Chapter 13
Wildlife Resources

13.1 Affected Environment

This section describes the affected environment related to wildlife resources, including special-status species, for the dam and reservoir modifications proposed under SLWRI action alternatives. For a more in-depth description, see the *Wildlife Resources Technical Report.*

Shasta Dam and Shasta Lake are located on the upper Sacramento River in Northern California. Shasta Dam is located approximately 9 miles northwest of Redding, and the dam and entire reservoir are located in Shasta County. Elevations in the Shasta Lake vicinity portion of the primary study area range between approximately 1,070 and 1,200 feet, and the terrain is moderate to steep.

The wildlife resources setting for the Shasta Lake and vicinity portion of the primary study area consists of the impoundment area (five arms and the main body of Shasta Lake) and the relocation areas (Figure 13-1). 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.

Reclamation established project boundaries for focused surveys in the area that would be subject to inundation under various enlargement scenarios. The lower boundary corresponds to the current full-pool elevation defined by Reclamation (1,070-foot mean sea level (msl) contour line). The upper boundary was established using the 1,090-foot msl contour line around the entire lake. This area is hereafter referred to as the “impoundment area” (Figure 13-1).

To examine the physical and biological resources along riverine habitats that would be subject to inundation if Shasta Dam were enlarged, reaches of 11 streams and rivers that are tributary to Shasta Lake were also incorporated into the Shasta Lake and vicinity portion of the primary study area. These streams were selected by Reclamation in conjunction with USFS as an initial sampling of streams representative of riverine and riparian habitats.

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" (Figure 13-1).

In addition to the areas subject to inundation and/or relocation, Reclamation has identified six locations considered for river restoration. These six locations are referred to as the potential Sacramento River downstream habitat restoration areas (Figure 13-2).

For the purposes of this investigation, approximate acreages for habitat types are reported by arm of the lake. For a relocation area that falls between two arms, the area is included with the arm that has the most acreage of the vegetation type or water of the United States.

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

- SLWRI Mission Statement Milestone Report (Reclamation 2003)
- SLWRI Initial Alternatives Information Report (Reclamation 2004)
- Chapter 3, "Biological Environment," in the Draft SLWRI Plan Formulation Report (Reclamation 2007)
- USFWS Endangered Species Lists
- California Natural Diversity Database (CNDDB)
- Numerous technical studies of botanical, wetland, and wildlife resources conducted by Reclamation in the Shasta Lake and vicinity portion of the primary study area since 2002.

Several attachments to the *Wildlife Resources 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 Surveys 2007-2013
- Attachment 4, Species Accounts for Special-Status Wildlife in the Primary Study Area Downstream from Shasta Dam
- Attachment 5, 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
- Attachment 8, Forest Carnivore Survey Report
- Attachment 9, Shasta Salamander Survey Report
- Attachment 10, Terrestrial Mollusk Survey Report
- Attachment 11, California Red-legged Frog Habitat Assessment Reports, Shasta Lake and Vicinity Portion of the Primary Study Area
- Attachment 12, Biological Characterizations, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Henderson Open Space
- Attachment 13, Biological Characterizations, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Tobiasson Island
- Attachment 14, Biological Characterizations, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Shea Island Complex
- Attachment 15, Biological Characterizations, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Kapusta Island
- Attachment 16, Biological Characterizations, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Anderson River Park
- Attachment 17, Biological Characterizations, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Reading Island
- Attachment 18, California Red-legged Frog Habitat Assessment, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Henderson Open Space
- Attachment 19, California Red-legged Frog Habitat Assessment, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Tobiasson Island

- Attachment 20, California Red-legged Frog Habitat Assessment, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Shea Island Complex

- Attachment 21, California Red-legged Frog Habitat Assessment, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Kapusta Island

- Attachment 22, California Red-legged Frog Habitat Assessment, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Anderson River Park

