, the Whiskeytown Reservoir Shoreline Erosion Control Project, the Sulphur Creek Crossing Restoration Project, and the Lower Sulphur Creek Realignment and Riparian Habitat Enhancement Project. SWAG is a potential local sponsor for watershed restoration actions in the study area.

Shasta Land Trust

The Shasta Land Trust is a regional, nonprofit organization dedicated to conserving open space, wildlife habitat, and agricultural land. The trust works with public agencies and private landowners and is funded primarily through membership dues and donations. It employs various voluntary programs to protect and conserve valuable lands using conservation easements, land donations, and property acquisitions. The trust is a potential local partner for restoration activities in the Shasta Dam–to–Red Bluff area.

The Nature Conservancy

TNC is a private, nonprofit organization involved in environmental restoration and conservation throughout the United States and the world. TNC approaches environmental restoration primarily through strategic land acquisition from willing sellers and obtaining conservation easements. Some of the lands are retained by TNC for active restoration, research, or monitoring activities, while others are turned over to government agencies such as USFWS or DFG for long-term management. Lower in the Sacramento River basin, TNC has been instrumental in acquiring and restoring lands in the SRNWR and managing several properties along the Sacramento River. It also has pursued conservation easements on various properties at tributary confluences, including Cottonwood and Battle Creeks.

The Trust for Public Land

The Trust for Public Land is a national, nonprofit organization involved in preserving lands with natural, historic, cultural, or recreational value, primarily through conservation real estate. The trust's Western Rivers Program has been involved in conservation efforts along the Sacramento River between Redding and Red Bluff (BLM's Sacramento River Bend Management Area), Battle

Creek, Paynes Creek, Inks Creek, and Fenwood Ranch in Shasta County. The group promotes public ownership of conservation lands to ensure public access and enjoyment.

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Chapter 2
Environmental Consequences

This chapter describes the environmental evaluation methods, assumptions, and specific criteria used to determine significance for each resource area, and discusses impacts and proposed mitigation measures. This impacts assessment evaluates the project's compliance with requirements outlined in Chapter 1 of this technical report. Mitigation measures are presented (as needed) to reduce impacts to a less-than- significant level.

Methods and Assumptions

The following sections describe the methods, processes, procedures, and assumptions used to formulate and conduct the environmental impact analysis.

This analysis of impacts on wildlife resources resulting from implementation of the project alternatives under consideration is based on review of existing documentation that addresses biological resources in or near the primary and extended study areas and on geographic information systems (GIS) analysis.

The following assumptions about activity at Shasta Lake and vicinity have been made for the purposes of the impact analysis:

- Activity areas (construction areas for infrastructure and relocation areas) would be completely cleared.
- Cutting/clearing of vegetation would be conducted from late summer through late winter, to the extent feasible.
- Removal of cleared material may occur during the typical breeding season for birds in Shasta County.
- Removal of cleared vegetation would be done using conventional yarding systems and aerial (helicopter) systems.
- No vegetation would be removed along the Pit River Arm upstream of Arbuckle Flat.
- Vegetation would be retained in a 250-foot buffer around known eagle and osprey nests and perch trees and no construction activities would occur within 250 feet of these nests. **[Note to Reviewer: Is this feasible?]**

- No blasting would be required for the mining of materials within the current boundary of Shasta Lake.

For the upper Sacramento River and extended study area, the project could potentially affect common wildlife and special-status wildlife species through the following impact mechanisms:

- Change in inundated width of the river from spring through fall
- Reduced frequency, duration, or magnitude of intermediate to large flows
- Altered geomorphic processes (e.g., meander, channel avulsion) along rivers
- Altered availability of groundwater
- Altered vegetative communities within the river corridor

Potential effects on the upper Sacramento River and extended study area resulting from these impact mechanisms were assessed for common wildlife and special-status wildlife species associated with riparian and wetland habitats located between Shasta Dam and Red Bluff Diversion Dam (RBDD) and within the extended study area that may be affected by altered hydrologic flows. It is assumed that construction-related activities, their effects, and mitigation were considered in the "Shasta Lake and Vicinity" section. The assessment in this section was based in part on the potential effects on vegetation communities provided in Chapter 2, "Environmental Consequences," of the Botanical Resources technical report.

Criteria for Determining Significance of Effects

Significance criteria used to analyze the potential impacts of the project on wildlife resources include factual and scientific information and regulatory standards of county, State, and Federal agencies, including the *California Environmental Quality Act Guidelines* (State CEQA Guidelines). These criteria have been developed to establish thresholds to determine the significance of impacts pursuant to CEQA (Section 15064.7) and should not be confused with a "take" or adverse effect under the Federal Endangered Species Act (ESA). An environmental document prepared to comply with the National Environmental Policy Act (NEPA) must consider the context and intensity of the environmental effects that would be caused by, or result from, the proposed action. Under NEPA, the significance of an effect is used solely to determine whether an environmental impact statement must be prepared. An environmental document prepared to comply with CEQA must identify the potentially significant environmental effects of a proposed project. A

"[s]ignificant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (State CEQA Guidelines, Section 15382). CEQA also requires that the environmental document propose feasible measures to avoid or substantially reduce significant environmental effects (State CEQA Guidelines, Section 15126.4(a)).

The following significance criteria were developed based on guidance provided by the State CEQA Guidelines. Impacts of an alternative on wildlife would be significant if project implementation would do any of the following:

- Result in mortality of State-listed or Federally listed wildlife species, or species that are candidates for listing or proposed for listing
- Have the potential to substantially reduce the habitat of any wildlife species, including those that are listed as endangered or threatened or are candidates or proposed for endangered or threatened status
- Have the potential to cause a wildlife population to drop below self-sustaining levels
- Substantially adversely affect any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations
- Have a substantial adverse effect, either directly or through habitat modifications, on any non-special-status wildlife species
- Substantially adversely affect, either directly or through habitat modifications, any wildlife species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by the California Department of Fish and Game (DFG) or U.S. Fish and Wildlife Service (USFWS)
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Conflict with or violate the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, State, or Federal habitat conservation plan relating to the protection of wildlife species
- Conflict with any State or local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance

- Substantially reduce the habitat of a wildlife species, cause a wildlife species to drop below self-sustaining levels, threaten to eliminate an animal community, or substantially reduce the number or restrict the range of an endangered, rare, or threatened species

Significance statements are relative to both existing conditions (2005) and future conditions (2030) unless stated otherwise.

Environmental Consequences and Mitigation Measures

This section identifies how wildlife could be affected by the project. The project could affect wildlife by doing any of the following:

- Causing construction-related effects at Shasta Dam
- Altering flow regimes downstream of Shasta Lake and downstream of other reservoirs with altered operations
- Increasing water supply reliability that in turn could contribute to growth or changes in agricultural land uses in the Central Valley Project (CVP) and State Water Project (SWP) service areas

By altering storage and reservoir operations, the project would change flow regimes in downstream waterways. In turn, these alterations to the flow regime could affect wildlife, particularly by affecting their riparian and wetland habitats along several waterways.

No-Action Alternative

Under the No-Action Alternative, the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) would not pursue an action to enlarge Shasta Dam. No new facilities would be constructed at Shasta Dam; thus there would be no construction-related impacts. In addition, there would be no changes in releases from Shasta Dam or other CVP reservoirs as a result of a Shasta Dam enlargement.

Primary Study Area

Shasta Lake and Vicinity

Impact Wild-1 (No-Action): Take and Loss of Habitat for the Shasta Salamander No direct take of the Shasta salamander or loss of its habitat would occur because the project would not be constructed. No impact would occur.

Ground-disturbing activities associated with construction could result in direct take of the Shasta salamander, a State-listed species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. However, under the No-Action Alternative, no direct take of the Shasta salamander or loss

of its habitat would occur because the project would not be constructed. Thus, no impact would occur.

Impact Wild-2 (No-Action): Take and Loss of Habitat for the Foothill Yellow-Legged Frog and Tailed Frog No direct take or loss of habitat for the foothill yellow-legged frog or tailed frog would occur because the project would not be constructed. No impact would occur.

Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, a Multi-Species Conservation Strategy (MSCS) covered species, California Species of Special Concern, and U.S. Forest Service (USFS) sensitive species and the tailed frog, a California Species of Special Concern. The potential for direct take would be temporary, occurring only during project construction. In addition, the raising of Shasta Dam would result in the conversion of suitable riverine and riparian habitat to unsuitable lacustrine habitat. However, under the No-Action Alternative, no direct take or loss of habitat for the foothill yellow-legged frog or tailed frog would occur because the project would not be constructed. Thus, no impact would occur.

Impact Wild-3 (No-Action): Take and Loss of Habitat for the Northwestern Pond Turtle No direct take or decrease of habitat quality for the northwestern pond turtle would occur because the project would not be constructed. No impact would occur.

Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the northwestern pond turtle, an MSCS covered species, California Species of Special Concern, and USFS sensitive species. In addition, project implementation could result in the degradation of suitable aquatic habitat due to increased erosion and sedimentation. However, under the No-Action Alternative, no direct take or decrease of habitat quality for the northwestern pond turtle would occur because the project would not be constructed. Thus, no impact would occur.

Impact Wild-4 (No-Action): Take of American Peregrine Falcons No take of the American peregrine falcon would occur because the project would not be constructed. No impact would occur.

Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of American peregrine falcons, a State-listed endangered and MSCS covered species. However, under the No-Action Alternative, no impacts on the American peregrine falcon would occur because the project would not be constructed.

Impact Wild-5 (No-Action): Take and Loss of Habitat for the Bald Eagle No take of loss of habitat for the bald eagle would occur because the project would not be constructed. No impact would occur.

Construction activities and project implementation would result in the loss of bald eagle nest/perch trees. However, under the No-Action Alternative, no impacts on the bald eagle would occur because the project would not be constructed.

Impact Wild-6 (No-Action): Take and Loss of Nesting and Foraging Habitat for the Northern Spotted Owl No take or loss of nesting and foraging habitat for the northern spotted owl would occur because the project would not be constructed. No impact would occur.

Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of northern spotted owl, federally listed as threatened and MSCS covered species). In addition, the raising of Shasta Dam would result in the loss of habitat for this species. However, under the No-Action Alternative, no impacts on the northern spotted owl would occur because the project would not be constructed.

Impact Wild-7 (No-Action): Take and Loss of Nesting Habitat for the Purple Martin No take or loss of nesting habitat for purple martins would occur because the project would not be constructed. No impact would occur.

Construction activities during the nesting season, such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of purple martins, a California Species of Special Concern. In addition, the raising of Shasta Dam would result in the loss of nest trees. However, under the No-Action Alternative, no impacts on purple martins would occur because the project would not be constructed.

Impact Wild-8 (No-Action): Take and Loss of Foraging and Nesting Habitat for Vaux's Swifts, Yellow Warblers, and Yellow-Breasted Chats No take or loss of foraging and nesting habitat for Vaux's swifts, yellow warblers, and yellow-breasted chats would occur because the project would not be constructed. No impact would occur.

Construction activities during the nesting season, such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Vaux's swifts, a California Species of Special Concern, and yellow warblers and yellow-breasted chats, both California Species of Special Concern and MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. However, under the No-Action

Alternative, no impacts on Vaux's swifts, yellow warblers, and yellow-breasted chats would occur because the project would not be constructed.

Impact Wild-9 (No Action): Take and Loss of Foraging and Nesting Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Sharp-Shinned Hawk, and Osprey No take or loss of foraging and nesting habitat for these species would occur because the project would not be implemented. No impact would occur.

Construction activities during the nesting season, such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Cooper's hawks and sharp-shinned hawks (California Species of Special Concern), northern goshawks (California Species of Special Concern and USFS sensitive), and long-eared owls and osprey (California Species of Special Concern and MSCS covered species). In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant. However, under the No-Action Alternative, no impacts on these species would occur because the project would not be implemented.

Impact Wild-10 (No-Action): Take and Loss of Habitat for the Pacific Fisher No take or loss of habitat for the Pacific fisher would occur because the project would not be implemented. No impact would occur.

Project implementation would result in a loss of habitat for the Pacific fisher (Federal candidate for listing, California Species of Special Concern, and USFS Sensitive species). Further, take (include mortality of individuals due to destruction of active dens) could result from construction activities and vegetation clearing. However, under the No-Action Alternative, no impacts on the Pacific fisher would occur because the project would not be implemented.
Impact Wild-11 (No-Action): Take and Loss of Habitat for Special-Status Bats and Ringtails No take or loss of habitat for special-status bats and the ringtail would occur because the project would not be implemented. No impact would occur.

Project implementation would result in a loss of habitat for special-status bats and the ringtail (MSCS covered species). Further, take (including mortality of individuals due to destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. However, under the No-Action Alternative, no impacts on special-status bats and the ringtail would occur because the project would not be implemented.

Impact Wild-12 (No-Action): Loss of Foraging Habitat for the Merlin No loss of foraging habitat for the merlin would occur because the project would not be implemented. No impact would occur.

Project construction and implementation would result in a loss of foraging habitat for the merlin. However, under the No-Action Alternative, no impacts on foraging habitat for the merlin would occur because the project would not be implemented.

Impact Wild-13 (No-Action): Take and Loss of Habitat for USFS Sensitive Species No take or loss of habitat for USFS sensitive species would occur because the project would not be implemented. No impact would occur.

Fourteen of the wildlife species with potential to occur in the Shasta Lake and vicinity portion of the study area are designated USFS sensitive species: Shasta sideband, Wintu sideband, Shasta chaparral, Shasta hesperian, Shasta salamander, foothill yellow-legged frog, northwestern pond turtle, northern goshawk, American peregrine falcon, Pacific fisher, American marten, pallid bat, western red bat, and Townsend's big-eared bat. With the exception of the terrestrial mollusks, potential impacts on these species are discussed as separate impacts under the respective action alternatives below. Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in suitable habitat). In addition, project implementation would result in the loss of suitable habitat. However, under the No-Action Alternative, no impacts on USFS sensitive species would occur because the project would not be implemented.

Upper Sacramento River (Shasta Dam to Red Bluff)
Impact Wild-14 (No-Action): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area The No-Action Alternative would not have a substantial adverse effect on special-status wildlife as a result of effects of continuing existing dam operation on riparian vegetation. This impact would be less than significant.

The No-Action Alternative would not result in changes to existing facilities or to reservoir operations. The No-Action Alternative would continue to alter the structure and species composition of riparian vegetation resulting from continued operation of the existing Shasta Dam, as described in the Botanical Resources technical report. Operation of the dam has decreased early successional riparian communities and increased the extent of mid-successional riparian communities. Although early and mid-sucessional riparian vegetation provides different habitat values and some shifts in species use may occur, this impact would not have a substantial adverse effect, nor would it be likely to cause a population to be eliminated. Therefore, this impact would be less than significant.

Impact Wild-15 (No-Action): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Future conditions for bank swallows are not expected to differ substantially from the existing

conditions because of the restoration projects being implemented on the Sacramento River. This impact would be less than significant.

The No-Action Alternative would continue to alter geomorphic processes due to operations of the dam. Loss of eroding banks during winter flood flows could limit the formation of suitable nesting habitat for bank swallow. However, future conditions for bank swallows are not expected to differ substantially from the existing conditions because of the restoration projects being implemented on the Sacramento River. Therefore, this impact would be less than significant.

Impact Wild-16 (No-Action): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime No adverse effects on vernal pool–associated wildlife species would occur. This impact would be less than significant.

The No-Action Alternative would not affect the hydrology of vernal pools or have an adverse effect on vernal pool–associated wildlife species. Therefore, this impact would be less than significant.

Impact Wild-17 (No Action): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area Riparian habitat conditions would not differ from baseline conditions. This impact would be less than significant.

The No-Action Alternative would not conflict with existing plans promoting riparian habitat because conditions would not differ from the existing baseline. Therefore, this impact would be less than significant.

Extended Study Area

Lower Sacramento River and Delta

Impact Wild-18 (No-Action): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta The No-Action Alternative would not have a substantial adverse effect on special-status wildlife as a result of effects of continuing existing dam operation on riparian vegetation in the lower Sacramento River and Delta areas. This impact would be less than significant.

This impact would be similar to Impact Wild-14 (No-Action) for the primary study area. The No-Action Alternative would continue to alter the structure and species composition of riparian habitat along the lower Sacramento River and into the Sacramento–San Joaquin River Delta (Delta) resulting from continued operation of Shasta Dam. The dam's operation, which has led to the decrease in early successional riparian communities and an increase in the extent of mid-successional riparian communities, would continue under the No-Action Alternative, thus having consequences for habitats used by special-status wildlife species because early- and mid-successional riparian vegetation provide different habitat values. However, this change is expected to be small and is not

likely to have a substantial adverse effect on special-status species, nor would it be likely to cause a population to be eliminated. Therefore, this impact would be less than significant.

Impact Wild-19 (No-Action): Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Future conditions for bank swallows along the lower Sacramento River are not expected to differ substantially from the existing conditions because of the restoration projects being implemented on the Sacramento River. This impact would be less than significant.

This impact would be similar to Impact Wild-15 (No-Action) for the primary study area. The No-Action Alternative would continue to alter geomorphic processes along the lower Sacramento River due to operations of the dam. Loss of eroding banks during winter flood flows could limit the formation of suitable nesting habitat for bank swallow. However, future conditions for bank swallows are not expected to differ substantially from the existing conditions because of the restoration projects being implemented on the Sacramento River. Therefore, this impact would be less than significant.

Impact Wild-20 (No-Action): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability No adverse effects on vernal pool–associated wildlife species along the lower Sacramento River and in the Delta would occur. This impact would be less than significant.

This impact would be similar to Impact Wild-16 (No-Action) for the primary study area. The No-Action Alternative would not affect the hydrology of vernal pools or have an adverse effect on vernal pool–associated wildlife species. Therefore, this impact would be less than significant.

Impact Wild-21 (No-Action): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta No adverse effects on vernal pool–associated wildlife species along the lower Sacramento River and in the Delta would occur. This impact would be less than significant.

This impact would be similar to Impact Wild-17 (No-Action) for the primary study area. The No-Action Alternative would not conflict with existing plans promoting riparian habitat along the lower Sacramento River and in the Delta because conditions would not differ from the existing baseline. Therefore, this impact would be less than significant.

CVP/SWP Service Areas

Impact Wild-22 (No-Action): Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from

Modifications to Existing Flow Regimes The No-Action Alternative would not have a substantial adverse effect on special-status wildlife as a result of effects of continuing existing dam operation on riparian vegetation in the in the CVP/SWP service areas. This impact would be less than significant.

This impact would be similar to Impact Wild-14 (No-Action) for the primary study area and Impact Wild-18 (No-Action) for the lower Sacramento River and Delta. Although Shasta Dam would not be altered under the No-Action Alternative, CVP and SWP water storage, conveyance, and deliveries to the CVP/SWP service areas would change because of several reasonably foreseeable projects that would occur with or without enlarging Shasta Dam. CVP and SWP deliveries could increase or decrease based on any number of factors between now and 2030. Given environmental regulations to protect sensitive habitats and species, these changes are not likely to have a substantial adverse effect on special-status species, nor would they be likely to cause a population to be eliminated. This impact would be less than significant.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

CP1 focuses on increasing water supply reliability while contributing to increased survival of anadromous fish, actions that are consistent with the 2000 CALFED Record of Decision (ROD). In addition to the common features above, CP1 consists primarily of raising Shasta Dam 6.5 feet, an elevation change that would increase the reservoir's gross pool by 8.5 feet and would enlarge the total storage space in the reservoir by 256,000 acre-feet. Under this plan, Shasta Dam operational guidelines would continue unchanged, with the additional storage retained for water supply reliability and and increased anadromous fish survival.