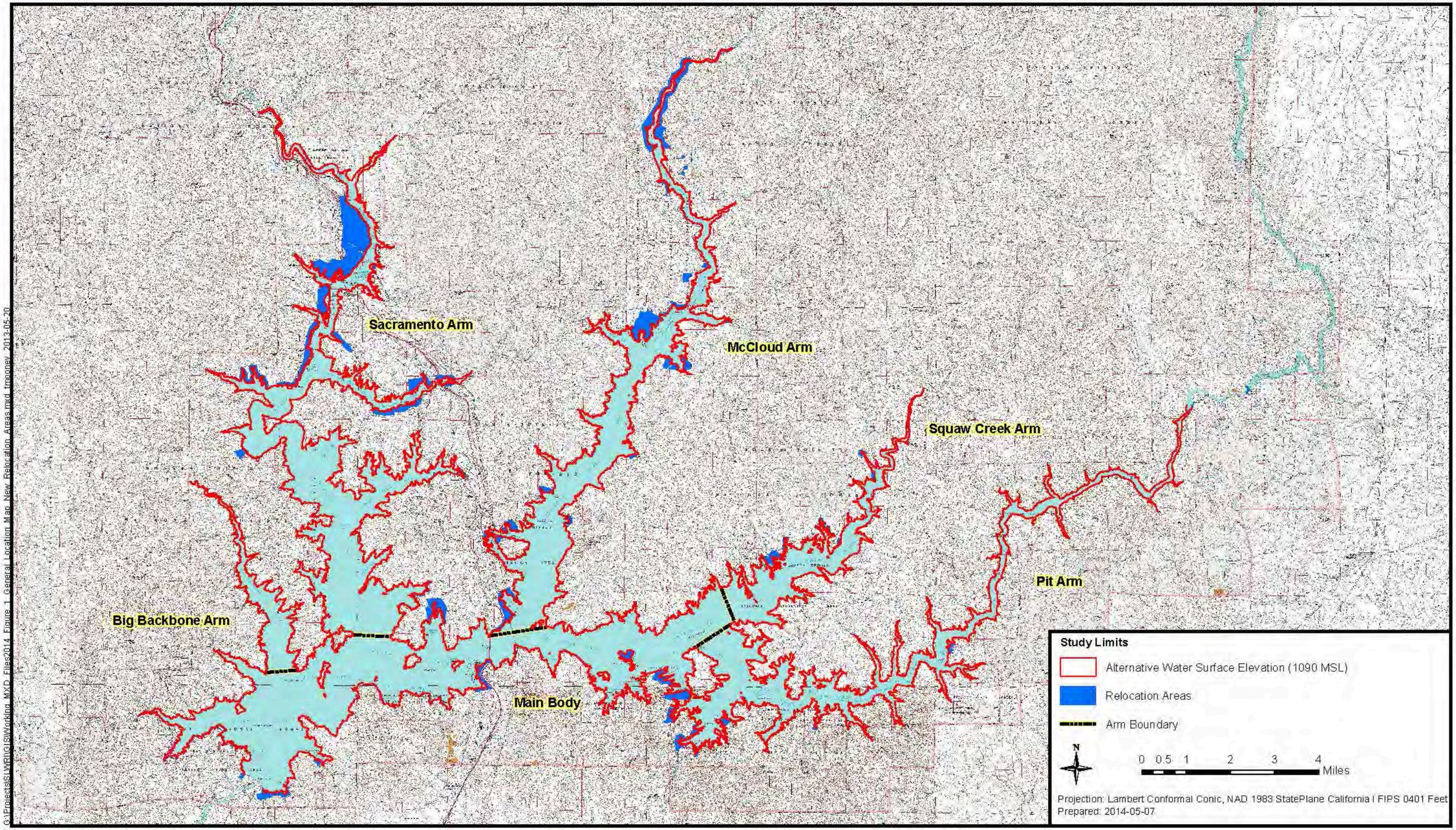
- Attachment 23, California Red-legged Frog Habitat Assessment, SLWRI Potential Sacramento River Downstream Habitat Restoration Areas: Reading Island

13.1.1 Wildlife

Shasta Lake and Vicinity

Wildlife resources described in this chapter 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 southeastern Klamath Mountains, Coast Ranges, the southern Cascade Range, 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.

Wildlife Habitats The Shasta Lake and vicinity portion of the primary study area is characterized by a variety of habitats typical of mixed woodlands and low-elevation forests found in the southeastern Klamath Mountains. 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 Tables 13-1 and 13-2, and depicted in Figures 13-3a through 13-3f. General habitat descriptions, including typically occurring wildlife species, are described below. Plant taxonomy follows Baldwin et al. (2012).



Key: MSL = feet above mean sea level

Figure 13-1. Study Limits

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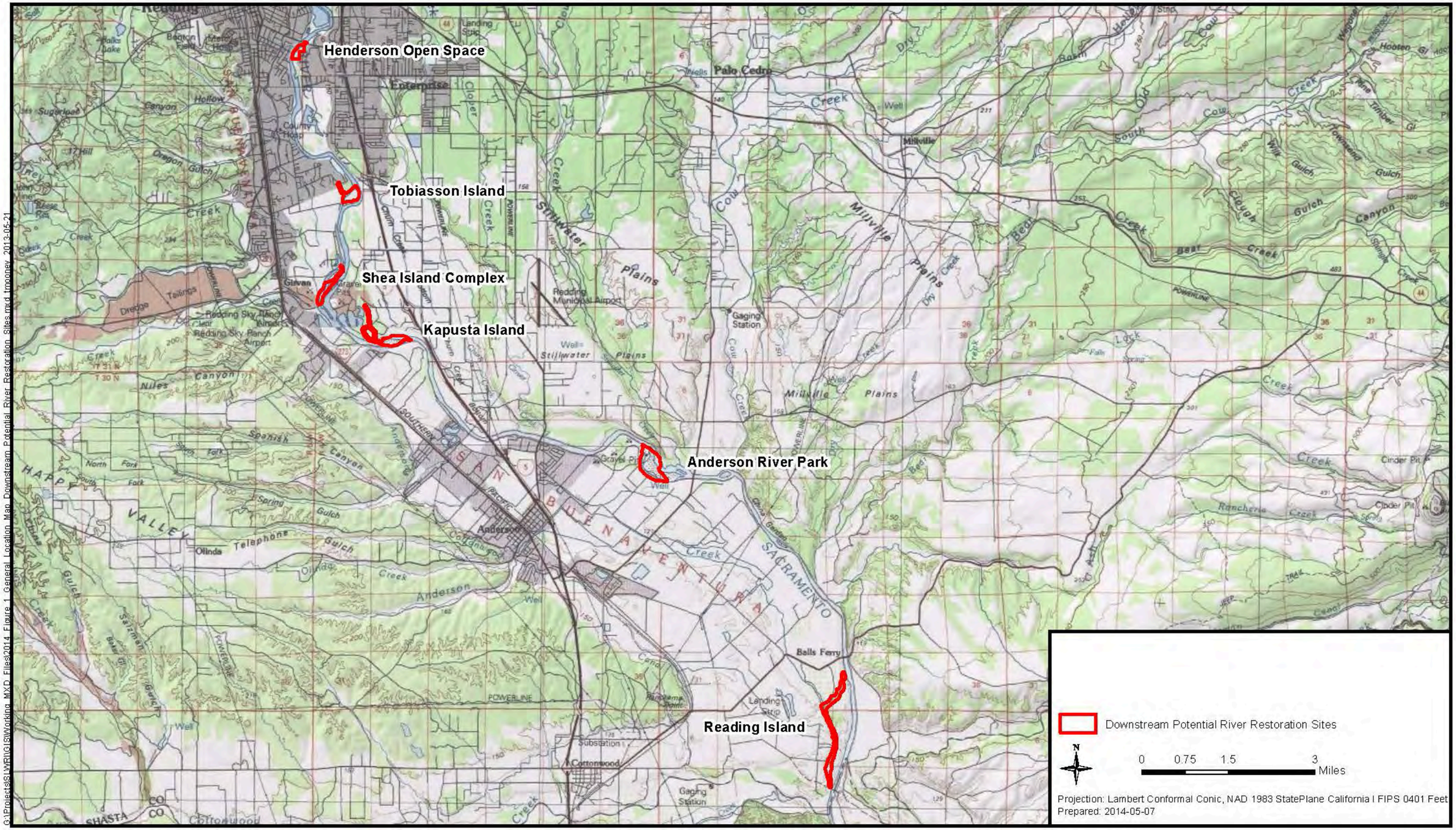