Primary Study Area

Shasta Lake and Vicinity

Impact Wild-1 (CP1): Take and Loss of Habitat for the Shasta Salamander
Ground-disturbing activities associated with construction could result in direct take of the Shasta salamander, a State-listed species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant.

A 6.5-foot dam raise would result in a loss of habitat (limestone and nonlimestone) for the Shasta salamander. **[Note to Reviewer: In order to analyze the extent of the impact, NSR will determine the number of known occupied locations that will be inundated. In addition, NSR will determine the amount of limestone habitat that will be inundated in areas that were not subject to surveys. Impacts to unsurveyed nonlimestone habitat will be determined based on the acreage of vegetated habitat that will be inundated.]** Additional loss of habitat could result from relocation of facilities and dam construction. Further, significant impacts on Shasta salamanders could

occur in areas of suitable habitat where complete vegetation clearing is implemented and/or mechanized construction equipment is employed, if these activities occur during the wet season when salamanders are on the surface. Potential significant impacts include mortality of individuals due to equipment and vehicle traffic. This impact would be significant.

Impact Wild-2 (CP1): Take and Loss of Habitat for the Foothill Yellow-Legged Frog and Tailed Frog Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, an MSCS covered species, California Species of Special Concern, and USFS sensitive species, and of the tailed frog, a California Species of Special Concern. The potential for direct take is temporary, occurring only during project construction. In addition, the raising of Shasta Dam would result in the conversion of suitable riverine and riparian habitat to unsuitable lacustrine habitat. This impact would be potentially significant.

Implementation of CP1 would result in a loss of 60.01 acres of habitat for the foothill yellow-legged frog and tailed frog (40.51 acres of montane riparian habitat and 19.50 acres of riverine habitat). Further, impacts on foothill yellow-legged frogs and tailed frogs could occur due to project-associated construction activities in or near suitable habitat. Potential construction impacts include mortality of individuals due to equipment use and vehicle traffic. The species could also be adversely affected if construction activities or inundation result in degradation of its aquatic habitat (e.g., erosion and sedimentation or accidental fuel leaks and spills). This impact would be potentially significant.

Impact Wild-3 (CP1): Take and Loss of Habitat for the Northwestern Pond Turtle Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the northwestern pond turtle, an MSCS covered species, California Species of Special Concern, and USFS sensitive species. In addition, project implementation could result in the degradation of suitable aquatic habitat due to increased erosion and sedimentation. This impact would be potentially significant.

Implementation of CP1 would result in a loss of 67.22 acres of habitat for the northwestern pond turtle (40.51 acres of montane riparian habitat, 19.50 acres of riverine habitat, and 7.21 acres of freshwater emergent habitat). Further, this species is known to travel upland for nesting and overwintering. Thus, loss of upland habitats adjacent to suitable aquatic habitat (within approximately 666 feet (DFG 1994)) could adversely affect this species.

Direct take of northern pond turtle eggs or juveniles could occur during the first inundation of habitat above 1,070 feet above mean sea level (msl). Turtles may lay eggs in suitable habitat that subsequently becomes inundated, resulting in the death of the eggs or overwintering juveniles. Direct take of northwestern

pond turtles could also occur as a result of project-associated construction activities in or near suitable habitat. Potential construction impacts include mortality of individuals due to equipment use and vehicle traffic.

The species could also be adversely affected if construction activities or inundation result in degradation of its aquatic habitat (e.g., erosion and sedimentation or accidental fuel leaks and spills). This impact would be potentially significant.

Impact Wild-4 (CP1): Take of American Peregrine Falcons Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of American peregrine falcons, a State-listed endangered and MSCS covered species. This impact would be significant.

Cliffs within the Shasta Lake and vicinity portion of the primary study area provide suitable nesting habitat for the peregrine falcon. Thus, construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests. This impact would be significant.

No known eyries would be inundated due to project implementation, and the conversion of uplands to lacustrine habitat is not expected to adversely affect foraging habitat for the species as they frequently forage over water.

Impact Wild-5 (CP1): Take and Loss of Habitat for the Bald Eagle
Construction activities and project implementation would result in the loss of bald eagle nest/perch trees. This impact would be less than significant.

Project construction activities are not expected to result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of bald eagle nests because activities would not occur within 250 feet of known eagle nests Project construction activities and a 6.5-foot dam raise would result in a loss of nest/perch trees for bald eagles. **[Note to Reviewer: In order to determine the extent of the impact, NSR will determine the number of known nest sites to be inundated and estimate percentage of potential nest/perch trees to be inundated.]** Due to the amount of similar habitat in the region, this impact is expected to be less than significant.

The increase in the lake size is expected to positively affect the prey base for bald eagles through an increase in available habitat for its main prey, fish. **[Note to Reviewer: this assumption will need to be confirmed by fisheries biologist.]**

Impact Wild-6 (CP1): Take and Loss of Nesting and Foraging Habitat for the Northern Spotted Owl Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of

fertile eggs or nestlings or otherwise lead to the abandonment of nests of northern spotted owl, Federally listed as threatened and an MSCS covered species). In addition, the raising of Shasta Dam would result in the loss of habitat for this species. This impact would be significant.

A 6.5-foot dam raise would result in a loss of approximately 4, 803 acres of nesting and foraging habitat for the northern spotted owl (1,266 acres of montane hardwood, 1,636 acres of montane hardwood-conifer, 1,839 acres of ponderosa pine, and 62 acres of Sierran mixed conifer).

Further, construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Loss of fertile eggs or nesting adults, or any activities resulting in nest abandonment would be a potentially significant impact.

Impact Wild-7 (CP1): Take and Loss of Nesting Habitat for the Purple Martin Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of purple martins, a California Species of Special Concern. In addition, the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant.

Based on 2007 data, a 6.5-foot dam raise would result in could result in the loss of nest cavities in 10 of 11 known nest trees (each nest tree contains several potential nest cavities at various heights above the water). The purple martin population on Shasta Lake is one of only two known interior breeding locations for purple martins in California. This impact would be significant.

Further, construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Loss of fertile eggs or nesting adults, or any activities resulting in nest abandonment, would be potentially significant.

Impact Wild-8 (CP1): Take and Loss of Foraging and Nesting Habitat for Vaux's Swifts, Yellow Warblers, and Yellow-Breasted Chats Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Vaux's swifts, a California Species of Special Concern, and yellow warblers and yellow-breasted chats, both California Species of Special Concern and MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

A 6.5-foot dam raise would result in a loss of nesting and foraging habitat for the Vaux's swift (4,843 acres of montane hardwood, montane hardwood-conifer, montane riparian, ponderosa pine, and Sierran mixed conifer) and

yellow warbler and yellow-breasted chat (47.72 acres of montane riparian and freshwater emergent).

Further, construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Loss of fertile eggs or nesting adults, or any activities resulting in nest abandonment, would be potentially significant.

Impact Wild-9 (CP1): Take and Loss of Foraging and Nesting Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Sharp-Shinned Hawk, and Osprey Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Cooper's hawks and sharp-shinned hawks (California Species of Special Concern), northern goshawks (California Species of Special Concern and USFS sensitive), and long-eared owls and osprey (California Species of Special Concern and MSCS covered species). In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

A 6.5-foot dam raise would result in a loss of 3,166 acres of nesting and foraging habitat (montane hardwood-conifer, ponderosa pine, and Sierran mixed conifer) for the long-eared owl and northern goshawk, and 5,176 acres of nesting and foraging habitat for the Cooper's hawk and sharp-shinned hawk (blue oak–foothill pine, closed-cone–cypress montane hardwood, montane hardwood-conifer, ponderosa pine, and Sierran mixed conifer).

[Note to Reviewer: In order to determine the extent of the impact for osprey, NSR will determine the number of known nest sites to be inundated and the number of potential nest/perch trees to be inundated.]

In addition, construction activities during the nesting season such as tree removal and site grading could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests.

This impact would be potentially significant.

Impact Wild-10 (CP1): Take and Loss of Habitat for the Pacific Fisher Project implementation would result in a loss of habitat for the Pacific fisher (Federal candidate for listing, California Species of Special Concern, and USFS Sensitive species). Further, take (including mortality of individuals due to removal or destruction of active dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

A 6.5-foot dam raise would result in a loss of approximately 4,843 acres of habitat (1,265 acres montane hardwood, 1,636 acres of montane hardwood-conifer, 41 acres of montane riparian, 1,839 acres of ponderosa pine, and 62 acres of Sierran mixed conifer) for the Pacific fisher.

Further direct impacts could result from construction activities and vegetation clearing. Potential significant impacts include mortality of individuals due to removal or destruction of active dens.

This impact would be potentially significant.

Impact Wild-11 (CP1): Take and Loss of Habitat for Special-Status Bats and Ringtails Project implementation would result in a loss of habitat for special-status bats and the ringtail (MSCS covered species). Further, take (including mortality of individuals due to destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

A 6.5-foot dam raise would result in a loss of roosting and foraging habitat for special-status bats (e.g., snags and caves) and ringtails (snags, hollow logs, debris piles). Further, loss of young could occur during the first inundation (above 1,070 feet msl) of bat maternity colony habitat because active maternity colonies may be flooded before young are volant (capable of flight).

A 6.5-foot dam raise would also result in a loss of approximately 4,956 acres of foraging and denning habitat (113 acres of blue oak–foothill pine, 1,265 acres of montane hardwood, 1,636 acres of montane hardwood-conifer, 41 acres of montane riparian, 1,839 acres of ponderosa pine, and 62 acres of Sierran mixed conifer) for the ringtail.

Further, depending on the season, the removal of large trees with cavities could result in the loss of pallid bat and Townsend's big-eared bat colonies. Potential direct impacts include the take of a maternity colony (females and young) and the take of individuals in a hibernaculum, which could eliminate an entire colony due to the loss of pregnant females.

Destruction of cave/cliff habitat could result in the loss of Townsend's big-eared bat and western mastiff bat colonies. Potential direct impacts include the take of a maternity colony and the take of individuals in a hibernaculum, which could eliminate an entire colony due to the loss of pregnant females.

Spotted bats may also roost in caves in the Shasta Lake and vicinity portion of the primary study area. However, destruction of cave/cliff habitat is less likely to result in a significant impact on this population, as they do not roost colonially (i.e., destruction of a cave will not result in the loss of an entire nesting colony).

Noise and visual disturbances associated with construction activities may disrupt bats roosting in or directly adjacent to the project site.

Removal of large trees with snags, debris piles, and hollow logs could also result in the take of ringtails.

This impact would be potentially significant.

Impact Wild-12 (CP1): Loss of Foraging Habitat for the Merlin Project construction and implementation would result in a loss of foraging habitat for the merlin. This impact would be less than significant.

Project construction and implementation would result in a loss of XX acres of foraging habitat (merlins do not breed in the project area) for the merlin. However, due to the abundance of suitable foraging habitat in the area, this impact would be less than significant.

Impact Wild-13 (CP1): Take and Loss of Habitat for USFS Sensitive Species Fourteen of the wildlife species with potential to occur in the Shasta Lake and vicinity portion of the primary study area are designated USFS sensitive species: Shasta sideband, Wintu sideband, Shasta chaparral, Shasta hesperian, Shasta salamander, foothill yellow-legged frog, northwestern pond turtle, northern goshawk, American peregrine falcon, Pacific fisher, American marten, pallid bat, western red bat, and Townsend's big-eared bat. With the exception of the terrestrial mollusks, potential impacts on these species are discussed as separate impacts above.

Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in suitable habitat). In addition, project implementation would result in the loss of suitable habitat.

A 6.5-foot dam raise would result in a loss of habitat for USFS sensitive terrestrial mollusks. Direct take of USFS sensitive terrestrial mollusks could occur as a result of facility relocation construction and/or dam construction activities in or near aquatic habitats.

[Note to Reviewer: Impacts will be determined based on number of known sites inundated and loss of suitable habitat. Significance level has not yet been determined.]

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-14 (CP1): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Project implementation would result in a modified flow regime that would reduce the frequency, duration, and magnitude of intermediate to large flows below Shasta Dam during winter and spring in some years and increase the volume of flows from spring through fall of most years. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. However, these changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated special-status wildlife species. Therefore, this impact would be less than significant.

The operation of Shasta Dam has substantially modified the natural flow regime within the primary study area. Construction and operation of the dam has limited the frequency and magnitude of intermediate to large flows in winter and spring and increased flow volumes during the active growing season (primarily March–October). Project implementation would be expected to amplify these effects. Reductions in the magnitude, frequency, and duration of intermediate to large flows could alter the dynamics and structure of wetland and riparian habitat that support special-status wildlife species along the Sacramento River, downstream of Shasta Dam, throughout the primary study area (see the Botanical Resources technical report for more information). The effects of modified flow regimes would be attenuated downstream because of the cumulative tributary flow adding to the Sacramento River.

Special-status wildlife that could be affected by these impacts includes special-status invertebrates, reptiles, amphibians, birds, and mammals, as discussed below.

- *Invertebrates:* Blue elderberry shrubs, the host plant for the valley elderberry longhorn beetle, are found throughout much of the Sacramento River's riparian corridor. Shrubs within the corridor are unlikely to be affected by modification of the existing flow regimes. Elderberry shrubs are usually not found growing immediately next to the edge of the river, but are often found on terraces or higher up the bank. Most of the effect on flow regime, including inundation during the growing season, would be concentrated in a narrow strip along the river channel. Because most elderberry shrubs do not occur in this strip, the project is not likely to prevent establishment or substantially reduce the vigor of existing elderberry shrubs in the primary study area; therefore, this impact would be less than significant.
- *Reptiles and Amphibians:* The northwestern pond turtle has been documented within the Sacramento River, and suitable habitat for the species is provided within the primary study area, including tributaries. Western pond turtles rely on habitat types (e.g., oxbow lakes) that have relatively slow rates of formation. The creation of new off-channel water bodies generally requires several high-flow events that drive the processes of meander migration and channel cutoff, but these high-flow events happen only periodically. Similarly, off-channel water bodies gradually terrestrialize as they fill with sediment and organic detritus, and as they are colonized by vegetation. Consequently, activities that promote the formation of off-channel water bodies (e.g., levee setback, retirement of bank armor, retaining aspects of the natural flow regime) are key to maintaining this important type of habitat for pond turtles. The increase in mean stage elevation resulting from project implementation could provide additional aquatic habitat for the species during some months of some years. However, less aquatic habitat could be available for northwestern pond turtle during winter, spring, and

drought periods. Modifying the flow regime could also reduce riparian habitat along the river corridor that provides cover and foraging habitat to the species. However, these changes in habitat availability are not expected to substantially reduce the range of the species or reduce the size of the population; therefore, alteration of habitat for the northwestern pond turtle would be a less-than-significant impact.

- *Birds:* The riparian and wetland habitats along the Sacramento River floodway provide potential nesting and foraging habitat for a number of special-status birds that nest in riparian vegetation, including western yellow-billed cuckoo, California yellow warbler, and yellow-breasted chat. In addition, northern harrier and short-eared owl may nest in marshes in or adjacent to the stream channel. Other raptors, including Cooper's hawk, Swainson's hawk, white-tailed kite, bald eagle, and osprey, may nest in trees in the riparian or oak woodlands in the study area. As described above, altering the flow regime could alter some existing riparian habitat. Over time, there would be less early successional (willow, cottonwood, and herbaceous dominated) and more mid-successional (mixed woodland) vegetation and less acreage of recently disturbed areas from erosion or scouring after intermediate to large flows, as described in the Botanical Resources technical report. The potential change to riparian vegetation is not expected to result in the loss of nesting territories or affect reproductive success of riparian nesting birds. The impact on special-status bird species that nest in riparian vegetation would be less than significant.
- *Mammals:* Special-status mammals potentially occurring in the project area include pallid bat, western red bat, and ringtail. Riparian habitat can provide important foraging and roosting habitat for bats, but these species are not typically dependent on riparian habitats. There would be no reduction in potential foraging habitat and available riparian habitats, even if modified by the new flow regime below Shasta Dam, would still be sufficient for roosting habitat such that impacts on special-status bats would be less than significant. Potential changes in riparian vegetation along the river channel in the study area would not substantially reduce habitat for ringtail. Therefore, impacts on special-status mammals would be less than significant.

Impact Wild-15 (CP1): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could alter the geomorphic process of the Sacramento River and tributaries, including erosion and sediment deposition events in the primary study area. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

Bank swallow forms nesting colonies in steep-cut river banks that are subject to frequent erosion. There are five known colonies of bank swallow along the Sacramento River in the primary study area (CNDDB 2007). The alteration of river flows and amplified disruption of geomorphic processes could affect the formation of suitable nesting habitat for bank swallows. Reduction of intermediate to large flows could create a more static river system, which, although it may protect existing colonies from destruction, would reduce erosion needed to create bank swallow nesting habitat. Because the proposed project could affect dynamic river processes upon which bank swallows depend for creation of suitable nesting sites, this impact would be potentially significant.

Impact Wild-16 (CP1): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime Construction-related disturbances at Shasta Dam are not anticipated to disturb or permanently remove vernal pool habitat for special-status wildlife species in the primary study area. Altered flow regimes as a result of dam operation associated with the project are also not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status wildlife species. This impact would be less than significant.

Vernal pools are present in upland areas in the vicinity of the Sacramento River and its tributaries within the primary study area. These pools provide habitat for numerous special-status species, including vernal pool tadpole shrimp, vernal pool fairy shrimp, and western spadefoot toad. Critical habitat for three special-status wildlife species—Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp—is located within the primary study area. Critical habitat for these species in the primary study area is confined to vernal pool communities (USFWS 2006).

Vernal pools are generally not present within the active floodplain of regulated rivers in the primary study area and are not anticipated to be affected by dam construction, use of staging areas, and/or movement of heavy equipment during construction. Vernal pool special-status species would also not likely be affected by changes in flow regime in the primary study area. Therefore, this impact would be less than significant.

Impact Wild-17 (CP1): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the proposed project and local and regional plans to promote riparian habitat would be a potentially significant impact.

Several local and regional plans have been developed and adopted to promote conservation and enhancement of riparian habitat in the primary and extended study areas. These plans include the Riparian Habitat Joint Venture, Sacramento River Advisory Council Forum, Sacramento River Conservation Area Program, Sacramento River National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment, and others. (See the "Regulatory Setting" section of Chapter 1, "Affected Environment.")

Because the project may have a potentially significant impact on riparian vegetation within the primary and extended study areas, the quality of riparian habitat may be reduced or distribution may be limited. This potential consequence of the project could potentially conflict with the goals developed in local and regional conservation plans for the Sacramento River. Conflict of the project with the local and regional plans would be a potentially significant impact.

Extended Study Area

Lower Sacramento River and Delta By altering storage and operations at several reservoirs, CP1 would change flow regimes in several downstream waterways. In turn, these alterations to the flow regime could particularly affect riparian and wetland habitats along these waterways. The potential effects on wildlife are similar to those discussed for the primary study area above. However, potential impacts on flow and stages of the middle Sacramento River from this plan would be small, as potential noticeable changes in flows and stages would diminish downstream of Red Bluff because of effects of inflows from tributaries and of diversions and flood bypasses.

Impact Wild-18 (CP1): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Project implementation would result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large winter flows below Shasta Dam, into the lower Sacramento River and Delta, during winter and spring of some years, and increase the volume of flows from spring through fall. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on distribution or abundance of riparian-associated or aquatic special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. Therefore, this impact would be less than significant.