Figure 13-2. General Location Map Downstream Potential River Restoration Areas

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Table 13-1. Summary of Wildlife Habitats in the Impoundment Area

Habitat	Area (Acres[1])						
	Main Body	**Big Backbone Arm**	**Sacramento Arm**	**McCloud Arm**	**Squaw Creek Arm**	**Pit Arm**	**Total**
Annual grassland	0.44	0.00	3.10	0.70	0.00	0.38	4.61
Barren	2.30	0.00	10.60	3.56	0.00	1.35	17.81
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	32.33	46.98
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	4.18	4.18
Closed-cone pine–cypress	32.68	0.00	12.95	20.89	44.72	70.52	181.77
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath Mixed Conifer	0.00	0.00	0.00	0.00	0.00	10.96	10.96
Mixed chaparral	29.19	13.64	161.04	15.14	10.35	12.99	242.36
Montane hardwood	73.49	38.76	171.01	70.37	19.43	78.84	451.91
Montane hardwood–conifer	70.68	0.99	150.42	136.54	111.63	179.48	649.76
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.19	161.64	49.56	122.07	767.30
Riverine	0.00	0.88	5.24	15.43	1.41	0.00	22.96
Urban	21.95	0.00	1.95	7.96	0.00	1.26	33.14
Total	**460.37**	**91.67**	**730.72**	**446.49**	**242.92**	**519.90**	**2492.07**

Note:
[1]Acreage values are approximate.

Table 13-2. Summary of Wildlife Habitats in the Relocation Areas

Habitat	Area (Acres[1])						
	Main Body	**Big Backbone Arm**	**Sacramento Arm**	**McCloud Arm**	**Squaw Creek Arm**	**Pit Arm**	**Total**
Annual grassland	4.79	0.00	26.46	9.75	0.84	0.23	42.07
Barren	22.37	0.00	72.18	29.71	11.53	12.06	147.86
Blue oak–foothill pine	1.91	0.00	0.00	0.00	0.00	7.24	9.16
Blue oak woodland	0.00	0.00	0.00	3.68	0.00	0.92	4.59
Closed-cone pine–cypress	0.11	0.00	41.98	9.63	1.94	12.50	66.15
Douglas-fir	0.00	0.00	0.00	3.02	0.00	0.00	3.02
Mixed chaparral	12.65	0.00	56.11	26.92	4.44	33.98	134.11
Montane hardwood	35.81	0.00	137.77	148.13	6.34	0.13	328.17
Montane hardwood–conifer	104.31	0.00	117.35	221.40	29.04	30.09	502.19
Montane riparian	0.34	0.00	1.35	3.08	0.23	0.02	5.02
Ponderosa pine	156.24	0.00	398.26	272.10	43.08	22.09	891.77
Riverine	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban	20.66	0.00	228.60	0.48	0.00	0.57	250.30
Total	**359.20**	**0.00**	**1080.05**	**727.90**	**97.44**	**119.83**	**2384.42**

Note:
[1] Acreage values are approximate.