Several riparian-associated or aquatic special-status wildlife species may be present in the lower Sacramento River and Delta portion of the extended study area, such as giant garter snake, black rail, and salt-marsh harvest mouse. As discussed under impacts on special-status wildlife species in the primary study area, construction and operation of Shasta Dam has limited the frequency, duration, and magnitude of intermediate to large flows in winter and spring and

increased flow volumes during the active growing season (primarily March–October). Project implementation would be expected to amplify these effects. However, the effect of altered flow regimes by the project would attenuate in the Sacramento River below RBDD because of the inflows from tributaries and by other diversions and flood bypasses. Effects of flow alterations are also unlikely to extend to the Delta because the Central Valley's reservoirs and diversions are managed as a single integrated system (consisting of the CVP and SWP). The guidelines for this management, which are described in the Long-Term Operations Criteria and Plan (OCAP), have been designed to maintain standards for Delta inflow. CVP and SWP operations must be consistent with the OCAP to allow coverage by the OCAP biological opinion. Thus, this project is not anticipated to cause an sufficient alteration in Sacramento River flow to the Delta, which would alter riparian habitat for special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area.

This impact would be less than significant.

Impact Wild-19 (CP1): Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of high flows could alter the geomorphic process of river systems, including erosion and sediment deposition events in the Sacramento River downstream of RBDD. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

Bank swallow forms nesting colonies in steep-cut river banks that are subject to frequent erosion. There are more than 100 presumed extant colonies of bank swallow in Butte, Glenn, Colusa, Yuba, Yolo, Sutter, and Sacramento Counties (CNDDB 2007). Although the effect downstream of RBDD is anticipated to be less than in the primary study area because of inputs from tributaries, the alteration of river flows and amplified disruption of geomorphic processes could affect the formation of suitable nesting habitat for bank swallows in the Sacramento River downstream of RBDD. Reduction of intermediate to large flows could create a more static river system, which, although it may protect existing colonies from destruction, would reduce erosion needed to create bank swallow nesting habitat. Because the project could affect dynamic river processes upon which bank swallows depend for creation of suitable nesting sites, this impact would be potentially significant.

Impact Wild-20 (CP1): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability Altered flow regimes as a result of dam operation associated with the project are not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status

wildlife species in the lower Sacramento River and Delta portion of the extended study area. This impact would be less than significant.

Vernal pools are present in upland areas in the vicinity of the Sacramento River and its tributaries within the extended study area. These pools provide habitat for numerous special-status species. Critical habitat for three special-status species—vernal pool fairy shrimp, vernal pool tadpole shrimp, and Conservancy fairy shrimp—is located within the extended study area. Critical habitat for these species is confined to vernal pool communities (USFWS 2006).

Vernal pools are generally not present within the active floodplain of regulated rivers along the lower Sacramento River and in the Delta. Vernal pool special-status species would also not likely be affected by changes in flow regime in the extended study area. Therefore, this impact would be less than significant.

Impact Wild-21 (CP1): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat Along the Lower Sacramento River and in the Delta Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes and reduction of riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the project and local and regional plans to promote riparian habitat would be a potentially significant impact.

As discussed in Impact Wild-17 (CP1) for the upper Sacramento River, several local and regional plans have been developed and adopted to promote conservation and enhancement of riparian habitat in the primary and extended study areas. These plans include the Riparian Habitat Joint Venture, Sacramento River Advisory Council Forum, Sacramento River Conservation Area Program, *Sacramento River National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment*, and others. (See the “Regulatory Setting” section in Chapter 1, “Affected Environment,” of the Botanical Resources technical report.)

Because the project may have a potentially significant impact on riparian vegetation within the primary and extended study areas, the quality of riparian habitat may be reduced or distribution may be limited. This potential consequence of the project could conflict with the goals developed in local and regional conservation plans for the Sacramento River. Conflict of the project with the local and regional plans would be a potentially significant impact.

CVP/SWP Service Areas Increased water supplies or increased supply reliability could reduce a limitation on growth or on other activities that could affect wildlife in the primary and extended study areas, potentially resulting in significant effects. The effects of this growth would be analyzed in general plan

environmental impact reports and in project-level CEQA compliance documents for the local jurisdictions in which the growth would occur. Mitigation of these effects would be the responsibility of these local jurisdictions, and not of Reclamation. The expected increase in water yield relative to the entire CVP/SWP service areas would be small, however, and assuming that this new yield could be provided to any number of geographic areas within the CVP/SWP service areas, the project's impact on growth that could affect vegetation would be minor. Similarly, projects potentially affecting most aquatic habitats and listed species would require permits from DFG, the U.S. Army Corps of Engineers, and USFWS; it is anticipated that effects on these resources would be avoided, minimized, and/or mitigated during those agency consultations. Because the extent, location, and timing of induced growth is currently highly uncertain, and in the future the effects of this growth would be analyzed and mitigated during land use planning and environmental review for specific projects, growth-inducing effects on wildlife are not discussed further in this chapter. However, additional discussion of growth-inducing effects specific to the project alternatives is provided in the project's environmental impact statement/environmental impact report.

Impact Wild-22 (CP1): Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes Project implementation could result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large flows along the Sacramento River; however, based on the CALSIM II modeling results, the hydrologic effects in tributaries with CVP and SWP dams are expected to be less than impacts on the Sacramento River. The change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated or aquatic special-status wildlife species in the CVP/SWP service areas. Therefore, this impact would be less than significant.

Several riparian-associated or aquatic special-status wildlife species may be present in the CVP/SWP service areas, such as least Bell's vireo and arroyo toad. As discussed under impacts on special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area, construction and operation of Shasta Dam has limited the frequency and magnitude of intermediate to large flows in winter and spring and increased flow volumes during the active growing season (primarily March–October). Project implementation would be expected to amplify these effects. However, the effect of altered flow regimes by the project would attenuate in the Sacramento River below RBDD because of the inflows from tributaries and by other diversions and flood bypasses. Effects of flow alterations from Shasta Dam are also unlikely to extend to the CVP/SWP service areas because the reservoirs and diversions are managed as a single integrated system (consisting of the CVP and SWP). The guidelines for this management, which are described in the OCAP, have been designed to maintain standards for Delta inflow. CVP and SWP

operations must be consistent with the OCAP to allow coverage by the OCAP biological opinion. Thus, this project is not anticipated to cause a sufficient alteration in flow to the CVP/SWP service areas to have a substantial effect on riparian habitat upon which special-status wildlife species depend. Therefore, this impact would be less than significant.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

Like CP1, this comprehensive plan focuses on enlargement of Shasta Dam and Shasta Lake consistent with the goals of the 2000 CALFED ROD, and was formulated for the primary purposes of increased water supply reliability and increased survival of anadromous fish. In addition to the common features above, CP2 consists of raising Shasta Dam 12.5 feet, an elevation change that would increase the gross pool by 14.5 feet and enlarge the total storage space in the reservoir by 443,000 acre-feet.

Primary Study Area

Shasta Lake and Vicinity

Impact Wild-1 (CP2): Take and Loss of Habitat for the Shasta Salamander
Ground-disturbing activities associated with construction could result in direct take of the Shasta salamander, a State-listed species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant.

Impacts from inundation are expected to be similar to, but greater than, those described under CP1 due to the increased area of inundation and would be significant. Impacts from construction are expected to be similar to those described under CP1. **[Note to Reviewer: The increase in impact will be quantified in future versions.]**

Impact Wild-2 (CP2): Take and Loss of Habitat for the Foothill Yellow-Legged Frog and Tailed Frog Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, an MSCS covered species, California Species of Special Concern, and USFS sensitive species, and of the tailed frog, a California Species of Special Concern. The potential for direct take is temporary, occurring only during project construction. In addition, the raising of Shasta Dam would result in the conversion of suitable riverine and riparian habitat to unsuitable lacustrine habitat. This impact would be potentially significant.

This impact would be similar to Impact Wild-2 (CP1). Loss of habitat would be greater than under CP1 due to the increased inundation level. Habitat loss would total 72.59 acres (50.21 acres of montane riparian and 22.38 acres of riverine). This impact would be potentially significant.

Impact Wild-3 (CP2): Take and Loss of Habitat for the Northwestern Pond Turtle Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the northwestern pond turtle, an MSCS covered species, California Species of Special Concern, and USFS sensitive species. In addition, project implementation could result in the degradation of suitable aquatic habitat due to increased erosion and sedimentation. This impact would be potentially significant.

This impact would be similar to Impact Wild-3 (CP1). Loss of habitat would be greater than under CP1 due to the increased inundation level. Loss of montane riparian, riverine, and freshwater emergent habitat would equal 79.8 acres. This impact would be potentially significant.

Impact Wild-4 (CP2): Take of American Peregrine Falcons Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of American peregrine falcons, a State-listed endangered and MSCS covered species. This impact would be significant.

This impact would be identical to Impact Wild-4 (CP1) and would be significant.

Impact Wild-5 (CP2): Take and Loss of Habitat for the Bald Eagle Construction activities and project implementation would result in the loss of bald eagle nest/perch trees. This impact would be less than significant.

This impact would be similar to Impact Wild-5 (CP1). Loss of known bald eagle nests and potential nest/roost trees would be greater than under CP1 due to the increased inundation level. However, the impact would be less than significant.

Impact Wild-6 (CP2): Take and Loss of Nesting and Foraging Habitat for the Northern Spotted Owl Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of northern spotted owl, Federally listed as threatened and an MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat for this species. This impact would be significant.

This impact would be similar to Impact Wild-6 (CP1). Loss of habitat would be greater than under CP1 due to the increased inundation level (approximately 5,181 acres total). This impact would be significant.

Impact Wild-7 (CP2): Take and Loss of Nesting Habitat for the Purple Martin Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or

nestlings or otherwise lead to the abandonment of nests of purple martins, a California Species of Special Concern. In addition, the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant.

Based on 2007 data, a 6.5-foot dam raise would result in the loss of nest cavities in 10 of 11 known nest trees (each nest tree contains several potential nest cavities at various heights above the water). The purple martin population on Shasta Lake is one of only two known interior breeding locations for purple martins in California. This impact would be significant.

This impact would be similar to Impact Wild-7 (CP1). Loss of nesting cavities would be greater than under CP1 due to the increased inundation level. This impact would be significant.

Impact Wild-8 (CP2): Take and Loss of Foraging and Nesting Habitat for Vaux's Swifts, Yellow Warblers, and Yellow-Breasted Chats Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Vaux's swifts, a California Species of Special Concern, and yellow warblers and yellow-breasted chats, both California Species of Special Concern and MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

This impact would be similar to Impact Wild-8 (CP1). Loss of habitat would be greater than under CP1 due to the increased inundation level. Habitat loss for the Vaux's swift would equal 5,231.3 acres and habitat loss for yellow warblers and yellow-breasted chats would equal 57.42 acres. This impact would be potentially significant.

Impact Wild-9 (CP2): Take and Loss of Foraging and Nesting Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Sharp-Shinned Hawk, and Osprey Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Cooper's hawks and sharp-shinned hawks (California Species of Special Concern), northern goshawks (California Species of Special Concern and USFS sensitive), and long-eared owls and osprey (California Species of Special Concern and MSCS covered species). In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

This impact would be similar to Impact Wild-9 (CP1). Loss of habitat would be greater than under CP1 due to the increased inundation level. Habitat loss for the long-eared owl and northern goshawk would equal 3,413.27 and habitat loss for the Cooper's hawk and sharp-shinned hawk would equal 5,600.19 acres. This impact would be potentially significant.

Impact Wild-10 (CP2): Take and Loss of Habitat for the Pacific Fisher Project implementation would result in a loss of habitat for the Pacific fisher (Federal candidate for listing, California Species of Special Concern, and USFS Sensitive species). Further, take (including mortality of individuals due to removal or destruction of active dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

This impact would be similar to Impact Wild-10 (CP1). Loss of habitat would greater than under CP1 due to the increased inundation level. Habitat loss for the Pacific fisher would equal approximately 5,231 acres (1,354 acres montane hardwood, 1,768 acres of montane hardwood-conifer, 50 acres of montane riparian, 1,995 acres of ponderosa pine, and 62 acres of Sierran mixed conifer) for the Pacific fisher.

Further direct impacts could result from construction activities and vegetation clearing. Potential significant impacts include mortality of individuals due to removal or destruction of active dens.

This impact would be potentially significant.

Impact Wild-11 (CP2): Take and Loss of Habitat for Special-Status Bats and Ringtails Project implementation would result in a loss of habitat for special-status bats and the ringtail (MSCS covered species). Further, take (including mortality of individuals due to destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

This impact would be similar to Impact Wild-11 (CP1). Loss of habitat would greater than under CP1 due to the increased inundation level. Approximately 5,290 acres of foraging and denning habitat (124 acres of blue oak–foothill pine, 1,354 acres of montane hardwood, 1,768 acres of montane hardwood-conifer, 50 acres of montane riparian, 1,995 acres of ponderosa pine, and 62 acres of Sierran mixed conifer) for the ringtail would be lost. This impact would be potentially significant.

Impact Wild-12 (CP2): Loss of Foraging Habitat for the Merlin Project construction and implementation would result in a loss of foraging habitat for the merlin. This impact would be less than significant.

This impact would be similar to Impact Wild-12 (CP1). Loss of habitat would greater than under CP1 due to the increased inundation level. This impact would be less than significant.

Impact Wild-13 (CP2): Take and Loss of Habitat for USFS Sensitive Species Fourteen of the wildlife species with potential to occur in the Shasta Lake and vicinity portion of the study area are designated USFS sensitive species: Shasta sideband, Wintu sideband, Shasta chaparral, Shasta hesperian, Shasta salamander, foothill yellow-legged frog, northwestern pond turtle, northern

goshawk, American peregrine falcon, Pacific fisher, American marten, pallid bat, western red bat, and Townsend's big-eared bat. With the exception of the terrestrial mollusks, potential impacts on these species are discussed as separate impacts above.

Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in suitable habitat). In addition, project implementation would result in the loss of suitable habitat.

This impact would be similar to Impact Wild-13 (CP1). Loss of habitat would greater than under CP1 due to the increased inundation level. **[Significance level has not yet been determined.]**

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-14 (CP2): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Project implementation would result in a modified flow regime that would reduce the frequency, duration, and magnitude of intermediate and large flows below Shasta Dam during winter and spring in some years and increase the volume of flows from spring through fall of most years. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. However, these changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated special-status wildlife species. Therefore, this impact would be less than significant.

This impact would be similar to Impact Wild-14 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. The differences in flow regime among the alternatives are described in detail in the Hydrology and Hydraulics technical report. This impact would be less than significant.

Impact Wild-15 (CP2): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could alter the geomorphic process of the Sacramento River and tributaries, including erosion and sediment deposition events in the primary study area. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

This impact would be similar to Impact Wild-15 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. The differences in flow regime among the alternatives are described in detail in the Hydrology and Hydraulics technical report. This impact would be potentially significant.

Impact Wild-16 (CP2): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime Construction-related disturbances at Shasta Dam are not anticipated to disturb or permanently remove vernal pool habitat for special-status wildlife species along the upper Sacramento River. Altered flow regimes as a result of dam operation associated with the project are also not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status wildlife species. This impact would be less than significant.

This impact would be similar to Impact Wild-16 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. This impact would be less than significant.

Impact Wild-17 (CP2): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes and riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the proposed project and local and regional plans to promote riparian habitat would be a potentially significant impact.

This impact would be similar to Impact Wild-17 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. This impact would be potentially significant.

Extended Study Area

Lower Sacramento River and Delta

Impact Wild-18 (CP2): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Project implementation would result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate and large flows below Shasta Dam, into the lower Sacramento River and Delta, during winter and spring of some years, and increase the volume of flows from spring through fall. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on distribution or abundance of riparian-associated or aquatic special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. Therefore, this impact would be less than significant.

This impact would be similar to Impact Wild-18 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. This impact would be less than significant.

Impact Wild-19 (CP2): Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could alter the geomorphic process of river systems, including erosion and sediment deposition events in the Sacramento River downstream of RBDD. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

This impact would be similar to Impact Wild-19 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. This impact would be potentially significant.

Impact Wild-20 (CP2): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability Altered flow regimes as a result of dam operation associated with the project are not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. This impact would be less than significant.

This impact would be similar to Impact Wild-20 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. This impact would be less than significant.

Impact Wild-21 (CP2): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat Along the Lower Sacramento River and in the Delta Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes and riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the project and local and regional plans to promote riparian habitat would be a potentially significant impact.

This impact would be similar to Impact Wild-21 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. This impact would be potentially significant.

CVP/SWP Service Areas

Impact Wild-22 (CP2): Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes By altering storage and operations at several reservoirs associated with the CVP/SWP service areas, CP2 would change flow regimes in several downstream waterways. Project implementation could result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large flows along the Sacramento River; however, based on the CALSIM II modeling results, the hydrologic effects in tributaries with CVP and SWP dams are expected to be less than impacts on the Sacramento River. Most potential noticeable changes in flows and stages would diminish downstream of Red Bluff. The change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated or aquatic special-status wildlife species in the CVP/SWP service areas. Therefore, this impact would be less than significant.

This impact would be similar to Impact Wild-22 (CP1). The extent of the impact would be potentially greater under CP2 than under CP1 but less than under CP3. This impact would be less than significant.

CP3 – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply

CP3 is similar to CP1 and CP2. It focuses on the greatest practical enlargement of Shasta Dam and Shasta Lake consistent with the goals of the 2000 CALFED ROD, and was formulated for the primary purposes of increased water supply reliability and increased survival of anadromous fish. In addition to the common features above, CP3 consists of raising Shasta Dam 18.5 feet, an elevation change that would increase the gross pool by 20.5 feet and enlarge the total storage space in the reservoir by 634,000 acre-feet to 5.19 million acre-feet.

Primary Study Area

Shasta Lake and Vicinity

Impact Wild-1 (CP3): Take and Loss of Habitat for the Shasta Salamander
Ground-disturbing activities associated with construction could result in direct take of the Shasta salamander, a State-listed species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant.

Impacts from inundation are expected to be similar to but greater than those described under CP1 and CP2 due to the increased area of inundation, and would be significant. Impacts from construction are expected to be similar to those described under CP1. **[Note to Reviewer: The increase in impact level will be quantified in future versions.]**

Impact Wild-2 (CP3): Take and Loss of Habitat for the Foothill Yellow-Legged Frog and Tailed Frog Ground-disturbing activities associated with

construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, an MSCS covered species, California Species of Special Concern, and USFS sensitive species, and of the tailed frog, a California Species of Special Concern. The potential for direct take is temporary, occurring only during project construction. In addition, the raising of Shasta Dam would result in the conversion of suitable riverine and riparian habitat to unsuitable lacustrine habitat. This impact would be potentially significant.

This impact would be similar to Impacts Wild-2 (CP1) and Wild-2 (CP2). Loss of habitat would be greater than under CP1 and CP2 due to the increased inundation level. Habitat loss would total 108.81 acres (74.72 acres of montane riparian and 34.09 acres of riverine). This impact would be potentially significant.

Impact Wild-3 (CP3): Take and Loss of Habitat for the Northwestern Pond Turtle Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the northwestern pond turtle, an MSCS covered species, California Species of Special Concern, and USFS sensitive species. In addition, project implementation could result in the degradation of suitable aquatic habitat due to increased erosion and sedimentation. This impact would be potentially significant.

This impact would be similar to Impacts Wild-3 (CP1) and Wild-3 (CP2). Loss of habitat would be greater than under CP1 and CP2 due to the increased inundation level. Loss of montane riparian, riverine, and freshwater emergent habitat would equal 116.02 acres. This impact would be potentially significant.

Impact Wild-4 (CP3): Take of American Peregrine Falcons Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of American peregrine falcons, a State-listed endangered and MSCS covered species. This impact would be significant.

This impact would be identical to Impact Wild-4 (CP1) and would be significant.

Impact Wild-5 (CP3): Take and Loss of Habitat for the Bald Eagle Construction activities and project implementation would result in the loss of bald eagle nest/perch trees. This impact would be significant.

This impact would be similar to Impacts Wild-5 (CP1) and Wild-5 (CP2). Loss of known eagle nests and potential nest/perch trees would be greater than under either CP1 or CP2 due to the increased inundation level. However, this impact would be less than significant.

Impact Wild-6 (CP3): Take and Loss of Nesting and Foraging Habitat for the Northern Spotted Owl Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of northern spotted owl, Federally listed as threatened and an MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat for this species. This impact would be significant.

This impact would be similar to Impacts Wild-6 (CP1) and Wild-6 (CP2). Loss of habitat would be greater than under either CP1 or CP2 due to the increased inundation level (approximately 5,757 acres total). This impact would be significant.

Impact Wild-7 (CP3): Take and Loss of Nesting Habitat for the Purple Martin Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of purple martins, a California Species of Special Concern. In addition, the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant.

Based on 2007 data, a 6.5-foot dam raise would result in could result in the loss of nest cavities in 10 of 11 known nest trees (each nest tree contains several potential nest cavities at various heights above the water). The purple martin population on Shasta Lake is one of only two known interior breeding locations for purple martins in California. This impact would be significant.

This impact would be similar to Impacts Wild-7 (CP1) and Wild-7 (CP2). Loss of loss of nesting cavities would be greater than under either CP1 or CP2 due to the increased inundation level. This impact would be significant.

Impact Wild-8 (CP3): Take and Loss of Foraging and Nesting Habitat for Vaux's Swifts, Yellow Warblers, and Yellow-breasted Chats Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Vaux's swifts, a California Species of Special Concern, and yellow warblers and yellow-breasted chats, both California Species of Special Concern and MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

This impact would be similar to Impacts Wild-8 (CP1) and Wild-8 (CP2). Loss of habitat would be greater than under either CP1 or CP2 due to the increased inundation level. Habitat loss for the Vaux's swift would equal 5,831.75 acres and habitat loss for yellow warblers and the yellow-breasted chat would equal 81.93 acres. This impact would be potentially significant.

Impact Wild-9 (CP3): Take and Loss of Foraging and Nesting Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Sharp-Shinned Hawk, and Osprey Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Cooper's hawks and sharp-shinned hawks (California Species of Special Concern), northern goshawks (California Species of Special Concern and USFS sensitive), and long-eared owls and osprey (California Species of Special Concern and MSCS covered species). In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

This impact would be similar to Impacts Wild-9 (CP1) and Wild-9 (CP2). Loss of habitat would be greater than under either CP1 or CP2 due to the increased inundation level. Habitat loss for the long-eared owl and northern goshawk would equal 4,270.00 acres and habitat loss for the Cooper's hawk and sharp-shinned hawk would equal 6241.43 acres. This impact would be potentially significant.

Impact Wild-10 (CP3): Take and Loss of Habitat for the Pacific Fisher Project implementation would result in a loss of habitat for the Pacific fisher (Federal candidate for listing, California Species of Special Concern, and USFS Sensitive species). Further, take (including mortality of individuals due to removal or destruction of active dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

This impact would be similar to Impacts Wild-10 (CP1) and Wild-10 (CP2). A 6.5-foot dam raise would result in a loss of approximately 5,832 acres of habitat (1,487 acres of montane hardwood, 1,970 acres of montane hardwood-conifer, 75 acres of montane riparian, 2,230 acres of ponderosa pine, and 70 acres of Sierran mixed conifer) for the Pacific fisher.

Further direct impacts could result from construction activities and vegetation clearing. Potential significant impacts include mortality of individuals due to removal or destruction of active dens.

This impact would be potentially significant.

Impact Wild-11 (CP3): Take and Loss of Habitat for Special-Status Bats and Ringtails Project implementation would result in a loss of habitat for special-status bats and the ringtail (MSCS covered species). Further, take (including mortality of individuals due to destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

This impact would be similar to Impacts Wild-11 (CP1) and Wild-11 (CP2). Loss of habitat would greater than under either CP1 or CP2 due to the increased

inundation level. Approximately 5,971 acres of foraging and denning habitat (139 acres of blue oak–foothill pine, 1,487 acres of montane hardwood, 1,970 acres of montane hardwood-conifer, 75 acres of montane riparian, 2,230 acres of ponderosa pine, and 70 acres of Sierran mixed conifer) for the ringtail would be lost. This impact would be potentially significant.

Impact Wild-12 (CP3): Loss of Foraging Habitat for the Merlin Project construction and implementation would result in a loss of foraging habitat for the merlin. This impact would be less than significant.

This impact would be similar to Impacts Wild-12 (CP1) and Wild-12 (CP2). Loss of habitat would greater than under either CP1 or CP2 due to the increased inundation level. This impact would be less than significant.

Impact Wild-13 (CP3): Take and Loss of Habitat for USFS Sensitive Species Fourteen of the wildlife species with potential to occur in the Shasta Lake and vicinity portion of the study area are designated USFS sensitive species: Shasta sideband, Wintu sideband, Shasta chaparral, Shasta hesperian, Shasta salamander, foothill yellow-legged frog, northwestern pond turtle, northern goshawk, American peregrine falcon, Pacific fisher, American marten, pallid bat, western red bat, and Townsend's big-eared bat. With the exception of the terrestrial mollusks, potential impacts on these species are discussed as separate impacts above.

Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in suitable habitat). In addition, project implementation would result in the loss of suitable habitat.

This impact would be similar to Impacts Wild-13 (CP1) and Wild-13 (CP2). Loss of habitat would greater than under either CP1 or CP2 due to the increased inundation level. **[Significance level has not yet been determined.]**

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-14 (CP3): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Project implementation would result in a modified flow regime that would reduce the frequency, duration, and magnitude of intermediate to large flows below Shasta Dam during winter and spring in some years and increase the volume of flows from spring through fall of most years. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. However, these changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated special-status wildlife species. Therefore, this impact would be less than significant.

This impact would be similar to Impact Wild-14 (CP1). Altered flow regimes as a result of dam operation associated with the project could be greatest under

CP3 because the alterations of flow regimes would be more substantial than under CP1 and CP2. The differences in flow regime among the alternatives are described in detail in the Hydrology and Hydraulics technical report. This impact would be less than significant.

Impact Wild-15 (CP3): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could alter the geomorphic process of the Sacramento River, including erosion and sediment deposition events in the primary study area. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

This impact would be similar to Impact Wild-15 (CP1). Modifications of geomorphic processes associated with the project could be greatest under CP3 because the alterations of the flow regime would be more substantial than under CP1 and CP2. The differences in flow regime among the alternatives are described in detail in the Hydrology and Hydraulics technical report. This impact would be potentially significant.

Impact Wild-16 (CP3): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime Construction-related disturbances at Shasta Dam are not anticipated to disturb or permanently remove vernal pool habitat for special-status wildlife species along the upper Sacramento River. Altered flow regimes as a result of dam operation associated with the project are also not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status wildlife species. This impact would be less than significant.

This impact would be similar to Impact Wild-16 (CP1). The extent of the impact could be greatest under CP3 because the alterations of flow regimes would be more substantial than under CP1 and CP2; however, this impact would be less than significant because vernal pool habitats are not expected to be affected by the flows.

Impact Wild-17 (CP3): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of the flow regime and riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the proposed project and local and regional plans to promote riparian habitat would be a potentially significant impact.

This impact would be similar to Impact Wild-17 (CP1). These effects associated with the project could be greatest under CP3 because the alterations of flow regimes would be more substantial than under CP1 and CP2. This impact would be potentially significant.

Extended Study Area

Lower Sacramento River and Delta

Impact Wild-18 (CP3): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Project implementation would result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large flows below Shasta Dam, into the lower Sacramento River and Delta, during winter and spring of some years, and increase the volume of flows from spring through fall. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on distribution or abundance of riparian-associated or aquatic special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. Therefore, this impact would be less than significant.

This impact would be similar to Impact Wild-18 (CP1). These effects associated with the project could be greatest under CP3 because the alterations of flow regimes would be more substantial than under CP1 and CP2. This impact would be less than significant.

Impact Wild-19 (CP3): Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could alter the geomorphic process of river systems, including erosion and sediment deposition events in the Sacramento River downstream of RBDD. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

This impact would be similar to Impact Wild-19 (CP1). These effects associated with the project could be greatest under CP3 because the alteration of flow regimes would be more substantial than under CP1 and CP2. This impact would be potentially significant.

Impact Wild-20 (CP3): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability Altered flow regimes as a result of dam operation associated with the project are not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status

wildlife species in the lower Sacramento River and Delta portion of the extended study area. This impact would be less than significant.

This impact would be similar to Impact Wild-20 (CP1). These effects associated with the project could be greatest under CP3 because the alterations of flow regimes would be more substantial than under CP1 and CP2. This impact would be less than significant.

Impact Wild-21 (CP3): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes and riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the project and local and regional plans to promote riparian habitat would be a potentially significant impact.

This impact would be similar to Impact Wild-21 (CP1). These effects associated with CP3 could be greatest under CP3 because the alterations of flow regimes would be more substantial than under CP1 and CP2. This impact would be potentially significant.

CVP/SWP Service Areas

Impact Wild-22 (CP3): Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes By altering storage and operations at several reservoirs associated with the CVP/SWP service areas, CP3 would change flow regimes in several downstream waterways. Project implementation could result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large flows along the Sacramento River; however, based on the CALSIM II modeling results, the hydrologic effects in tributaries with CVP and SWP dams are expected to be less than impacts on the Sacramento River. Most potential noticeable changes in flows and stages would diminish downstream of Red Bluff. The change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated or aquatic special-status wildlife species in the CVP/SWP service areas. Therefore, this impact would be less than significant.

This impact would be similar to Impact Wild-22 (CP1). These effects associated with the project could be greatest under CP3 because the alterations of flow regimes would be more substantial than under CP1 and CP2. This impact would be less than significant.

CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus

The primary function of CP4 is to address survival of anadromous fish, while still improving water supply reliability. It focuses on increasing the volume of cold water available to the temperature control device through reservoir reoperations, and on raising Shasta Dam by 18.5 feet. As with CP3 and the common features above, this raise would increase the gross pool by 20.5 feet and enlarge total reservoir storage space by 634,000 acre-feet.

Primary Study Area

Shasta Lake and Vicinity

Impact Wild-1 (CP4): Take and Loss of Habitat for the Shasta Salamander Ground-disturbing activities associated with construction could result in direct take of the Shasta salamander, a State-listed species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant.

This impact would be identical to Impact Wild-1 (CP3) and would be significant.

Impact Wild-2 (CP4): Take and Loss of Habitat for the Foothill Yellow-Legged Frog and Tailed Frog Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, an MSCS covered species, California Species of Special Concern, and USFS sensitive species, and of the tailed frog, a California Species of Special Concern. The potential for direct take is temporary, occurring only during project construction. In addition, the raising of Shasta Dam would result in the conversion of suitable riverine and riparian habitat to unsuitable lacustrine habitat. This impact would be potentially significant.

This impact would be identical to Impact Wild-2 (CP3) and would be potentially significant.

Impact Wild-3 (CP4): Take and Loss of Habitat for the Northwestern Pond Turtle Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the northwestern pond turtle, an MSCS covered species, California Species of Special Concern, and USFS sensitive species. In addition, project implementation could result in the degradation of suitable aquatic habitat due to increased erosion and sedimentation. This impact would be potentially significant.

This impact would be identical to Impact Wild-3 (CP3) and would be potentially significant.

Impact Wild-4 (CP4): Take of American Peregrine Falcons Construction activities during the nesting season such as tree removal, site grading, and

excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of American peregrine falcons, a State-listed endangered and MSCS covered species. This impact would be significant.

This impact would be identical to Impact Wild-4 (CP3) and would be significant.

Impact Wild-5 (CP4): Incidental Take and Loss of Habitat for the Bald Eagle Construction activities and project implementation would result in the loss of bald eagle nest/perch trees. This impact would be significant.

This impact would be identical to Impact Wild-5 (CP3) and would be less than significant significant.

Impact Wild-6 (CP4): Take and Loss of Nesting and Foraging Habitat for the Northern Spotted Owl Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of northern spotted owl, Federally listed as threatened and an MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat for this species. This impact would be significant.

This impact would be identical to Impact Wild-6 (CP3) and would be significant.

Impact Wild-7 (CP4): Take and Loss of Nesting Habitat for the Purple Martin Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of purple martins, a California Species of Special Concern. In addition, the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant.

Based on 2007 data, a 6.5-foot dam raise would result in could result in the loss of nest cavities in 10 of 11 known nest trees (each nest tree contains several potential nest cavities at various heights above the water). The purple martin population on Shasta Lake is one of only two known interior breeding locations for purple martins in California. This impact would be significant.

This impact would be identical to Impact Wild-7 (CP3) and would be significant.

Impact Wild-8 (CP4): Take and Loss of Foraging and Nesting Habitat for Vaux's Swifts, Yellow Warblers, and Yellow-breasted Chats Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Vaux's swifts, a California Species of Special Concern, and yellow warblers and yellow-breasted chats,

both California Species of Special Concern and MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

This impact would be identical to Impact Wild-8 (CP3) and would be potentially significant.

Impact Wild-9 (CP4): Take and Loss of Foraging and Nesting Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Sharp-Shinned Hawk, and Osprey Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Cooper's hawks and sharp-shinned hawks (California Species of Special Concern), northern goshawks (California Species of Special Concern and USFS sensitive), and long-eared owls and osprey (California Species of Special Concern and MSCS covered species). In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

This impact would be identical to Impact Wild-9 (CP3) and would be potentially significant.

Impact Wild-10 (CP4): Take and Loss of Habitat for the Pacific Fisher Project implementation would result in a loss of habitat for the Pacific fisher (Federal candidate for listing, California Species of Special Concern, and USFS Sensitive species). Further, take (including mortality of individuals due to removal or destruction of active dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

This impact would be identical to Impact Wild-10 (CP3) and would be potentially significant.

Impact Wild-11 (CP4): Take and Loss of Habitat for Special-Status Bats and Ringtails Project implementation would result in a loss of habitat for special-status bats and the ringtail (MSCS covered species). Further, take (including mortality of individuals due to destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

This impact would be identical to Impact Wild-11 (CP3) and would be potentially significant.

Impact Wild-12 (CP4): Loss of Foraging Habitat for the Merlin Project construction and implementation would result in a loss of foraging habitat for the merlin. This impact would be less than significant.

This impact would be identical to Impact Wild-12 (CP3) and would be less than significant.

Impact Wild-13 (CP4): Take and Loss of Habitat for USFS Sensitive Species Fourteen of the wildlife species with potential to occur in the Shasta Lake and vicinity portion of the study area are designated USFS sensitive species: Shasta sideband, Wintu sideband, Shasta chaparral, Shasta hesperian, Shasta salamander, foothill yellow-legged frog, northwestern pond turtle, northern goshawk, American peregrine falcon, Pacific fisher, American marten, pallid bat, western red bat, and Townsend's big-eared bat. With the exception of the terrestrial mollusks, potential impacts on these species are discussed as separate impacts above.

Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in suitable habitat). In addition, project implementation would result in the loss of suitable habitat.

This impact would be identical to Impact Wild-13 (CP3). **[Significance level has not yet been determined.]**

Upper Sacramento River (Shasta Dam to Red Bluff)
Impact Wild-14 (CP4): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Project implementation would result in a modified flow regime that would reduce the frequency, duration, and magnitude of intermediate to large flows below Shasta Dam during winter and spring in some years and increase the volume of flows from spring through fall of most years. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. However, these changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated special-status wildlife species. Therefore, this impact would be less than significant.

This impact would be the same as Impact Wild-14 (CP1) and would be less than significant.

Impact Wild-15 (CP4): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could alter the geomorphic process of the Sacramento River and tributaries, including erosion and sediment deposition events in the primary study area. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

This impact would be the same as Impact Wild-15 (CP1) and would be potentially significant.

Impact Wild-16 (CP4): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Dam Construction and from Changes in Flow

Regime Construction-related disturbances at Shasta Dam are not anticipated to disturb or permanently remove vernal pool habitat for special-status wildlife species in the primary study area. An altered flow regime as a result of dam operation associated with the project is also not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status wildlife species. This impact would be less than significant.

This impact would be the same as Impact Wild-16 (CP1) and would be less than significant.

Impact Wild-17 (CP4): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes and riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the proposed project and local and regional plans to promote riparian habitat would be a potentially significant impact.

This impact would be the same as Impact Wild-17 (CP1) and would be potentially significant.

Extended Study Area

Lower Sacramento River and Delta

Impact Wild-18 (CP4): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Project implementation would result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large flows below Shasta Dam, into the lower Sacramento River and Delta during winter and spring of some years, and increase the volume of flows from spring through fall. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on distribution or abundance of riparian-associated or aquatic special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. Therefore, this impact would be less than significant.

This impact would be the same as Impact Wild-17 (CP1) and would be less than significant.

Impact Wild-19 (CP4): Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could

alter the geomorphic process of river systems, including erosion and sediment deposition events in the Sacramento River downstream of RBDD. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

This impact would be the same as Impact Wild-18 (CP1) and would be potentially significant.

Impact Wild-20 (CP4): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife Along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability Altered flow regimes as a result of dam operation associated with the project are not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. This impact would be less than significant.

This impact would be the same as Impact Wild-19 (CP1) and would be less than significant.

Impact Wild-21 (CP4): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes and riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the project and local and regional plans to promote riparian habitat would be a potentially significant impact.

This impact would be the same as Impact Wild-21 (CP1) and would be potentially significant.

CVP/SWP Service Areas

Impact Wild-22 (CP4): Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes Project implementation could result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large flows along the Sacramento River; however, based on the CALSIM II modeling results, the hydrologic effects in tributaries with CVP and SWP dams are expected to be less than impacts on the Sacramento River. The change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on the distribution or

abundance of riparian-associated or aquatic special-status wildlife species in the CVP/SWP service areas. Therefore, this impact would be less than significant.

This impact would be the same as Impact Wild-22 (CP1) and would be less than significant.

CP5 – 18.5-Foot Dam Raise, Combination Plan

CP5 would address both the primary and secondary planning objectives. It includes enlarging Shasta Dam 18.5 feet, which is consistent with the objectives of the 2000 CALFED ROD, and also includes the common features above. In addition, CP5 involves (1) implementing environmental restoration features along the lower reaches of major tributaries to Shasta Lake, (2) constructing shoreline fish habitat around Shasta Lake, and (3) constructing either additional or improved recreation features at various locations around Shasta Lake to increase the value of the recreational experience. Formulation of specific environmental restoration features and increased recreation components is not yet complete but will be included in the draft Feasibility Report.

Primary Study Area

Shasta Lake and Vicinity

Impact Wild-1 (CP5): Take and Loss of Habitat for the Shasta Salamander
Ground-disturbing activities associated with construction could result in direct take of the Shasta salamander, a State-listed species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant.

This impact would be identical to Impact Wild-1 (CP3) and would be significant.

Impact Wild-2 (CP5): Take and Loss of Habitat for the Foothill Yellow-Legged Frog and Tailed Frog Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, an MSCS covered species, California Species of Special Concern, and USFS sensitive species, and of the tailed frog, a California Species of Special Concern. The potential for direct take is temporary, occurring only during project construction. In addition, the raising of Shasta Dam would result in the conversion of suitable riverine and riparian habitat to unsuitable lacustrine habitat. This impact would be potentially significant.

This impact would be identical to Impact Wild-2 (CP3) and would be potentially significant.

Impact Wild-3 (CP5): Take and Loss of Habitat for the Northwestern Pond Turtle Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in or adjacent to riverine or riparian habitat) of the northwestern pond turtle, an MSCS covered species,

California Species of Special Concern, and USFS sensitive species. In addition, project implementation could result in the degradation of suitable aquatic habitat due to increased erosion and sedimentation. This impact would be potentially significant.

This impact would be identical to Impact Wild-3 (CP3) and would be potentially significant.

Impact Wild-4 (CP5): Take of American Peregrine Falcons Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of American peregrine falcons, a State-listed endangered and MSCS covered species. This impact would be significant.