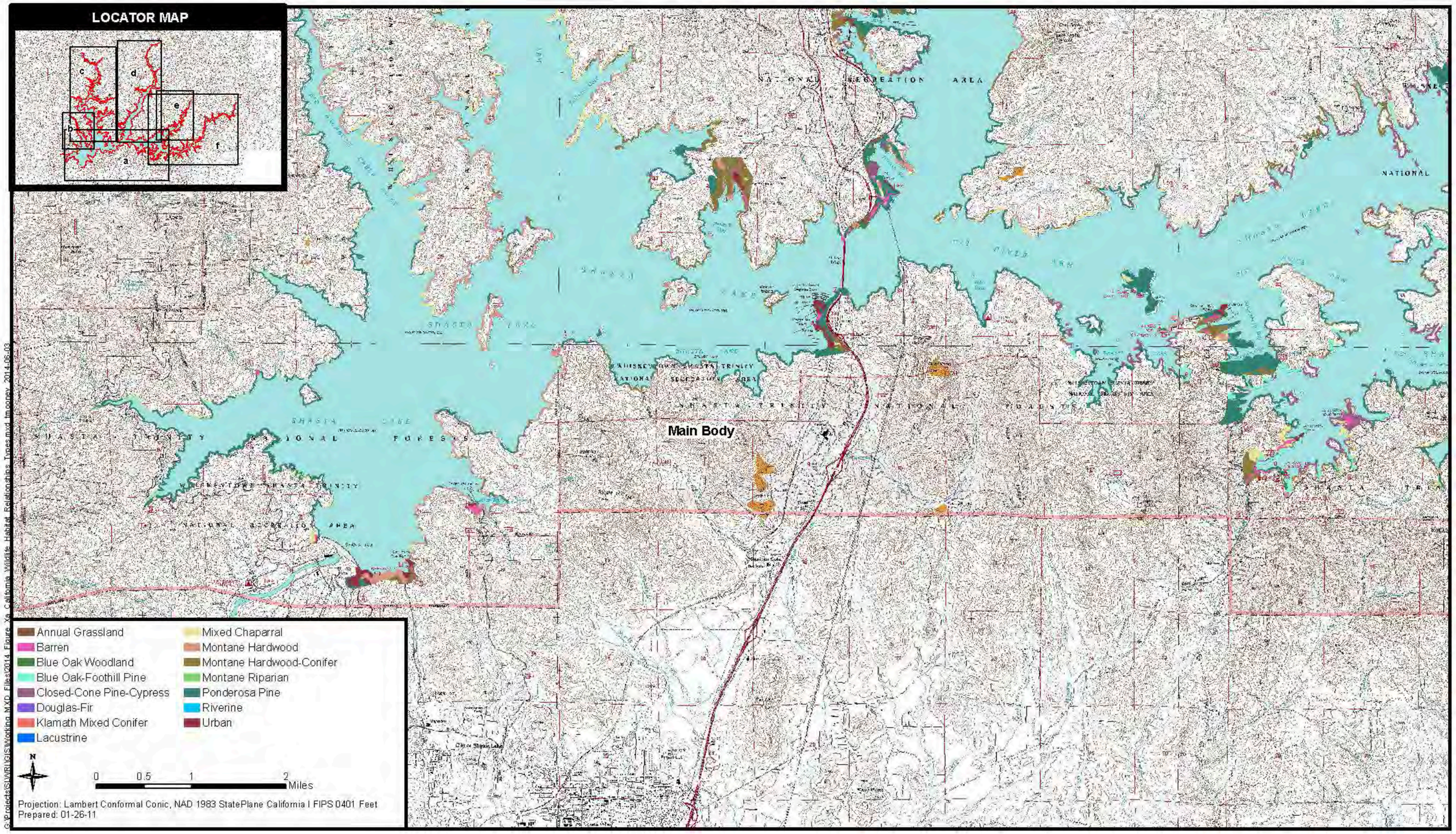

Figure 13-3a. California Wildlife Habitat Relationship Types

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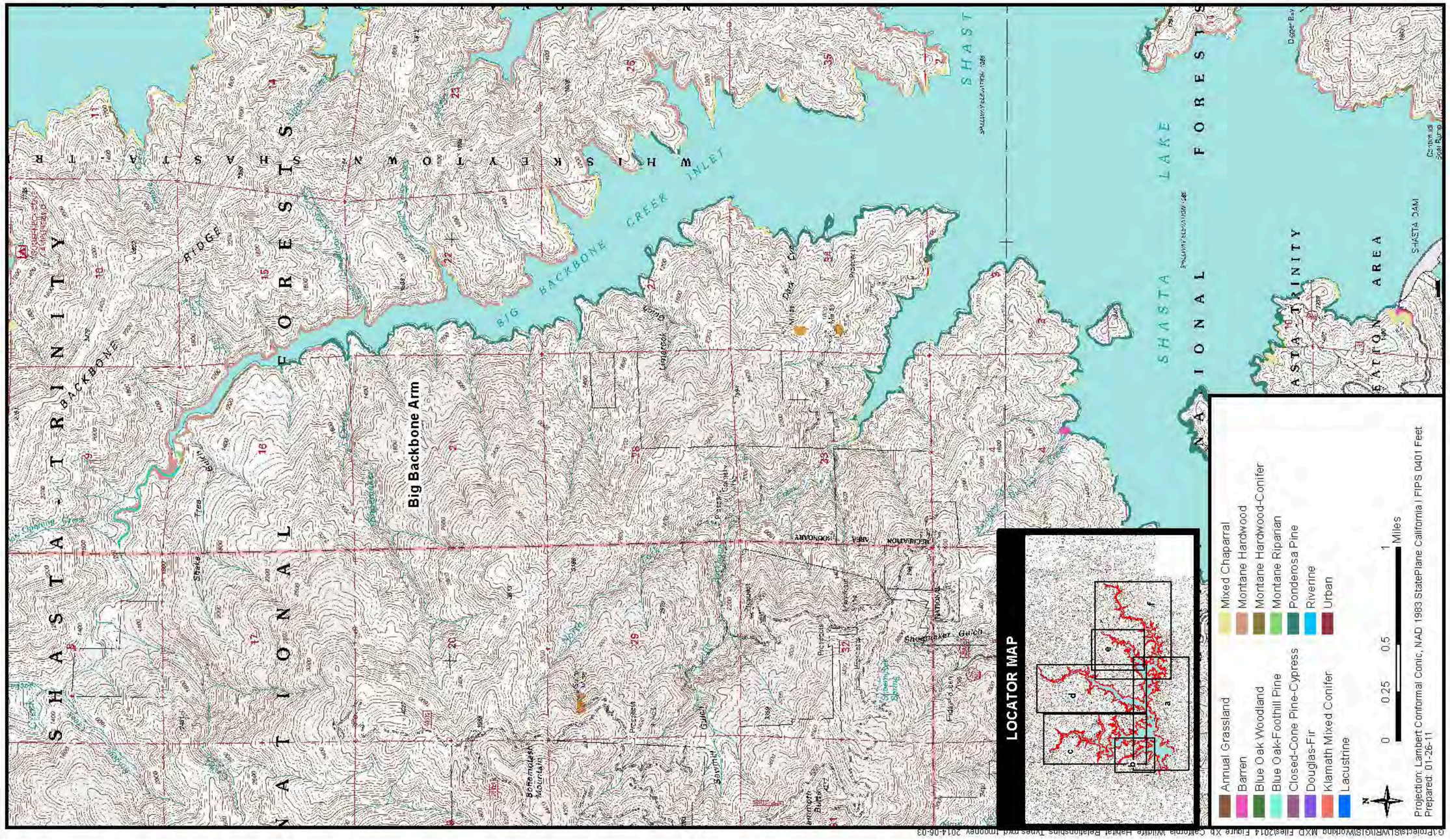

Figure 13-3b. California Wildlife Habitat Relationship Types

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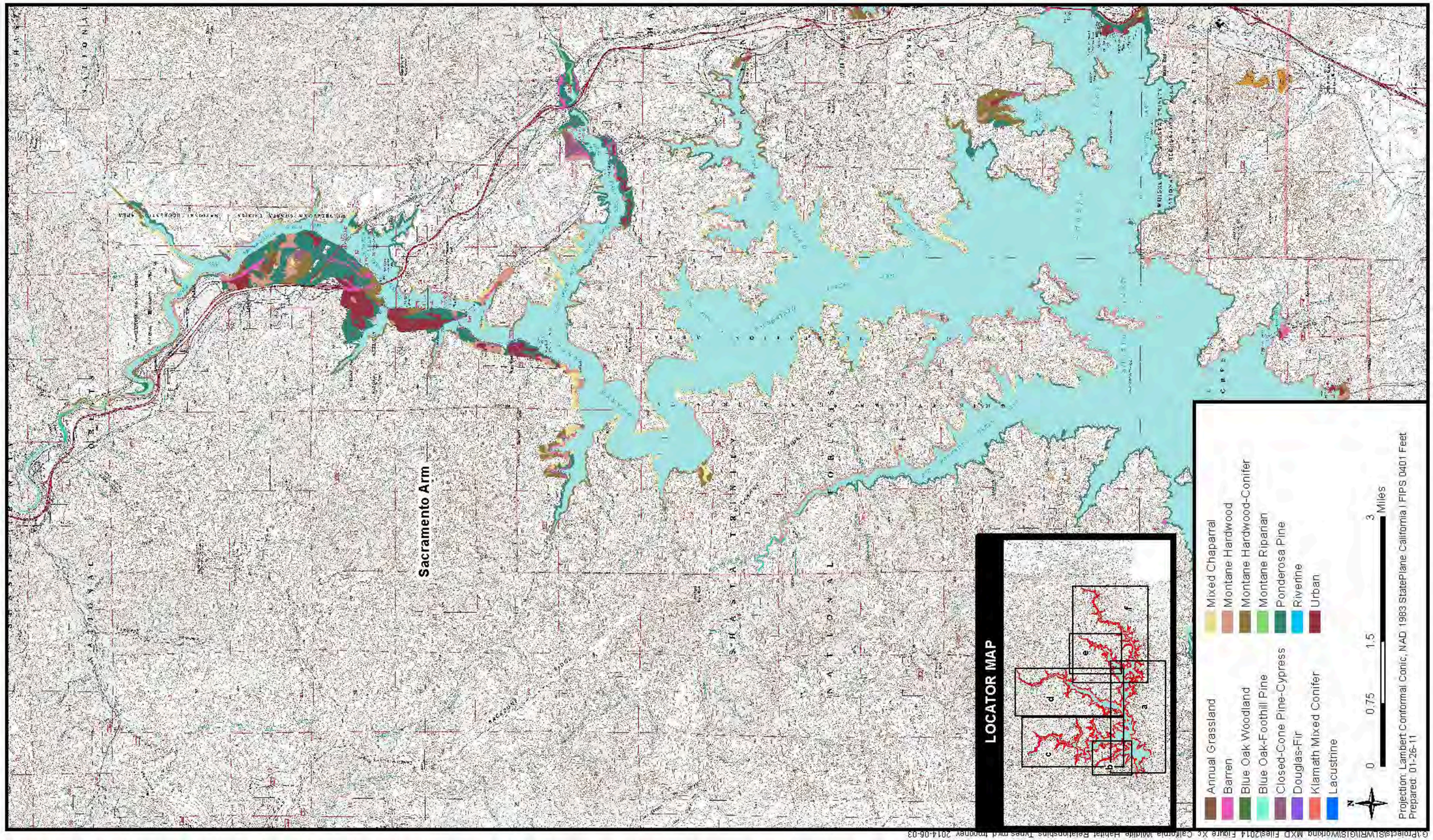