This impact would be identical to Impact Wild-4 (CP3) and would be significant.

Impact Wild-5 (CP5): Take and Loss of Habitat for the Bald Eagle Construction activities during the bald eagle nesting season such as tree removal, site grading, and use of explosives could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests. In addition, construction activities and project implementation would result in the loss of bald eagle nest/perch trees. This impact would be significant.

This impact would be identical to Impact Wild-5 (CP3) and would be less than significant.

Impact Wild-6 (CP5): Take and Loss of Nesting and Foraging Habitat for the Northern Spotted Owl Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of northern spotted owl, Federally listed as threatened and an MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat for this species. This impact would be significant.

This impact would be identical to Impact Wild-6 (CP3) and would be significant.

Impact Wild-7 (CP5): Take and Loss of Nesting Habitat for the Purple Martin Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of purple martins, a California Species of Special Concern. In addition, the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant.

Based on 2007 data, a 6.5-foot dam raise would result in could result in the loss of nest cavities in 10 of 11 known nest trees (each nest tree contains several

potential nest cavities at various heights above the water). The purple martin population on Shasta Lake is one of only two known interior breeding locations for purple martins in California. This impact would be significant.

This impact would be identical to Impact Wild-7 (CP3) and would be significant.

Impact Wild-8 (CP5): Take and Loss of Foraging and Nesting Habitat for Vaux's Swifts, Yellow Warblers, and Yellow-breasted Chats Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Vaux's swifts, a California Species of Special Concern, and yellow warblers and yellow-breasted chats, both California Species of Special Concern and MSCS covered species. In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

This impact would be identical to Impact Wild-8 (CP3) and would be potentially significant.

Impact Wild-9 (CP5): Take and Loss of Foraging and Nesting Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Sharp-Shinned Hawk, and Osprey Construction activities during the nesting season such as tree removal, site grading, and excavation could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of Cooper's hawks and sharp-shinned hawks (California Species of Special Concern), northern goshawks (California Species of Special Concern and USFS sensitive), and long-eared owls and osprey (California Species of Special Concern and MSCS covered species). In addition, the raising of Shasta Dam would result in the loss of habitat, including nesting habitat, for these species. This impact would be potentially significant.

This impact would be identical to Impact Wild-9 (CP3) and would be potentially significant.

Impact Wild-10 (CP5): Take and Loss of Habitat for the Pacific Fisher Project implementation would result in a loss of habitat for the Pacific fisher (Federal candidate for listing, California Species of Special Concern, and USFS Sensitive species). Further, take (including mortality of individuals due to removal or destruction of active dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

This impact would be identical to Impact Wild-10 (CP3) and would be potentially significant.

Impact Wild-11 (CP5): Take and Loss of Habitat for Special-Status Bats and Ringtails Project implementation would result in a loss of habitat for special-status bats and the ringtail (MSCS covered species). Further, take (including

mortality of individuals due to destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

This impact would be identical to Impact Wild-11 (CP3) and would be potentially significant.

Impact Wild-12 (CP5): Loss of Foraging Habitat for the Merlin Project construction and implementation would result in a loss of foraging habitat for the merlin. This impact would be less than significant.

This impact would be identical to Impact Wild-12 (CP3) and would be less than significant.

Impact Wild-13 (CP5): Take and Loss of Habitat for USFS Sensitive Species Fourteen of the wildlife species with potential to occur in the Shasta Lake and vicinity portion of the study area are designated USFS sensitive species: Shasta sideband, Wintu sideband, Shasta chaparral, Shasta hesperian, Shasta salamander, foothill yellow-legged frog, northwestern pond turtle, northern goshawk, American peregrine falcon, Pacific fisher, American marten, pallid bat, western red bat, and Townsend's big-eared bat. With the exception of the terrestrial mollusks, potential impacts on these species are discussed as separate impacts above.

Ground-disturbing activities associated with construction could result in direct take (e.g., due to operation of equipment in suitable habitat). In addition, project implementation would result in the loss of suitable habitat.

This impact would be identical to Impact Wild-12 (CP3). **[Significance level has not yet been determined.]**

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-14 (CP5): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Project implementation would result in a modified flow regime that would reduce the frequency, duration, and magnitude of intermediate to large flows below Shasta Dam during winter and spring in some years and increase the volume of flows from spring through fall of most years. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. However, these changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated special-status wildlife species. Therefore, this impact would be less than significant.

This impact would be the same as Impact Wild-14 (CP3) and would be less than significant.

Impact Wild-15 (CP5): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could alter the geomorphic process of the Sacramento River and tributaries, including erosion and sediment deposition events in the primary study area. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

This impact would be the same as Impact Wild-15 (CP3) and would be potentially significant.

Impact Wild-16 (CP5): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Dam Construction and from Changes in Flow Regime Construction-related disturbances at Shasta Dam are not anticipated to disturb or permanently remove vernal pool habitat for special-status wildlife species in the primary study area. An altered flow regime as a result of dam operation associated with the project is also not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status wildlife species. This impact would be less than significant.

This impact would the same as Impact Wild-16 (CP3) and would be less than significant.

Impact Wild-17 (CP5): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes and riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the proposed project and local and regional plans to promote riparian habitat would be a potentially significant impact.

This impact would be the same as Impact Wild-17 (CP3) and would be potentially significant.

Extended Study Area

Lower Sacramento River and Delta

Impact Wild-18 (CP5): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Project implementation would result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large flows below Shasta Dam, into the lower Sacramento River and Delta, during winter and spring of some years, and

increase the volume of flows from spring through fall. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on distribution or abundance of riparian-associated or aquatic special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. Therefore, this impact would be less than significant.

This impact would be the same as Impact Wild-18 (CP3) and would be less than significant.

Impact Wild-19 (CP5): Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Reductions in the magnitude, duration, and frequency of intermediate to large flows could alter the geomorphic process of river systems, including erosion and sediment deposition events in the Sacramento River downstream of RBDD. Nesting habitat for bank swallows may be reduced by limiting flows that cause bank erosion. Loss of habitat for bank swallow nesting colonies would be a potentially significant impact.

This impact would be the same as Impact Wild-19 (CP3) and would be potentially significant.

Impact Wild-20 (CP5): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability Altered flow regimes as a result of dam operation associated with the project are not anticipated to temporarily disturb or permanently remove vernal pool habitat for special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. This impact would be less than significant.

This impact would be the same as Impact Wild-20 (CP3) and would be less than significant.

Impact Wild-21 (CP5): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta Several conservation and management plans have been adopted in the primary and extended study areas that have goals of promoting riparian habitat along the Sacramento River. Because alteration of flow regimes and riverine geomorphic processes could occur as a result of the proposed project, riparian habitat could be affected such that the goals of the local and regional plans are less likely to be attained. The potential conflict between the project and local and regional plans to promote riparian habitat would be a potentially significant impact.

This impact would be the same as Impact Wild-21 (CP3) and would be potentially significant.

CVP/SWP Service Areas
Impact Wild-22 (CP5): Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes Project implementation could result in modified flow regimes that would reduce the frequency, duration, and magnitude of intermediate to large flows along the Sacramento River; however, based on the CALSIM II modeling results, the hydrologic effects in tributaries with CVP and SWP dams are expected to be less than impacts on the Sacramento River. The change in surface and subsurface hydrology could affect habitats adjacent to the river channel that provide habitat for special-status wildlife species. These changes are unlikely to result in substantial effects on the distribution or abundance of riparian-associated or aquatic special-status wildlife species in the CVP/SWP service areas. Therefore, this impact would be less than significant.

This impact would be the same as Impact Wild-22 (CP3) and would be less than significant.

Mitigation Measures

[Note to Reviewer: Need to add in discussion of mitigation habitat for MSCS Species and State and Federally listed species.]

No-Action Alternative

No mitigation measures are required for this alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation is required for Impacts Wild-5 (CP1), Wild-12 (CP1), Wild-14 (CP1), Wild-16 (CP1), Wild-18 (CP1), Wild-20 (CP1), and Wild-22 (CP1). Mitigation is provided below for the remaining impacts of CP1 on wildlife species.

Mitigation Measure Wild-1 (CP1): Conduct Preconstruction Survey for Shasta Salamander and Implement Best Management Practices Potential mitigation measures include preconstruction surveys of facility relocation areas, dam construction areas, and all known salamander locations to be inundated. Shasta salamanders found during the surveys shall be moved to suitable habitat outside of the impact boundary.

Loss of limestone habitat cannot be mitigated for. Mitigation out of kind (i.e., enhancement of nonlimestone habitat in the project vicinity) is a potential option.

Mitigation Measure Wild-2 (CP1): Conduct Preconstruction Survey for Foothill Yellow-Legged Frog and Tailed Frog and Implement Best

Management Practices In order to avoid and/or minimize impacts on the foothill yellow-legged frog and tailed frog, the following measures shall be implemented:

- A preconstruction survey for yellow-legged frog and tailed frog larvae and/or eggs shall be conducted by a qualified biologist prior to the onset of facility relocation or dam construction ground disturbing activities in or adjacent to perennial stream habitat. This survey shall be conducted within the construction boundary no more than 2 weeks prior to the start of instream construction activities. If larvae or eggs are detected, the biologist shall relocate them to a suitable location outside of the construction boundary.

- In the event that a yellow-legged frog or tailed frog is observed within the construction boundary, the contractor shall temporarily halt construction activities in the vicinity until the frog has been moved to a safe location with suitable habitat outside of the construction limits.

- Mitigation measures for addressing erosion and sedimentation and accidental spills shall be fully implemented to mitigate for potential impacts on habitat for the yellow-legged frog and tailed frog due to sedimentation and accidental spills.

Mitigation Measure Wild-3 (CP1): Conduct Preconstruction Survey for Northwestern Pond Turtle and Implement Best Management Practices In order to avoid and/or minimize impacts on the northwestern pond turtle, the following measures shall be implemented:

- A minimum of one survey for pond turtle nests shall be conducted by a qualified biologist a maximum of 1 week prior to the onset of facility relocation or dam construction ground-disturbing activities in or adjacent to northwestern pond turtle habitat. If a pond turtle nest is found, the biologist shall flag the site and determine whether construction activities can avoid affecting the nest. If the nest cannot be avoided, the nest shall be excavated by the biologist and reburied at a suitable location outside of the construction limits.

- In the event that a pond turtle is observed within the construction limits, the contractor shall temporarily halt construction activities until the turtle has been moved by a qualified biologist to a safe location within suitable habitat outside of the construction limits.

- Mitigation measures for addressing erosion and sedimentation and accidental spills shall be fully implemented to mitigate the potential indirect impacts on potential dispersal habitat due to sedimentation and accidental spills.

Mitigation Measure Wild-4 (CP1): Conduct Preconstruction Survey for American Peregrine Falcon and Establish Buffer Zones In order to avoid and/or minimize impacts on nesting American peregrine falcons, the following measures shall be implemented:

- Vegetation removal, grading, and other construction activities shall be scheduled to avoid the nesting season for the peregrine falcon to the extent possible. The nesting season for this species in Shasta County extends from February 1 through September 31. If construction occurs outside of the breeding season, no further mitigation is necessary. If the breeding season cannot be completely avoided, the following measure shall be implemented.

- A qualified biologist shall conduct a minimum of one preconstruction survey for this species within the disturbance area boundary and a 250-foot buffer around the boundary. The survey shall be conducted no more than 15 days prior to the initiation of construction in any given area. The preconstruction survey shall be used to ensure that no nests of this species within or immediately adjacent to the site would be disturbed during project implementation. If an active nest is found, a qualified biologist shall determine the extent of a construction-free buffer zone to be established around the nest until the young have fledged.

Mitigation Measure Wild-6 (CP1): [To be determined]

Mitigation Measure Wild-7 (CP1): Conduct Preconstruction Survey for Purple Martin and Establish Buffer Zones In order to avoid and/or minimize impacts on nesting purple martins, the following measures shall be implemented:

- Vegetation removal, grading, and other construction activities shall be scheduled to avoid the nesting season for these species to the extent possible. The nesting season for this species in Shasta County extends from February 1 through August 31. If construction occurs outside of the breeding season, no further mitigation is necessary. If the breeding season cannot be completely avoided, the following measure shall be implemented.

- A qualified biologist shall conduct a minimum of one preconstruction survey for these species within the disturbance area boundary and a 250-foot buffer around the boundary. The survey shall be conducted no more than 15 days prior to the initiation of construction in any given area. The preconstruction survey shall be used to ensure that no nests of this species within or immediately adjacent to the site would be disturbed during project implementation. If an active nest is found, a qualified biologist shall determine the extent of a construction-free

buffer zone to be established around the nest until the young have fledged.

[Note to Reviewer: Loss of habitat for purple martins may be significant and mitigation may not be possible.]

Mitigation Measure Wild-8 (CP1): Conduct Preconstruction Survey for Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffer Zones In order to avoid and/or minimize impacts on nesting Vaux's swifts, yellow warblers, and yellow-breasted chats, the following measures shall be implemented:

- Vegetation removal, grading, and other construction activities shall be scheduled to avoid the nesting season for these species to the extent possible. The nesting season for these species in Shasta County extends from February 1 through August 31. If construction occurs outside of the breeding season, no further mitigation is necessary. If the breeding season cannot be completely avoided, the following measure shall be implemented.

- A qualified biologist shall conduct a minimum of one preconstruction survey for these species within the disturbance area boundary and a 250-foot buffer around the boundary. The survey shall be conducted no more than 15 days prior to the initiation of construction in any given area. The preconstruction survey shall be used to ensure that no nests of these species within or immediately adjacent to the site would be disturbed during project implementation. If an active nest is found, a qualified biologist shall determine the extent of a construction-free buffer zone to be established around the nest until the young have fledged.

Mitigation Measure Wild-9 (CP1): Conduct Preconstruction Survey for Nesting Special-Status Raptors and Establish Buffer Zones In order to avoid and/or minimize impacts on nesting special-status raptors, the following measures shall be implemented:

- Vegetation removal, grading, and other construction activities shall be scheduled to avoid the nesting season for these species to the extent possible. The nesting season for this species in Shasta County extends from February 1 through August 31. If construction occurs outside of the breeding season, no further mitigation is necessary. If the breeding season cannot be completely avoided, the following measure shall be implemented.

- A qualified biologist shall conduct a minimum of one preconstruction survey for these species within the disturbance area boundary and a 250-foot buffer around the boundary. The survey shall be conducted no

more than 15 days prior to the initiation of construction in any given area. The preconstruction survey shall be used to ensure that no nests of this species within or immediately adjacent to the site would be disturbed during project implementation. If an active nest is found, a qualified biologist shall determine the extent of a construction-free buffer zone to be established around the nest until the young have fledged.

Mitigation Measure Wild-10 (CP1): [To be determined]

Mitigation Measure Wild-11 (CP1): Conduct Preconstruction Survey for Special-Status Bats and Ringtails and Establish Buffer Zones In order to avoid and/or minimize impacts on bats and ringtails, the following measures shall be implemented:

- A predemolition survey for roosting bats should be conducted prior to the inundation or destruction of any caves or trees 12 inches or greater in diameter at breast height. The survey should be conducted by a qualified bat biologist. No activities that would result in disturbance to active roosts would proceed prior to the completed surveys. If no active roosts are found, then no further action would be warranted. If a maternity roost is present, a qualified bat biologist would determine the extent of construction-free zones around active nurseries since bats are known to abandon young when disturbed. If either a maternity roost or hibernacula is present, either of the following measures should be implemented. DFG should also be notified of any active nurseries within the construction zone.

- If active maternity roosts or hibernacula are found, the project could be redesigned to avoid the loss of the building or tree occupied by the roost.

- If an active nursery roost is located and the project cannot be redesigned to avoid removal of the occupied tree or structure, demolition of that tree or structure should commence before maternity colonies form (i.e., prior to March 1) or after young are volant (flying) (i.e., after July 31). The disturbance-free buffer zones described in Mitigation 1 should be observed during the maternity roost season (March 1–July 31).

If a nonbreeding bat hibernacula is found in a structure or tree scheduled to be razed, the individuals should be safely evicted, under the direction of a qualified bat biologist (as determined by a memorandum of understanding with DFG), by opening the roosting area to allow air flow through the cavity. Demolition should then follow no less than the following day (i.e., there should be no less than 1 night between initial disturbance for air flow and the demolition). This action should allow bats to leave during dark hours, thus increasing their chance

of finding new roosts with a minimum of potential predation during daylight. Trees with roosts that need to be removed should first be disturbed at dusk, just prior to removal that same evening, to allow bats to escape during the darker hours.

Mitigation Measure Wild-13 (CP1). [Reviewers: The significance level of Impact Wild-13 (CP1) has not yet been determined.]

Mitigation Measure Wild-15 (CP1): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow in the Primary Study Area Reclamation shall implement Mitigation Measure Bot-6 (CP1), "Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," described in Chapter 2, "Environmental Consequences," of the Botanical Resources technical report. Development and implementation of this plan would include assessment of the feasibility of implementing operation procedures for Shasta Dam that would reduce or eliminate adverse effects on bankfull and overbank flows and meander migration rates. These procedures would be designed to promote creation of bank swallow nesting habitat. Implementation of this mitigation measure would reduce Impact Wild-15 (CP1) to a less-than-significant level.

Mitigation Measure Wild-17 (CP1): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area Reclamation shall implement Mitigation Measure Bot-6 (CP1), "Develop and Implement a Riverine Ecosystem Mitigationand Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," described in Chapter 2, "Environmental Consequences," of the Botanical Resources technical report. Implementation of this mitigation measure would reduce Impact Wild-17 (CP1) to a less-than-significant level.

Mitigation Measure Wild-19 (CP1): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Reclamation shall implement Mitigation Measure Bot-6 (CP1), "Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," described in Chapter 2, "Environmental Consequences," of the Botanical Resources technical report. Development and implementation of this plan would include assessment of the feasibility of implementing operation procedures for Shasta Dam that would reduce or eliminate adverse effects on bankfull and overbank flows and meander migration rates. These procedures would be designed to promote creation of bank swallow nesting habitat. Implementation of this mitigation measure would reduce Impact Wild-19 (CP1) to a less-than-significant level.

Mitigation Measure Wild-21 (CP1): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta Reclamation shall implement Mitigation Measure Bot-6 (CP1), "Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," described in Chapter 2, "Environmental Consequences," of the Botanical Resources technical report. Implementation of this mitigation measure would reduce Impact Wild-21 (CP1) to a less-than-significant level.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation is required for Impacts Wild-5 (CP2), Wild-12 (CP2), Wild-14 (CP2), Wild-16 (CP2), Wild-18 (CP2), Wild-20 (CP2), and Wild-22 (CP2). Mitigation is provided below for the remaining impacts of CP2 on wildlife species.

Mitigation Measure Wild-1 (CP2): Conduct Preconstruction Survey for Shasta Salamander and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Implementation of this mitigation measure would reduce Impact Wild-1 (CP2) to a less-than-significant level.

Mitigation Measure Wild-2 (CP2): Conduct Preconstruction Survey for Foothill Yellow-Legged Frog and Tailed Frog and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-2 (CP1). Implementation of this mitigation measure would reduce Impact Wild-2 (CP2) to a less-than-significant level.

Mitigation Measure Wild-3 (CP2): Conduct Preconstruction Survey for Northwestern Pond Turtle and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-3 (CP1). Implementation of this mitigation measure would reduce Impact Wild-3 (CP2) to a less-than-significant level.

Mitigation Measure Wild-4 (CP2): Conduct Preconstruction Survey for American Peregrine Falcon and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-4 (CP1). Implementation of this mitigation measure would reduce Impact Wild-4 (CP2) to a less-than-significant level.