Figure 13-3c. California Wildlife Habitat Relationship Types

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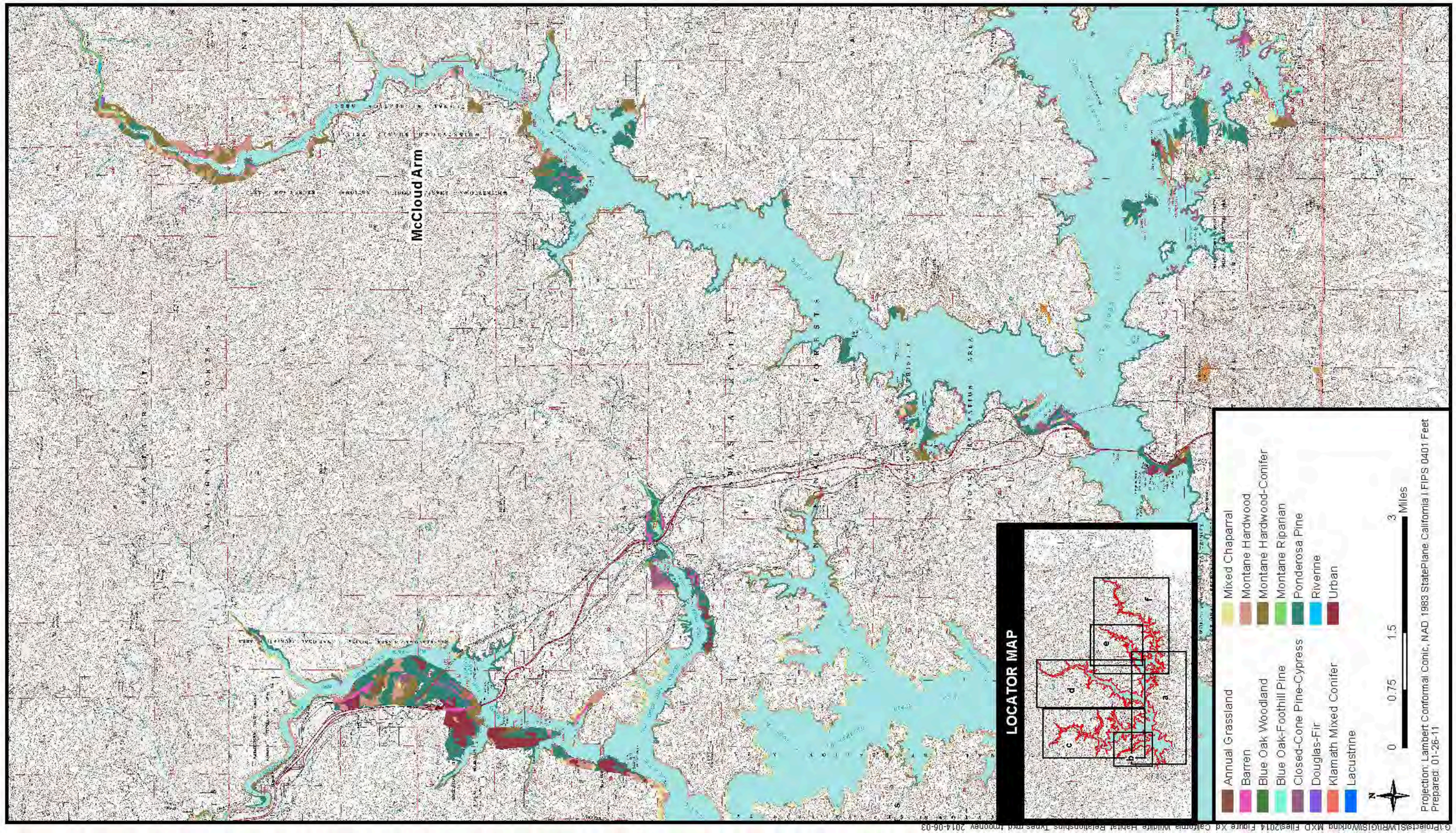

Figure 13-3d. California Wildlife Habitat Relationship Types

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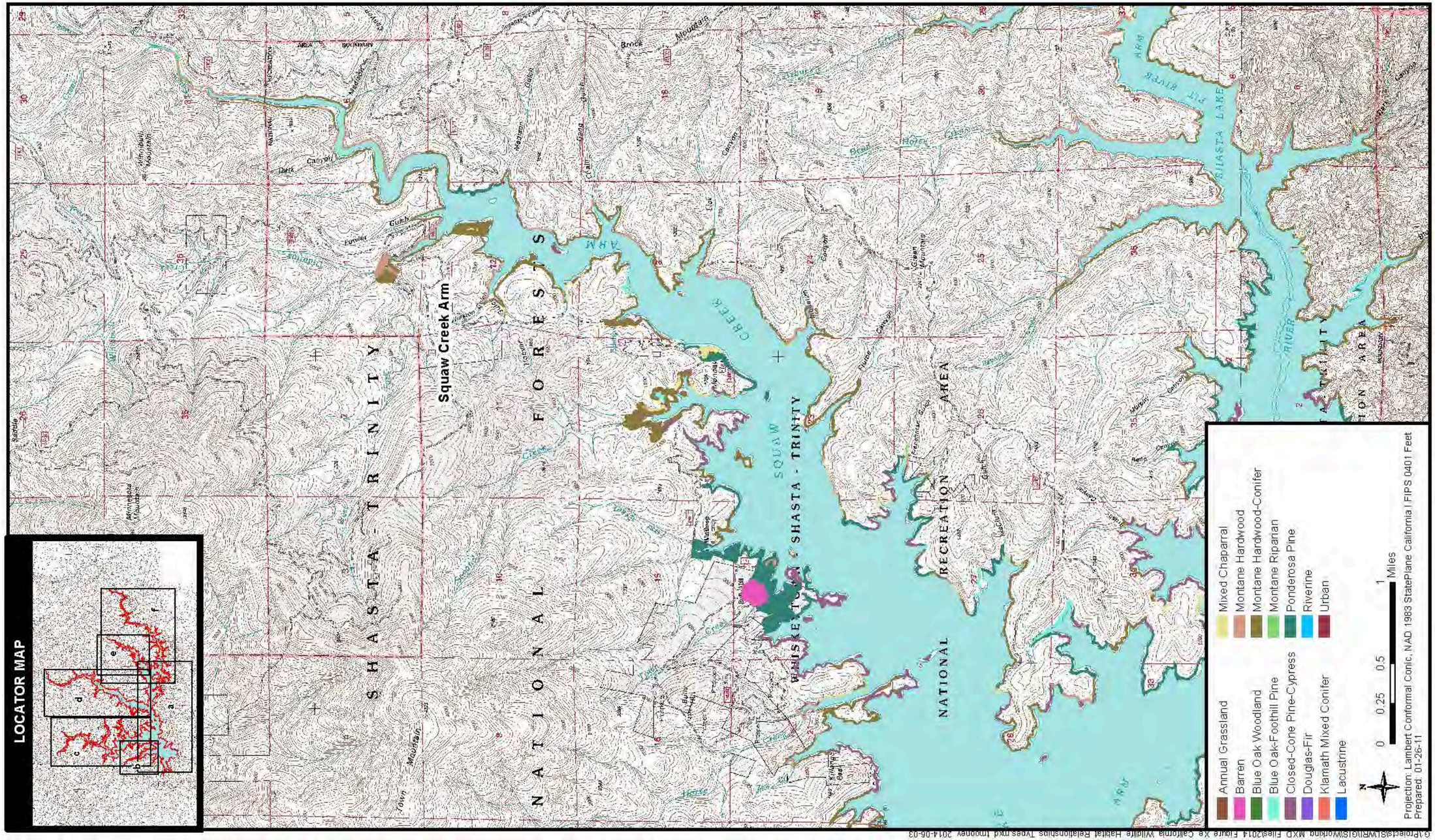

Figure 13-3e. California Wildlife Habitat Relationship Types

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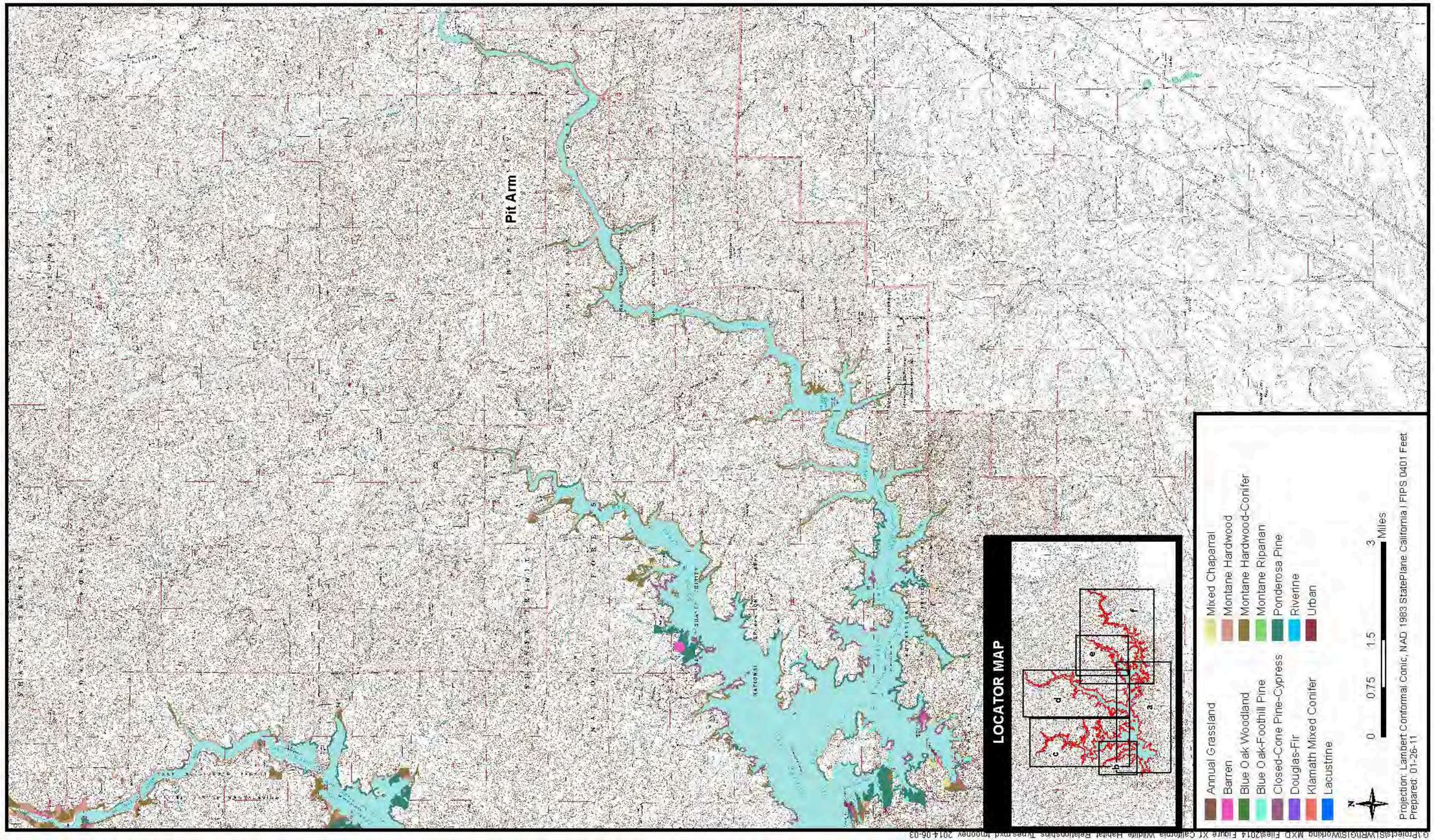

Figure 13-3f. California Wildlife Habitat Relationship Types

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Annual Grassland Annual grassland is uncommon in the Shasta Lake and vicinity portion of the primary study area and occurs as small inclusions in other more prevalent plant series types or in areas subjected to previous disturbance. Dominant species include wild oat (*Avena fatua*), cheatgrass (*Bromus tectorum*), ripgut (*B. diandrus*), yellow star-thistle (*Centaurea solstitialis*), squirreltail (*Elymus elymoides*), and European hairgrass (*Aira caryophyllea*). 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 inhabit this area include the western fence lizard (*Sceloporus occidentalis*), western skink (*Eumeces skiltonianus*), western rattlesnake (*Crotalus viridis*), and yellow-bellied racer (*Coluber constrictor*).