Mitigation Measure Wild-6 (CP2): [To be determined]

Mitigation Measure Wild-7 (CP2): Conduct Preconstruction Survey for Purple Martin and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-7 (CP1). **[Note to Reviewer: Loss of**

habitat for purple martins may be significant and mitigation may not be possible.]

Mitigation Measure Wild-8 (CP2): Conduct Preconstruction Survey for Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-8 (CP1). Implementation of this mitigation measure would reduce Impact Wild-8 (CP2) to a less-than-significant level.

Mitigation Measure Wild-9 (CP2): Conduct Preconstruction Survey for Nesting Special-Status Raptors and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-9 (CP1). Implementation of this mitigation measure would reduce Impact Wild-9 (CP2) to a less-than-significant level.

Mitigation Measure Wild-10 (CP2): [To be determined]

Mitigation Measure Wild-11 (CP2): Conduct Preconstruction Survey for Special-Status Bats and Ringtails and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-11 (CP1). Implementation of this mitigation measure would reduce Impact Wild-11 (CP2) to a less-than-significant level.

Mitigation Measure Wild-13 (CP2). [Reviewers: The significance level of Impact Wild-13 (CP2) has not yet been determined.]

Mitigation Measure Wild-15 (CP2): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow in the Primary Study Area This mitigation measure is identical to Mitigation Measure Wild-15 (CP1). Implementation of this mitigation measure would reduce Impact Wild-15 (CP2) to a less-than-significant level.

Mitigation Measure Wild-17 (CP2): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area This mitigation measure is identical to Mitigation Measure Wild-17 (CP1). Implementation of this mitigation measure would reduce Impact Wild-17 (CP2) to a less-than-significant level.

Mitigation Measure Wild-19 (CP2): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes This mitigation measure is identical to Mitigation Measure Wild-19 (CP1). Implementation of this mitigation measure would reduce Impact Wild-19 (CP2) to a less-than-significant level.

Mitigation Measure Wild-21 (CP2): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of

Promoting Riparian Habitat along the Lower Sacramento River and in the Delta This mitigation measure is identical to Mitigation Measure Wild-21 (CP1). Implementation of this mitigation measure would reduce Impact Wild-21 (CP2) to a less-than-significant level.

CP3 – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply

No mitigation is required for Impacts Wild-5 (CP3), Wild-12 (CP3), Wild-14 (CP3), Wild-16 (CP3), Wild-18 (CP3), Wild-20 (CP3), and Wild-22 (CP3). Mitigation is provided below for the remaining impacts of CP3 on wildlife species.

Mitigation Measure Wild-1 (CP3): Conduct Preconstruction Survey for Shasta Salamander and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Implementation of this mitigation measure would reduce Impact Wild-1 (CP3) to a less-than-significant level.

Mitigation Measure Wild-2 (CP3): Conduct Preconstruction Survey for Foothill Yellow-Legged Frog and Tailed Frog and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-2 (CP1). Implementation of this mitigation measure would reduce Impact Wild-2 (CP3) to a less-than-significant level.

Mitigation Measure Wild-3 (CP3): Conduct Preconstruction Survey for Northwestern Pond Turtle and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-3 (CP1). Implementation of this mitigation measure would reduce Impact Wild-3 (CP3) to a less-than-significant level.

Mitigation Measure Wild-4 (CP3): Conduct Preconstruction Survey for American Peregrine Falcon and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-4 (CP1). Implementation of this mitigation measure would reduce Impact Wild-4 (CP3) to a less-than-significant level.

Mitigation Measure Wild-6 (CP3): [To be determined]

Mitigation Measure Wild-7 (CP3): Conduct Preconstruction Survey for Purple Martin and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-7 (CP1). **[Note to Reviewer: Loss of habitat for purple martins may be significant and mitigation may not be possible.]**

Mitigation Measure Wild-8 (CP3): Conduct Preconstruction Survey for Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure

Wild-8 (CP1). Implementation of this mitigation measure would reduce Impact Wild-8 (CP3) to a less-than-significant level.

Mitigation Measure Wild-9 (CP3): Conduct Preconstruction Survey for Nesting Special-Status Raptors and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-9 (CP1). Implementation of this mitigation measure would reduce Impact Wild-9 (CP2) to a less-than-significant level.

Mitigation Measure Wild-10 (CP3): [To be determined]

Mitigation Measure Wild-11 (CP3): Conduct Preconstruction Survey for Special-Status Bats and Ringtails and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-11 (CP1). Implementation of this mitigation measure would reduce Impact Wild-11 (CP3) to a less-than-significant level.

Mitigation Measure Wild-13 (CP3). [Reviewers: The significance level of Impact Wild-13 (CP1) has not yet been determined.]

Mitigation Measure Wild-15 (CP3): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow in the Primary Study Area This mitigation measure is identical to Mitigation Measure Wild-15 (CP1). Implementation of this mitigation measure would reduce Impact Wild-15 (CP3) to a less-than-significant level.

Mitigation Measure Wild-17 (CP3): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area This mitigation measure is identical to Mitigation Measure Wild-17 (CP1). Implementation of this mitigation measure would reduce Impact Wild-17 (CP3) to a less-than-significant level.

Mitigation Measure Wild-19 (CP3): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes This mitigation measure is identical to Mitigation Measure Wild-19 (CP1). Implementation of this mitigation measure would reduce Impact Wild-19 (CP3) to a less-than-significant level.

Mitigation Measure Wild-21 (CP3): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta This mitigation measure is identical to Mitigation Measure Wild-21 (CP1). Implementation of this mitigation measure would reduce Impact Wild-21 (CP3) to a less-than-significant level.

CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus

No mitigation is required for Impacts Wild-5 (CP4), Wild-12 (CP4), Wild-14 (CP4), Wild-16 (CP4), Wild-18 (CP4), Wild-20 (CP4), and Wild-22 (CP4). Mitigation is provided below for the remaining impacts of CP4 on wildlife species.

Mitigation Measure Wild-1 (CP4): Conduct Preconstruction Survey for Shasta Salamander and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Implementation of this mitigation measure would reduce Impact Wild-1 (CP4) to a less-than-significant level.

Mitigation Measure Wild-2 (CP4): Conduct Preconstruction Survey for Foothill Yellow-Legged Frog and Tailed Frog and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-2 (CP1). Implementation of this mitigation measure would reduce Impact Wild-2 (CP4) to a less-than-significant level.

Mitigation Measure Wild-3 (CP4): Conduct Preconstruction Survey for Northwestern Pond Turtle and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-3 (CP1). Implementation of this mitigation measure would reduce Impact Wild-3 (CP4) to a less-than-significant level.

Mitigation Measure Wild-4 (CP4). Conduct Preconstruction Survey for American Peregrine Falcon and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-4 (CP1). Implementation of this mitigation measure would reduce Impact Wild-4 (CP4) to a less-than-significant level.

Mitigation Measure Wild-6 (CP4): [To be determined]

Mitigation Measure Wild-7 (CP4): Conduct Preconstruction Survey for Purple Martin and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-7 (CP1). **[Note to Reviewer: Loss of habitat for purple martins may be significant and mitigation may not be possible.]**

Mitigation Measure Wild-8 (CP4): Conduct Preconstruction Survey for Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-8 (CP1). Implementation of this mitigation measure would reduce Impact Wild-8 (CP4) to a less-than-significant level.

Mitigation Measure Wild-9 (CP4): Conduct Preconstruction Survey for Nesting Special-Status Raptors and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-9 (CP1). Implementation of

this mitigation measure would reduce Impact Wild-9 (CP4) to a less-than-significant level.

Mitigation Measure Wild-10 (CP4): [To be determined]

Mitigation Measure Wild-11 (CP4): Conduct Preconstruction Survey for Special-Status Bats and Ringtails and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-11 (CP1). Implementation of this mitigation measure would reduce Impact Wild-11 (CP4) to a less-than-significant level.

Mitigation Measure Wild-13 (CP4). [Reviewers: The significance level of Impact Wild-13 (CP1) has not yet been determined.]

Mitigation Measure Wild-15 (CP4): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow in the Primary Study Area This mitigation measure is identical to Mitigation Measure Wild-15 (CP1). Implementation of this mitigation measure would reduce Impact Wild-15 (CP4) to a less-than-significant level.

Mitigation Measure Wild-17 (CP4): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area This mitigation measure is identical to Mitigation Measure Wild-17 (CP1). Implementation of this mitigation measure would reduce Impact Wild-17 (CP4) to a less-than-significant level.

Mitigation Measure Wild-19 (CP4): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes This mitigation measure is identical to Mitigation Measure Wild-19 (CP1). Implementation of this mitigation measure would reduce Impact Wild-19 (CP4) to a less-than-significant level.

Mitigation Measure Wild-21 (CP4): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta This mitigation measure is identical to Mitigation Measure Wild-21 (CP1). Implementation of this mitigation measure would reduce Impact Wild-21 (CP4) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Mitigation Measure Wild-1 (CP5): Conduct Preconstruction Survey for Shasta Salamander and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Implementation of this mitigation measure would reduce Impact Wild-1 (CP5) to a less-than-significant level.

Mitigation Measure Wild-2 (CP5): Conduct Preconstruction Survey for Foothill Yellow-Legged Frog and Tailed Frog and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-2 (CP1). Implementation of this mitigation measure would reduce Impact Wild-2 (CP5) to a less-than-significant level.

Mitigation Measure Wild-3 (CP5): Conduct Preconstruction Survey for Northwestern Pond Turtle and Implement Best Management Practices This mitigation measure is identical to Mitigation Measure Wild-3 (CP1). Implementation of this mitigation measure would reduce Impact Wild-3 (CP5) to a less-than-significant level.

Mitigation Measure Wild-4 (CP5): Conduct Preconstruction Survey for American Peregrine Falcon and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-4 (CP1). Implementation of this mitigation measure would reduce Impact Wild-4 (CP5) to a less-than-significant level.

Mitigation Measure Wild-6 (CP5): [To be determined]

Mitigation Measure Wild-7 (CP5): Conduct Preconstruction Survey for Purple Martin and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-7 (CP1). **[Note to Reviewer: Loss of habitat for purple martins may be significant and mitigation may not be possible.]**

Mitigation Measure Wild-8 (CP5): Conduct Preconstruction Survey for Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-8 (CP1). Implementation of this mitigation measure would reduce Impact Wild-8 (CP5) to a less-than-significant level.

Mitigation Measure Wild-9 (CP5): Conduct Preconstruction Survey for Nesting Special-Status Raptors and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-9 (CP1). Implementation of this mitigation measure would reduce Impact Wild-9 (CP5) to a less-than-significant level.

Mitigation Measure Wild-10 (CP5): [To be determined]

Mitigation Measure Wild-11 (CP5): Conduct Preconstruction Survey for Special-Status Bats and Ringtails and Establish Buffer Zones This mitigation measure is identical to Mitigation Measure Wild-11 (CP1). Implementation of this mitigation measure would reduce Impact Wild-11 (CP5) to a less-than-significant level.

Mitigation Measure Wild-13 (CP5). [Reviewers: The significance level of Impact Wild-13 (CP1) has not yet been determined.]

Mitigation Measure Wild-15 (CP5): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow in the Primary Study Area This mitigation measure is identical to Mitigation Measure Wild-15 (CP1). Implementation of this mitigation measure would reduce Impact Wild-15 (CP5) to a less-than-significant level.

Mitigation Measure Wild-17 (CP5): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area This mitigation measure is identical to Mitigation Measure Wild-17 (CP1). Implementation of this mitigation measure would reduce Impact Wild-17 (CP5) to a less-than-significant level.

Mitigation Measure Wild-19 (CP5): Implement Mitigation Measure Bot-6 (CP1) to Reduce Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes This mitigation measure is identical to Mitigation Measure Wild-19 (CP1). Implementation of this mitigation measure would reduce Impact Wild-19 (CP5) to a less-than-significant level.

Mitigation Measure Wild-21 (CP5): Implement Mitigation Measure Bot-6 (CP1) to Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta This mitigation measure is identical to Mitigation Measure Wild-21 (CP1). Implementation of this mitigation measure would reduce Impact Wild-21 (CP5) to a less-than-significant level.

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Chapter 3
Cumulative Effects

This chapter provides an analysis of overall cumulative impacts of the project alternatives and the No-Action Alternative taken together with other past, present, and reasonably foreseeable future projects producing related impacts, as required by the California Environmental Quality Act Guidelines (State CEQA Guidelines) (Title 14, Section 15130 of the California Code of Regulations (14 CCR Section 15130)) and National Environmental Policy Act (NEPA) implementing regulations (Title 40, Section 1508.7 of the Code of Federal Regulations (40 CFR 1508.7)). This analysis follows applicable guidance provided by the Council on Environmental Quality (CEQ) in *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997) and *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ 2005), and in applicable guidance and directives provided by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) in the most recent public review draft of Reclamation's *NEPA Handbook* (Reclamation 2000).

The CEQ regulations that implement provisions of NEPA define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions over time and differ from indirect impacts (40 CFR 1508.8). They are caused by the incremental increase in total environmental effects when the evaluated project is added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can thus arise from causes that are totally unrelated to the project being evaluated, and the analysis of cumulative impacts looks at the life cycle of the effects, not the project at issue. These impacts can be either adverse or beneficial.

Cumulative impacts are defined in the State CEQA Guidelines (14 CCR Section 15355) as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." A cumulative impact occurs from "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (14 CCR Section 15355(b)).

Consistent with the State CEQA Guidelines (14 CCR Section 15130(a)), the discussion of cumulative impacts in this chapter focuses on significant and

potentially significant cumulative impacts. The State CEQA Guidelines (14 CCR Section 15130(b)) state that:

> The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact.

Methods and Assumptions

Although NEPA guidelines do not provide specific guidance on how to conduct a cumulative impact analysis, Reclamation's *NEPA Handbook* (Reclamation 2000) states that an environmental impact statement (EIS) should identify associated actions (past, present, or future) that, when viewed with the proposed or alternative actions, may have significant cumulative impacts. Cumulative impacts should not be speculative, but should be based on known long-range plans, regulations, or operating agreements.

The State CEQA Guidelines identify two basic methods for establishing the cumulative environment in which the project is to be considered: the use of a list of past, present, and probable future projects (the "list approach") or the use of adopted projections from a general plan, other regional planning document, or certified environmental impact report (EIR) for such a planning document (the "plan approach"). For this cumulative effects analysis, the list approach and the plan approach have been combined in quantitative and qualitative assessments of cumulative effects to generate the most reliable future projections possible. The methodology for each of these assessments is described below.

Quantitative Assessments

Quantitative assessments were made where feasible for each of the resource areas. For this resource area, the effects of actions related to water resources and of development projects were assessed quantitatively. The methodologies for these quantitative assessments are described below.

Quantitative Assessment of Actions Related to Water Resources

The quantitative assessment of actions related to water resources relied primarily on CALSIM II modeling of hydrologic conditions potentially affecting vegetation and habitat types or special-status plant species. The model was run using two different baselines: modeling runs of "existing conditions," which were based on 2005 facilities and demands (a 2005 baseline), and

modeling runs of "future conditions," which were based on forecasted 2030 demands and reasonably foreseeable projects and facilities (a 2030 baseline). In this modeling, reasonably foreseeable projects and facilities were as follows:

- Forecasted 2030 level of demands for water supplies
- New Placer County Water Agency (PCWA) pump station along the American River
- Freeport Regional Water Project (FRWP)
- Delta Mendota Canal intertie
- Contra Costa Water District (CCWD) Alternative Intake Project
- Sacramento Valley Water Management—Phase 8 Short-Term Agreement regarding water transfer supplies

A detailed description of the CALSIM II model, the modeling methodology used in evaluations, and key assumptions (including a description of forecasted 2030 facilities and demands) are provided in the modeling appendix. Summaries of the analysis and modeling results are provided in the Hydrology and Hydraulics technical report. Moreover, Reclamation and the California Department of Water Resources (DWR) have developed "common assumptions"—reasonable assumptions that have been built into the CALSIM II model and are the standard for evaluating systemwide hydrologic and water supply conditions under existing and future conditions.

Cumulative effects on hydrologic conditions were quantified by comparing modeling runs with conditions under the No-Action Alternative (2030) to modeling runs with the 2005 baseline. For example, the No-Action Alternative (2030) was compared to existing conditions (2005 baseline) to identify the cumulative effects of reasonably foreseeable projects and facilities on hydrologic conditions. Similarly, comparisons of project alternatives to existing conditions (to satisfy CEQA requirements) and to the No-Action Alternative (2030) (to satisfy NEPA requirements) identified the combined cumulative effect of project alternatives and other foreseeable projects and facilities.

Quantitative Assessment of Potential Development Actions

The quantitative assessment of development actions relied on a geographic information system (GIS)–based analysis of the land uses designated by the adopted general plans of all cities and counties in the study area. This analysis used the following data layers:

- Existing land cover (CDF 2002)
- General plan land use designations (UCD 2004)

- Boundaries of the Central Valley Project (CVP) and State Water Project (SWP) service areas (derived from Reclamation 2003 and Reclamation 2006, respectively)

Through this analysis, the extent, location, and type of existing natural vegetation within areas designated for residential, commercial, or industrial development were identified for the entire study area. Although it is very unlikely that all of this vegetation would be eliminated by developed land uses in the next several decades, it is likely that much of it would be eliminated or adversely affected. Thus, this analysis indicates the habitat types potentially affected by development actions and the potential extent of effects on wildlife species. The potential conversion of natural vegetation to agricultural land uses was also included in the analysis.

A more detailed description of the methods of this analysis, and its results, are provided in Attachment 6 of the Botanical Resources technical report. Within the primary study area, individual development projects were also included in the qualitative assessment.

Qualitative Assessment of Other Actions

In addition to the quantitative assessments described previously, past, present, and reasonably foreseeable future actions were assessed qualitatively. Existing information on current and historical conditions was used to evaluate the combined effects of past actions on wildlife resources. For present and reasonably foreseeable future actions, a list of related actions was compiled. The combined effects of these past, present, and reasonably foreseeable future actions, and of the actions that were evaluated quantitatively, were then evaluated together with those of the project. The combined effects of past actions and the list of related present and reasonably future projects are described further below.

Past Actions

A large number of past actions have occurred in the study area. These past actions have substantially degraded wildlife resources within the primary and extended study areas. This degradation is indicated by the number of species that have been listed as threatened or endangered under the California and Federal Endangered Species Acts, or considered species of special concern by the California Department of Fish and Game (DFG) (Attachments 5, 6, and 7).

Past actions have caused these effects by converting habitat to developed or agricultural land uses, altering biotic interactions or physical processes, and damaging or causing mortality from human activities (e.g., vegetation removal during road, levee, or utility maintenance).

Converting natural vegetation to agricultural and developed land uses has eliminated most natural habitat within the study area and fragmented much of the remaining habitat. In vegetation that has been divided into smaller areas

interspersed in a matrix of developed and agricultural land cover, wildlife species are represented by smaller populations that are more vulnerable to extirpation. Also, fragmentation of natural vegetation facilitates the spread of invasive plant species and results in greater alteration of the processes that sustain habitats (e.g., fire and flood regimes).

More than 225 species of birds, mammals, reptiles, and amphibians depend on California's riparian habitats. Riparian ecosystems harbor the most diverse bird communities in the arid and semiarid portions of the western United States. Riparian vegetation is critical to the quality of instream habitat and aids significantly in maintaining aquatic life by providing shade, food, and nutrients that form the basis of the food chain. Riparian vegetation also supplies instream habitat when downed trees and willow mats scour pools and form logjams important for fish, amphibians, and aquatic insects (RHJV 2004).

The loss and fragmentation of wetland and riparian habitats in the study area has been extensive. In the Central Valley, less than 10 percent of woody riparian habitats, 5 percent of tidal marsh habitats, and 25 percent of vernal pool habitats remain (Hunter et al. 1999; Holland 1998; CALFED 2000a, 2002). Similarly, in California overall, 90–95 percent of historical wetlands have been lost (Dahl 1990, cited in Grewell, Callaway, and Ferren 2007).

In addition to these land use changes, large numbers of nonnative species have been introduced. These nonnative species have changed the biotic interactions of native plant species (e.g., new competitors have been introduced), and they have reduced the suitability of habitat for many native species in large areas of vegetation in the study area. Nearly 1,200 nonnative plant species have been intentionally or unintentionally introduced to California and subsequently spread into natural vegetation (Randall, Rejmanek, and Hunter 1998; Bossard and Randall 2007). Dozens of these nonnative species are invasive and have become very abundant and widespread (CIPC 2006). These invasive plants change ecosystems as they come to dominate them, eliminating or reducing the quality of habitat for wildlife species, and altering some of the physical processes that sustain habitats (e.g., nutrient cycling, fire regimes).

Within the study area such invasive, nonnative species dominate almost all grassland habitats (Stromberg, Corbin, and D'Antonio 2007), most floating and submerged aquatic vegetation, and the understory of most oak savannas and woodlands, and are abundant within wetland and riparian habitats (Bossard and Randall 2007). For example, within riparian habitats of the study area, although native tree species still dominate the canopy of the majority of woodlands and forests, the nonnative Himalayan blackberry (*Rubus procerus*), giant reed (*Arundo donax*), salt cedar (*Tamarix* sp.), and other nonnative species dominate the shrub and tree layers of large (and increasing) areas of riparian habitats in numerous watersheds (Dudley 2000, Hoshovsky 2000, Hunter et al. 2003).

Wildlife species have a varied response to changes in native habitat. Some common and special-status species of birds, such as yellow-breasted chat, frequently nest in stands of Himalayan blackberry, tamarisk, and other nonnative plants that provide dense shrub layers. However, other nonnatives can have a deleterious effect on reproductive success of individuals (i.e., create a reproductive sink) and dramatically reduce the diversity of wildife species. In general, invasive, introduced plants affect native birds by doing all of the following (RHJV 2004):

- Competing with native vegetation, thereby eliminating useful foraging and nesting habitat.
- Providing a suboptimal nesting substrate, in which nest success is reduced
- Reducing several orders of native insects
- Enhancing nonnative animal populations

Within the study area, fire regimes, river flow and streamflow regimes, groundwater movement, and nutrient cycling have all been altered substantially. These physical processes generate or sustain habitats by creating landforms (like point bars in a river channel), providing resources for growth; thus, altering these processes alters the habitats present on a landscape. Fires are suppressed, and the availability of nutrients has been altered as fertilizer has been applied to developed and agricultural lands. In addition, air pollution has deposited nitrogen, which also affects nutrient availability in the remaining areas of natural vegetation (Bobbink and Lamers 2002; Chapin, Matson, and Mooney 2002).

Flood control and water supply projects have also altered physical processes within the study area's remaining natural vegetation. Levees have isolated large areas of floodplain from rivers and streams throughout the study area, reducing the frequency of inundation and sediment scour and deposition and altering the extent and quality of riparian habitats. By reducing the magnitude and frequency of winter and spring peak flows and increasing the volume of summer and fall flows, water storage projects have altered the riparian habitats that were not isolated from rivers by levees. In particular, the operation of Shasta Dam (beginning in 1945) and the other major reservoirs of the CVP and SWP has strongly affected aquatic and riparian communities along the Sacramento River, other Central Valley rivers, and in the Sacramento–San Joaquin River Delta (Delta) (Fremier 2003; TNC, Stillwater, and ESSA 2008).

Direct disturbance by human activities also adversely affects wildlife resources and their habitats. Within the study area these disturbances include wood cutting; clearing of vegetation during levee, road, and utility maintenance; and crushing of vegetation and compaction of soil (e.g., by off-highway vehicles).

For example, oaks are frequently removed to improve rangeland or to provide high-quality firewood; because additional trees establish from seed only infrequently in many oak woodlands, this wood cutting has often resulted in long-term, adverse effects. In general, however, the effects of direct human disturbance are more localized. Thus, these effects are less substantial than either the effects of converting habitat to developed and agricultural land uses or the degradation of habitat by invasive species and altered physical processes.

Most wildlife resources in the study area have been adversely affected by most of the mechanisms described above (i.e., conversion of habitat to developed or agricultural land uses, the spread of invasive species, alteration of physical processes, and human disturbance). Overall, these wildlife resources have been substantially degraded by past actions, and past actions are continuing to affect them. In particular, the geographic range and abundance (and thus the effects) of many nonnative, invasive plant species that were introduced into the study area in the past are still rapidly increasing. For example, red sesbania (*Sesbania punicea*) was undocumented in California's riparian vegetation before the 1990s, but it has now become widespread along Central Valley rivers, dominating extensive areas along the San Joaquin River and several streams in the American River Basin (Hunter and Platenkamp 2003). Also, because many trees and clonal plants are long-lived, effects on some species and vegetation types lag decades behind the actions that caused the effects. (Such a lag has been documented for changes in riparian vegetation types in the study area (Fremier 2003).) As a result of past actions and their continued effects on wildlife habitats, the current condition of many wildlife resources in the study area is not ecologically sustainable.

Present and Reasonably Foreseeable Future Actions

Present projects and reasonably foreseeable (probable) future projects are those projects that are currently under construction, approved for construction, or in final stages of formal planning.

The present or reasonably foreseeable (probable) future actions considered in this cumulative effects analysis are those actions located within the primary study area or the extended study area that have been identified as potentially having an effect on resources that also may be affected by the Shasta Lake Water Resources Investigation (SLWRI). These actions were identified by compiling and then reviewing a preliminary list of actions. A preliminary list of actions was compiled by reviewing available information regarding planned projects (including agency Web sites). Actions were then reviewed for inclusion in the cumulative effects analysis based on three criteria:

- The action has an identified sponsor actively pursuing project development, has completed or issued NEPA and/or CEQA compliance documents such as a Draft EIS or EIR, and appears to be "reasonably foreseeable" given other considerations such as public and stakeholder controversy.

- Available information defines the action in sufficient detail to allow meaningful analysis.

- The action could affect resources potentially affected by the SLWRI.

Any action that could affect resources potentially affected by the SLWRI and was under construction was considered to be "reasonably foreseeable."

Based on this review, the effects of the following actions were qualitatively considered in the assessment of the cumulative effects of the SLWRI. This list is organized into four categories of actions: water resources, resource management and restoration, levee, and development actions. (This list includes actions that are also included in the quantitative assessment of the effects of present and future water resource actions.) It should be noted that some unknown subset of the following projects, while not strictly meeting the criteria above, would likely be implemented: Bay Delta Conservation Plan (and associated alternative Delta conveyance facilities), In-Delta Storage Program (Delta Wetlands Project), North-of-Delta Offstream Storage Facility (Sitz Reservoir), Upper San Joaquin River Basin Storage Investigation (Temperance Flat Reservoir), Los Vaqueros Reservoir Expansion Project, Delta Cross Channel Reoperation and Through-Delta Facility, and South Delta Improvements Program. It would be speculative to consider these projects at any more than a conceptual basis because these projects and their effects are not defined in sufficient detail to allow meaningful analysis.

Water Resources

Long-Term CVP and SWP Operations Criteria and Plan Reclamation and DWR use the Long-Term Operations Criteria and Plan (OCAP) to guide their operation of the CVP and SWP. Because the CVP and SWP both use the Sacramento River and Delta as conveyance facilities, CVP and SWP reservoir releases and export operations must be coordinated to ensure that each retains its share of commingled water, and that each bears its share of obligations to protect beneficial uses. OCAP describes how Reclamation and DWR operate the CVP and SWP in a coordinated manner to divert, store, and convey water consistent with applicable law. Applicable law includes the Coordinated Operations Agreement, State Water Resources Control Board (SWRCB) Water Right Decision 1641, CVP long-term water service contracts, 1993 *Sacramento River Winter-Run Chinook Salmon Biological Opinion*, Central Valley Improvement Act, CALFED Record of Decision (ROD) and Environmental Water Account, and the ROD for the Trinity River Mainstem Fishery Restoration Program EIS (Reclamation 2004a).

Although a revised OCAP Biological Assessment was released in May 2008 (Reclamation 2008), Reclamation is still consulting with the U.S. Fish and Wildlife Service (USFWS) on OCAP because of changed circumstances regarding delta smelt populations.

Sacramento Valley Water Management—Phase 8 Short-Term Agreement The Phase 8 Short-Term Agreement is a commitment by Reclamation and DWR to meet the flow-related standards of SWRCB Water Right Decision 1641 (SWRCB 2008). The agreement provides for a collaborative process among interested parties to develop projects to meet water supply, water quality, and environmental needs in the Sacramento Valley and San Francisco Bay/Sacramento–San Joaquin River Delta (Bay-Delta) areas, and throughout California. The parties include more than 40 water suppliers in the Sacramento Valley, DWR, Reclamation, and downstream water users, who developed a cooperative water management partnership to better manage water and provide a mechanism for satisfying Bay-Delta water quality and flow objectives. The agreement's actions would be locally proposed projects and actions that include groundwater projects, reservoir reoperation, system improvements, and surface-water and groundwater planning studies. These short-term projects and actions would be implemented for 10 years in areas of Shasta, Butte, Sutter, Glenn, Tehama, Colusa, Sacramento, Placer, and Yolo Counties.

The Phase 8 Short-Term Agreement was signed in December 2002 and the notice of intent/notice of preparation (NOI/NOP) was published on August 5, 2003.

North-of-Delta Offstream Storage Investigation The North-of-Delta Offstream Storage Investigation is a feasibility study being performed by DWR and Reclamation, in partnership with local interests and pursuant to the ROD for the CALFED Programmatic EIS/EIR (DWR 2008a). This study is evaluating potential offstream surface-water storage projects in the upper Sacramento River Basin at Sites Reservoir that could improve water supply and reliability, enhance survival of anadromous fish, and provide high-quality water for agricultural, municipal and industrial, and environmental uses.

The Sites Reservoir Project could contribute to cumulative effects on water supplies and associated resources. The project could increase water supplies available for export in those years when export supplies otherwise would be limited. This project also could modify the timing and magnitude of upstream reservoir releases in wet years.

An NOI/NOP for this project was issued in November 2001 and public scoping for the environmental document occurred in January 2002. The complete plan formulation report is scheduled to be completed by summer 2008, and the complete feasibility report and EIS/EIR are scheduled to be completed by winter 2010.

Placer County Water Agency Pump Station Reclamation and Placer County Water Agency (PCWA) are pursuing the development of a year-round water diversion facility capable of diverting up to 35,500 acre-feet annually of PCWA's water entitlements from its Middle Fork Project in the extended study area on the American River (Reclamation 2007a). The project consists of

constructing a pump station and associated facilities including pipelines, access roads, power lines, and safety features in the American River Canyon within the Auburn Dam construction area. It also involves building an intake structure for the pumping plant and restoring the currently dewatered river segment near Auburn, allowing for all beneficial uses of water, including recreation, navigation, and other instream uses. Site construction activity began in September 2003 and will conclude in 2008.

Folsom Dam Raise Project The U.S. Army Corps of Engineers (USACE), sponsored by the Sacramento Area Flood Control Agency (SAFCA) and the Central Valley Flood Protection Board, is responsible for the Folsom Dam Raise Project in the CVP service area on the American River. This project will raise Folsom Dam 7 feet to reduce the Sacramento area's flood risks. The Folsom Dam Raise Project involves raising Folsom Dam and the related dikes/auxiliary dam, modifying L. L. Anderson Dam, constructing a bridge downstream of Folsom Dam, completing temperature shutter modifications, and restoring the area's ecosystem. (USACE 2008a.) Construction on the dam raise began in December 2007 and is expected to be completed in 2015.

Freeport Regional Water Project The Sacramento County Water Agency (SCWA) and East Bay Municipal Utility District (EBMUD), in close coordination with the City of Sacramento and Reclamation, are developing the FRWP. The FRWP is a regional water supply project being developed on the Sacramento River near the town of Freeport in the extended study area. The project is designed to help meet future drinking-water needs in central Sacramento County and to provide adequate water supply during future drought periods in the East Bay. FRWP will provide up to 100 million gallons per day of water for EBMUD to use during drought years and 85 million gallons per day for SCWA for use in all years. The project will divert water from the Sacramento River and deliver it to a new water treatment facility being constructed as part of the project and the Folsom South Canal. From the Folsom Canal, water will be delivered to the Mokelumne Aqueduct. This project requires the construction of fish screens and a pumping plant at the intake on the Sacramento River, a water treatment facility in Sacramento County, and pipeline facilities to transport the water from Freeport to the Mokelumne Aqueduct.

EBMUD will be able to receive water from the project by the end of 2009. Sacramento will receive water in 2011 because it will take additional time to complete the Vineyard Surface Water Treatment Plant in central Sacramento County. Pipeline construction began in 2007 with completion expected in 2009, and construction of the water intake facility began in 2006 with completion expected in 2009 (FRWA 2008).

Delta Cross Channel Reoperation and Through-Delta Facility Reclamation and DWR are evaluating the Delta Cross Channel Reoperation and Through-Delta Facility project in the extended study area in the Delta. This project

proposes a new screened diversion on the Sacramento River of up to 4,000 cubic feet per second (cfs) and conveyance of that water into the Delta and improvements to operational procedures for the Delta Cross Canal to address fishery and water quality concerns. The objective is to increase the net outflow in the Delta to reduce salinity at the export locations in the southern Delta by reducing seawater intrusion.

Studies are currently under way to determine whether this project will be considered. These include an assessment of strategies for operating the Delta Cross Canal and confirmation of continued concern about impacts of canal operations on water quality, an evaluation of the technical viability of the Through-Delta Facility (potential diversion sites between and including Hood and Georgiana Slough will be considered as part of this evaluation), and a satisfactory resolution of the fisheries concerns about a Through-Delta Facility. (DWR 2008b.)

In-Delta Storage Program (Delta Wetlands Project) DWR, in coordination with the California Bay-Delta Authority and with technical assistance from Reclamation, completed the State feasibility study for the In-Delta Storage Program in the extended study area in the south Delta. The In-Delta Storage Project would provide capacity to store approximately 217,000 acre-feet of water in the south Delta for a wide array of water supply, water quality, and ecosystem benefits. The project would include two storage islands (Webb Tract and Bacon Island) and two habitat islands (Holland Tract and Bouldin Island), an embankment design, consolidated inlet and outlet structures, project operations, and habitat management plans. Planning objectives include enhancing water supply reliability and operational flexibility of the CVP/SWP system, contributing to ecosystem restoration, and providing water for the Environmental Water Account (EWA) (DWR 2008c).

Detailed planning work on the In-Delta Storage Project has been suspended; some limited work on economics and operations modeling associated with the Common Assumptions effort continues.

Contra Costa Water District Alternative Intake Project The Contra Costa Water District (CCWD) and Reclamation have completed the planning phase for the CCWD Alternative Intake Project (CCWD 2008) in the extended study area in the Delta. The CCWD Alternative Intake Project is intended to protect and improve the water quality of drinking water for CCWD customers. The project would enable CCWD to relocate some of its existing diversions to Victoria Canal, a Delta location with higher quality source water than is currently available at CCWD's Old River and Rock Slough intakes. The project includes a 250-cfs intake, a fish screen, and an underground pipeline that would extend 12,000–14,000 feet from the new intake across Victoria Island and beneath Old River and tie into CCWD's existing Old River conveyance system on Byron Tract. The intake would be used primarily in late summer and fall (when water quality is better than in Old River). The final EIR/EIS for the

CCWD Alternative Intake Project was released in October 2006, and construction is expected to begin in 2008 and be completed by 2010.

Los Vaqueros Reservoir Expansion Project Reclamation, DWR, and CCWD are conducting a feasibility study for the Los Vaqueros Reservoir Expansion Project in the extended study area in the Delta. The project is examining alternatives to improve water quality and water supply reliability for Bay Area water users while enhancing the Delta's environment. Among the alternative actions being considered is expanding the existing Los Vaqueros Reservoir; project planners have evaluated expanding reservoir storage from 100 thousand acre-feet (TAF) up to 275 TAF to improve water quality and water supply reliability. An expanded reservoir would require a new or expanded Delta intake, with a capacity of up to about 1,000 cfs for the maximum reservoir size. Locations being considered for the new Delta intake include Old River and adjacent channels. The purposes of the Los Vaqueros Reservoir expansion include increased reliability, water quality, and environmental water supply. A connection to Bethany Reservoir is also currently under study. (Los Vaqueros Study Team 2008.) The draft feasibility report and draft EIS/EIR for the project were scheduled to be completed by early 2008, but remained in progress at the time of publication of this technical report.

South Delta Improvements Program DWR and Reclamation are responsible for implementing CALFED's South Delta Improvements Program in the extended study area in the Delta. This program includes a series of proposed actions designed to improve water quality and protect salmon in the south Delta while allowing the SWP to operate more effectively. These proposed actions are intended to maximize diversion capability into Clifton Court Forebay while providing an adequate water supply for the South Delta Water Authority and reducing the effects of SWP exports on aquatic resources. The South Delta Improvements Program includes physical/structural improvements and operational changes. (Reclamation and DWR 2005.) The schedule for construction is unknown at this time.

Delta-Mendota Canal Intertie The Delta-Mendota Canal/California Aqueduct Intertie would consist of constructing and operating a pumping plant and pipeline connection between the Delta-Mendota Canal and the California Aqueduct in the extended study area in the Delta. The intertie would be used in a number of ways to achieve multiple benefits, including meeting current water supply demands, allowing for the maintenance and repair of the CVP Delta export and conveyance facilities, and providing operational flexibility to respond to emergencies related to both the CVP and SWP. The intertie would include a 450-cfs pumping plant at the Delta-Mendota Canal that would allow water to be pumped from the canal to the California Aqueduct via an underground pipeline. Reclamation has been preparing a draft EIS for the intertie (Reclamation 2004b).

Resource Management and Restoration

Trinity River Mainstream Fishery Restoration Program The Trinity River Restoration Program staff, funded by Federal, State, and local agencies, is responsible for implementing the Trinity River Mainstem Fishery Restoration Program in the CVP service area at Lewiston Dam on the Trinity River. The program plans to implement recovery of the Trinity River and its fish and wildlife populations. This plan includes direct in-channel actions, continued watershed restoration activities, replacement of bridges and structures within the floodplain, and a rigorous program to monitor and improve restoration activities. Restoration goals are to reestablish the natural physical processes that create and maintain high-quality aquatic habitat and to create spawning and rearing conditions downstream of the dams that best compensate for lost habitat upstream, including adequate water temperatures.

The ROD was signed in December 2000, and after various legislative delays, was put into action after November 2004. Full implementation of the releases specified in the ROD and construction of the channel rehabilitation sites depend on identifying and implementing an appropriate realty strategy for private landowners along the river. (Trinity River Restoration Program 2008.)

Central Valley Improvement Act The Central Valley Improvement Act (CVPIA) (Title 34, Sections 3401–3408(h) of Public Law 102-575) is concerned with restoring anadromous fish populations, providing water supplies for Federal and State refuges, mitigating effects of the CVP on other fish and wildlife, and retiring drainage-impaired farmlands. To fulfill these provisions, the CVPIA established an ongoing program creating a fund for restoration actions. The program is financed by the CVP's water and power users and administered by Reclamation. Funds are contributed annually to multiple restoration actions, to finance restoration of aquatic, riparian, and other habitats and modify CVP operations. In the study area, such actions have included all of the following (Reclamation and USFWS 2005):

- The annual dedication and management of up to 800 TAF of CVP water for restoration of fish and wildlife habitat
- Installation of a temperature control device at Shasta Dam
- Improvements for fish passage at Red Bluff Diversion Dam (RBDD), including removal of five dams, 15 diversions, and other obstacles to fish passage (during 1992–2002)
- Projects to add gravel to the river and restore riparian habitat.

CALFED Ecosystem Restoration Program DFG, USFWS, and the National Marine Fisheries Service implement the CALFED Ecosystem Restoration Program (CALFED 2000b), which works to improve the ecological health of the Bay-Delta watershed by restoring and protecting habitats, ecosystem functions, and native species. The program includes all projects authorized,

funded, and permitted (even if not constructed) to date, particularly in the Delta, that aim to do any of the following:

- Recover at-risk native species dependent on the Delta, Suisun Bay, and San Francisco Bay
- Minimize the downward population trends of native species that are not listed
- Protect and restore functional habitat types in the Bay-Delta estuary and its watershed for ecological and public values
- Prevent the establishment of additional nonnative invasive species and reduce the negative ecological and economic impacts of established nonnative species in the Bay-Delta estuary
- Improve and/or maintain water and sediment quality conditions that fully support healthy and diverse aquatic ecosystems in the Bay-Delta estuary and watershed

Since its inception, Ecosystem Restoration Program agencies have consolidated their vision into a single "blueprint" for ecosystem restoration. They further identified more than 600 programmatic actions and the 119 milestones throughout the Bay-Delta watershed. The blueprint has been implemented through a large number of competitive and directed grants.

CALFED Environmental Water Account DWR, DFG, Reclamation, USFWS, and the National Marine Fisheries Service are responsible for implementing the CALFED EWA in the extended study area in the Delta (Reclamation 2007b). The EWA was established to provide water for the protection and recovery of at-risk fish species beyond water available through existing regulatory actions related to the operations of the SWP and CVP. The EWA's purpose is to provide protection to the at-risk fish species of the Bay-Delta estuary through environmentally beneficial changes in SWP and CVP operations at no uncompensated water cost to the projects' water users. The EWA was set up as a short-term program, but is expected to continue until 2011. (Reclamation 2007b.)

Shasta-Trinity National Forest Land and Resource Management Plan The U.S. Forest Service has prepared the *Shasta-Trinity National Forest Land and Resource Management Plan* (STNF LRMP) to guide the management of the Shasta and Trinity National Forests in the primary study area in the vicinity of Shasta Lake. The primary goals of this plan are to integrate a mix of management activities that allow use and protection of forest resources, meet the needs of guiding legislation, and address national, regional, and local issues. The STNF LRMP also includes goals to protect unique landscapes and their wild and scenic characteristics for the indefinite future; maintain a rich diversity of plants, fish, and wildlife; provide high-quality recreational experiences; and

provide a long-term sustained yield of timber, forage, and other resource products and services consumed by society. The plan also includes specific goals relating to wildlife, habitat, water quality, fires and fuel management, visual quality, recreation, minerals, law enforcement, and cultural resources (USFS 1995a). The STNF LRMP is currently being implemented.

Iron Mountain Mine Restoration Plan The Iron Mountain Mine Trustee Council developed the Iron Mountain Mine Restoration Plan. It identifies restoration actions to address injuries to, or lost use of, natural resources from acid mine drainage from the Iron Mountain Mine complex, which is located in the primary study area west of the upper Sacramento River. The plan involves restoring salmonid populations, riparian habitat, and instream ecological functions. In addition, the plan is to implement restoration projects to compensate for the lost use of public areas and public services. The aquatic and riparian habitats affected by releases of hazardous substances at or from the Iron Mountain Mine site include the site creeks (Boulder, Slickrock, Flat, and Spring) and the main stem and tributaries of the Sacramento River from Keswick Reservoir to RBDD. As additional compensation for damage to natural resources, this project includes an option for the Federal government to acquire approximately 1,250 acres for transferring into public ownership and to be administered by the U.S. Bureau of Land Management (BLM) (IMMTC 2002, NOAA 2008). The Iron Mountain Mine Trustee Council has allocated funds to several projects designed to meet the goals of the *Iron Mountain Mine Restoration Plan.*

Mendocino National Forest Land and Resource Management Plan The U.S. Forest Service developed the *Mendocino National Forest Land and Resource Management Plan* (Mendocino NF LRMP) to direct the management program for use and protection of the Mendocino National Forest in the primary and extended study areas. The plan fulfills legislative requirements while addressing national, regional, and local issues. The Mendocino NF LRMP also includes goals for fish and wildlife, wild and scenic rivers, minerals and energy, law enforcement, heritage resources, fire and fuels, facilities, air quality and diversity (USFS 1995b). The Mendocino NF LRMP is currently being implemented.

Sacramento River Conservation Area Forum Program The Sacramento River Conservation Area Forum is a nonprofit organization that works to protect, restore, and enhance the fisheries and riparian habitat along the Sacramento River in the primary and extended study areas, from Keswick Dam downriver to Verona. This is a cooperative effort that works to ensure that habitat restoration and management addresses not only the dynamics of riparian ecosystems, but also the realities of local agricultural and recreational issues associated with land use changes occurring along the river. The program (SRCAF 2008) has goals to protect, restore, and enhance fisheries and riparian habitat along the Sacramento River and its tributaries and develops and implements site-specific and subreach plans for areas within the conservation area.

U.S. Bureau of Land Management Redding Resource Management Plan BLM prepared this plan (BLM 1992) to identify the direction for the proposed management of public lands and Federal mineral estate it administers within the primary study area and the extended study area along the middle Sacramento River. The primary goal of BLM's *Redding Resource Management Plan* is to manage public lands to prevent deterioration of habitat for special-status species, thereby precluding the need for State or Federal listing of those species. In 1993, BLM issued a ROD announcing its intent to implement the plan.

Sacramento River National Wildlife Refuge Draft Comprehensive Conservation Plan This plan, put forth by USFWS, provides a 15-year strategy for achieving the goals of the Sacramento River National Wildlife Refuge, located between Red Bluff and Colusa in the extended study area along the middle Sacramento River region. One goal of the *Sacramento River National Wildlife Refuge Draft Comprehensive Conservation Plan* is to contribute to the recovery of endangered and threatened species and provide a natural diversity and abundance of migratory birds and anadromous fish by restoring and managing the viable riparian habitats along the Sacramento River, using the principles of landscape ecology. The plan also seeks to provide high-quality opportunities for hunting, fishing, wildlife viewing, and photographic visits; provide visitor safety; and ensure compliance with regulations through law enforcement (USFWS 2008).

The *Draft Comprehensive Conservation Plan and Environmental Assessment for the Sacramento National Wildlife Refuge* (USFWS 2008) became available for review and comment on July 21, 2008, with the review period scheduled to end on September 12, 2008. The final conservation plan will be developed through modifications made during the internal and public review processes.

Comprehensive Management Plan for the Sacramento River Wildlife Area DFG has prepared a this plan for the 3,770-acre Sacramento River Wildlife Area between Red Bluff and Colusa in the extended study area along the middle Sacramento River. This plan provides an ecosystem approach to managing the Great Valley riparian habitat communities in the wildlife area for their ecological values and the enjoyment of the public (DFG 2003).

North Delta Flood Control and Ecosystem Restoration Project Reclamation and DWR propose the North Delta Flood Control and Ecosystem Restoration Project in the extended study area in the north Delta (DWR 2008d). The goal of this project is to implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Components being considered for flood control include setback levees, detention basins, dredging, and levee degradation for floodplain expansion, which may also be configured to create quality habitat for species of concern in the north Delta area. These goals would be accomplished by using McCormick-Williamson Tract and Staten Island in the Delta.

The draft EIR was released in January 2008, and will be followed by the final EIR during 2008. The design is also expected to be completed during 2008, and construction is expected to be complete in spring 2011.

Levee

California Department of Water Resources Levee Repair DWR, USACE, and DFG are responsible for repairing critical erosion sites on California's Federal/State levee system throughout the primary and extended study areas and in the CVP and SWP service areas. Repairs are necessary to keep the levee systems functioning. Some of these systems have deteriorated over time or do not meet current design standards, or both. In general, repairs to Federal and State project levees are being made under three main programs: the Critical Erosion Repairs Program, the Sacramento River Bank Protection Project, and the Public Law 84-99 Rehabilitation Program. A fourth program to repair critically damaged levees on the San Joaquin Flood Control System is under development by DWR. DWR is also working with local agencies to survey and document damage from erosion at additional sites that are under local control (not part of the Federal/State flood control system). The aim is also to assist local jurisdictions in determining the best approach for needed repairs. (DWR 2008e.)

Nearly 250 levee repair sites have been identified to date. More than 100 of the most critical sites have been repaired. Still more are being identified, planned, and prioritized (DWR 2008e).

CALFED Levee System Integrity Program DWR, DFG, and USACE implement the CALFED Levee System Integrity Program, which maintains and improves the integrity of the Bay-Delta estuary's levee system. The goal of the Levee System Integrity Program is to reduce risk to land use and associated economic activities, water supply, agriculture and residential use, infrastructure, and the ecosystem from the effects of catastrophic breaching of Delta levees. Resources protected by the program include water quality, ecosystem health, infrastructure such as utilities and transportation corridors, agriculture, and recreational industries.

Since 2000, protection for and maintenance of nearly 700 miles of Delta levees has been increased, with ongoing maintenance of more than 600 miles of eligible project and nonproject levees undertaken. Further, stability was improved for more than 45 additional miles of levees. Significant levee rehabilitation projects have been undertaken on numerous islands, along with projects for growing native vegetation, reuse of more than 2 million cubic yards of dredged material for levee stability and habitat development, and development of approximately 50 acres of riparian and wetland habitat and 3,000 linear feet of shaded riverine aquatic habitat (CALFED 2007).

Feather River Levee Repair Project The Three Rivers Levee Improvement Authority is responsible for the Feather River Levee Repair Project, which will

construct a new setback levee and remove all or portions of the existing levee along the Feather River in the SWP service area. The setback levee will be approximately 5.7 miles long, extending from approximately Star Bend upstream to near Shanghai Bend. It will be set back approximately 0.5 mile to the east of the existing Feather River levee. (State of California 2008, TRLIA 2008, USACE 2008b.) Construction has begun on this project; the estimated completion date is June 2010.

Natomas Levee Improvement Program Landside Improvement Project SAFCA is proposing the Natomas Levee Improvement Program Landside Improvements Project in the extended study area along the lower Sacramento River. The project consists of early implementation (2008–2010) of improvements to the perimeter levee system of the Natomas Basin in Sutter and Sacramento Counties and modification of associated landscaping and irrigation/drainage infrastructure. The project objectives are to provide at least a 100-year level of flood protection to the Natomas Basin as quickly as possible, provide "200-year" protection to the basin over time, and avoid any substantial increase in expected annual damages as new development occurs in the basin.

The draft EIS for Phase 2 of the Natomas Levee Improvement Program was completed and underwent a public-review period that ended in July 2008 (SAFCA 2007). Release of the final EIS for Phase 2 is expected in October 2008. An NOI and an NOP for preparation of an EIS/EIR for Phase 3 of the Natomas Levee Improvement Program were issued in July 2008. Some project construction began in 2007. All construction is expected to be completed by 2010.

Development

Turntable Bay Master Development Plan The U.S. Forest Service issued a draft EIS for this plan, which includes water-based and land-based developments on Shasta Lake in the primary study area. The development area is approximately 79 acres; plans include a marina and associated land-based facilities that would be developed for recreational use. Water-based development at Turntable Bay would consist of docks and public moorage facilities as well as a store and other services. Land-based development would include a day-use area and a walking trail. Other public facilities, including restrooms, would also be provided. The current land-based operations at Digger Bay would be abandoned and the water-based improvements would be relocated to Turntable Bay or unusable components at Bridge Bay Resort would be decommissioned. All proposed land-based facilities would accommodate a 20-foot increase in the full-pool elevation of Shasta Lake to 1,090 feet above mean sea level, which would be caused by the increase in Shasta Dam's height to 18.5 feet (USFS 2006).

Antlers Bridge Replacement Caltrans, in cooperation with the Federal Transit Administration, proposes to replace Antlers Bridge over Shasta Lake, which is located on Interstate 5 near the community of Lakehead in Shasta County in the

primary study area. This project includes construction of a 1,942-foot, five-lane segmental bridge with deep pile foundations that are 12 feet in diameter. In addition, it includes realignment of a 0.4-mile-long segment of Interstate 5, which includes hillside excavation, construction of a five-lane freeway section, and demolition of the existing 1,500 feet of steel deck truss bridge. The new bridge will be constructed next to the existing bridge, which will remain open to traffic until the new bridge is completed. This project will affect visual resources, fish and wildlife, and water quality standards. However, incorporation of mitigation would reduce these impacts to a less-than-significant level. The project is not expected to have any other significant impacts (Caltrans and FTA 2007). Construction is expected to begin in 2009 and will take approximately 3 years.

Stillwater Business Park The City of Redding has begun construction on the Stillwater Business Park (City of Redding 2008), a 700-acre master-planned business park with corporate, manufacturing, and office uses within the Redding city limits in the primary study area. Phase 1 of the project entails developing up to 3,245,300 square feet of primarily light industrial, general industrial, and high-tech cluster uses throughout the entire site. Phase 2 will involve developing up to 1,165,100 square feet of the same uses on the remaining parcels that were not developed under Phase 1. Developable land includes 16 parcels ranging in size from 5 acres to 100 acres. Two parcels totaling 186 acres will be designated for open space. Construction began in July 2008; Phase 1 work is anticipated to be completed in spring 2009.

Airport Road Widening and Bridge Replacement Project at Sacramento River The Shasta County Department of Public Works is responsible for the Airport Road Widening and Bridge Replacement Project, which consists of constructing a new six-span, 1,445-foot-long, post-tensioned bridge over the upper Sacramento River on the north edge of the city of Anderson in the primary study area. The new bridge will be supported on driven steel H-piles. The existing bridge will be removed upon completion of the new bridge. Approach-roadway work involves construction of approximately 3,000 feet of new four-lane roadway with a center turn lane from Riverside Avenue to Dersch Road. (Shasta County 2005) Construction work began in December 2007, and is expected to be completed in June 2010.

Shasta Metro Enterprise Zone Project The Shasta County Department of Public Works is responsible for the Shasta Metro Enterprise Zone Project in the primary study area around Shasta Lake and the upper Sacramento River. Enterprise zones are designated by the State as economic development areas created to encourage and stimulate economically depressed areas. This is generally achieved via tax, hiring, and financial incentives from the State, in combination with local assistance. Approval of the Shasta Metro Enterprise Zone could stimulate development/redevelopment projects within the project area.

The Shasta Metro Enterprise Zone covers approximately 33 square miles that extends along the valley floor from Mountain Gate south to the Cottonwood area, including properties in the Cities of Shasta Lake, Redding, and Anderson, and in Shasta County. Although 64 percent of the Enterprise Zone area will consist of industrial and commercial uses, the remaining 36 percent is divided among single-family and multiple-family residential, open space, public, mixed-use, and specific plan uses. An EIR was completed for this project in October 2007 (Shasta County 2007).

Cypress Avenue Bridge and Street Widening The City of Redding plans to widen Cypress Avenue and the Sacramento River bridges to three lanes in each direction and adding a traffic signal at the intersection of Akard Avenue (City of Redding 2004). This is a multiphase project located in the primary study area along the upper Sacramento River. Construction has begun and is expected to be completed in 2008 or 2009.

Relationship to CALFED Programmatic Cumulative Impacts Analysis

This analysis of cumulative effects considers but does not tier from the cumulative impacts assessment in the CALFED Programmatic EIS/EIR (CALFED 2000c). The "Shasta Lake Enlargement" project was included in the cumulative impacts analysis of the CALFED Programmatic EIS/EIR as a project in CALFED's Storage Program (CALFED 2000c). This project-specific analysis considers, but stands alone from and refines, the analysis of cumulative effects in the CALFED Final Programmatic EIS/EIR (CALFED 2000c). This analysis focuses on issues specific to the SLWRI resulting from the cumulative effects of this project combined with other reasonably foreseeable projects.

Significance Criteria

Impacts of an alternative would be significant if its implementation would make a considerable contribution to a significant cumulative effect. The alternative's contribution is evaluated in combination with the effects of other past, present, and reasonably foreseeable future projects to determine if (1) the overall cumulative effect is significant and (2) the alternative's contribution is considerable. Cumulatively significant impacts would do any of the following:

- Cause a significant adverse effect on a botanical resource (using the criteria for significance described in Chapter 2, "Environmental Consequences")
- Adversely affect a botanical resource that already has a degraded or declining condition because of substantial adverse effects that have already occurred
- Cause effects that were initially not significant but that would be part of an irreversible degrading or declining trend

Cumulative Effects Analysis

Shasta Lake and Vicinity

[Forthcoming]

Upper Sacramento River and Extended Study Area

No-Action Alternative

As described in Chapter 2, "Environmental Consequences," the No-Action Alternative would continue to adversely alter the structure and species composition of riparian vegetation and wildlife habitats along the upper Sacramento River and the upstream reaches of the lower Sacramento River. The impacts on special-status wildlife species inhabiting riparian areas would be less than significant under the No-Action Alternative, which includes past, present, and reasonably foreseeable probable future projects, because the effects on riparian habitat are not likely to have a substantial adverse effect on wildlife use of the habitat, nor would they be likely to cause a population to be eliminated. Therefore, the No-Action Alternative would not result in a cumulatively considerable contribution to of overall adverse effects on wildlife resources. This would not be a cumulatively significant effect.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

As described in Chapter 2, without mitigation, CP1 could cause potentially significant effects on vegetation, wildlife habitats, and special-status wildlife species in the primary and extended study areas. These effects could be caused by alteration of the flow regime of the Sacramento River and associated geomorphic processes in the primary study area or the extended study area, or both. Given major past alterations to vegetation and wildlife habitat along the Sacramento River, the contributing adverse effects from CP1 would be cumulatively considerable. With the implementation of Mitigation Measure Bot-6, "Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," adverse effects from CP1 would no longer result in a cumulatively considerable incremental contribution to cumulative effects on these resources. This would not be a cumulatively significant effect.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

The cumulative effects of CP2 would be similar to those of CP1, but greater in magnitude. Given major past alterations to vegetation and wildlife habitat along the Sacramento River, the contributing adverse effects from CP2 would be cumulatively considerable. With the implementation of Mitigation Measure Bot-6, "Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," adverse effects from CP2

would no longer result in a cumulatively considerable incremental contribution to cumulative effects on these resources. This would not be a cumulatively significant effect.

CP3 – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply
The cumulative effects of CP3 would be similar to those of CP1, but greater in magnitude. Given major past alterations to vegetation and wildlife habitat along the Sacramento River, the contributing adverse effects from CP3 would be cumulatively considerable. With the implementation of Mitigation Measure Bot-6, "Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," adverse effects from CP3 would no longer result in a cumulatively considerable incremental contribution to cumulative effects on these resources. This would not be a cumulatively significant effect.

CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus
The cumulative effects of CP4 would be similar to those of CP1, but greater in magnitude. Given major past alterations to vegetation and wildlife habitat along the Sacramento River, the contributing adverse effects from CP4 would be cumulatively considerable. With the implementation of Mitigation Measure Bot-6, "Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," adverse effects from CP4 would no longer result in a cumulatively considerable incremental contribution to cumulative effects on these resources. This would not be a cumulatively significant effect.

CP5 – 18.5-Foot Dam Raise, Combination Plan
The cumulative effects of CP5 would be similar to those of CP1, but greater in magnitude. Given major past alterations to vegetation and wildlife habitat along the Sacramento River, the contributing adverse effects from CP5 would be cumulatively considerable. With the implementation of Mitigation Measure Bot-6, "Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities," adverse effects from CP5 would no longer result in a cumulatively considerable incremental contribution to cumulative effects on these resources. This would not be a cumulatively significant effect.

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