Barren Barren habitat consists mainly of human-made features without vegetation scattered throughout the Shasta Lake and vicinity portion of the primary study area, including boat ramps, parking lots, and roads. Other barren habitats include a large gravel plain feature at the confluence of Butcher Creek and Shasta Lake (Main Body) and a sealed riprap feature adjacent to Interstate 5 near the upper Sacramento Arm and Shasta Lake confluence. Vegetation is usually not present, although a sparse cover of grasses/forbs or weedy species may be present. Barren habitat has limited value for wildlife; however, many species in adjacent habitats may use these areas occasionally as opportunities arise, such as for feeding. Also, open nesting species, such as killdeer (*Charadrius vociferus*), may use some barren surfaces for nesting.

Blue Oak Woodland Blue oak woodland occurs mainly as small inclusions within other more prevalent habitats; however, moderate-sized stands also occur. This habitat occurs at scattered locations along the Main Body, McCloud Arm, and Pit Arm. Blue oak woodland is characterized by a moderate overstory of blue oak *(Quercus douglasii)* with a dense herbaceous understory. 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 hemionus columbianus*). Snags and live trees containing cavities provide nesting habitat for species such as the western bluebird (*Sialia 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, Virginia 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 found 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–Foothill Pine Blue oak–foothill pine habitat also occurs mainly as small inclusions within other more prevalent habitats in the Shasta Lake and vicinity portion of the primary study area; however, moderate-sized stands also occur. This habitat is found in the Main Body, Squaw Creek Arm, and Pit Arm. Species composition is similar to the blue oak woodland habitat; however, gray pine and a shrub component are more common. Dominant overstory species include blue oak, California black oak *(Quercus kelloggii),* valley oak *(Quercus lobata),* interior live oak *(Quercus wislizenii),* and gray pine *(Pinus sabiniana).* Common shrubs observed in this habitat include white leaf manzanita *(Arctostaphylos viscida),* buck brush *(Ceanothus cuneatus),* poison oak *(Toxicodendron diversilobum),* coffee berry *(Frangula californica),* snowdrop bush *(Styrax officinalis),* wild mock orange *(Philadelphus lewisii),* deer brush *(Ceanothus integerrimus),* and California buckeye *(Aesculus californica).* Common grasses and forbs observed in this vegetation habitat include pussy ears *(Calochortus tolmiei),* Pacific hounds tongue *(Cynoglossum grande),* slender wild oat, and soaproot *(Chlorogalum pomeridianum).* Lianas of Dutchman's pipe *(Aristolochia californica)* and chaparral clematis *(Clematis lasiantha)* shroud shrubs and often grow into the tree canopy.

The blue oak–foothill 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 the spotted towhee (*Pipilo maculatus*), California towhee (*Pipilo crissalis*), wrentit (*Chamaea fasciata*), and blue-gray gnatcatcher (*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–Cypress Closed-cone pine–cypress consists of open to dense knobcone pine (*Pinus contorta*) stands. This habitat is scattered throughout all portions of the Shasta Lake and vicinity portion of the primary study area and often occurs in disturbed areas, including areas subject to wildfires and historic mining activities. Dominant species include knobcone pine, with occasional canyon live oak (*Quercus chrysolepis*), California black oak, ponderosa pine, and gray pine. The shrub layer is moderate to dense and is dominated by white leaf manzanita and poison oak. The ground cover varies and is dominated by various grasses and forbs. 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.

Douglas-Fir As a habitat type, Douglas-fir is uncommon in the Shasta Lake and vicinity portion of the primary study area. This habitat type occurs in the upper portion of the McCloud Arm. Douglas-fir is characterized by moderate to dense conifer stands dominated by Douglas-fir (*Pseudotsuga menziesii*), with occasional ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), incense cedar (*Calocedrus decurrens*), canyon live oak, and California black oak. Associated understory species vary and include Pacific dogwood (*Cornus nuttallii*), mock orange (*Philadelphus lewisii*), poison oak, snowdrop bush, and white leaf manzanita. The ground layer ranges from open to moderate and is dominated by various grasses and forbs. The multilayered vegetation in the Douglas-fir 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*), and bobcat (*Lynx rufus*).

Klamath Mixed Conifer Klamath mixed conifer is an uncommon habitat type in the Shasta Lake and vicinity portion of the primary study area. This habitat type occurs in the upper portion of the Pit Arm, and in scattered locations in the watershed above the Shasta Lake and vicinity portion of the primary study area. Klamath mixed conifer is characterized by conifer stands dominated by Douglas-fir, ponderosa pine, sugar pine, with occasional incense cedar. Dominant hardwoods include canyon live oak, California black oak, and Pacific madrone (*Arbutus menziesii*). Associated understory species vary and include Pacific dogwood, mock orange, poison oak, and snowberry (*Symphoricarpos* sp.). The ground layer ranges from open to moderate and is dominated by various grasses and forbs. These forest stands are generally complex structurally, tend to grow on cooler northerly aspect slopes, and support similar wildlife species as the Douglas-fir habitat.

Lacustrine Lacustrine habitat consists of the area regularly inundated by Shasta Lake (i.e., areas up to and below the 1,070-foot elevation). Most of this

area is barren of vegetation and is characterized as exposed soil and/or rock. Portions of the lacustrine habitat do support vegetation during draw-down periods, including woody riparian species, such as black willow, button willow, Fremont cottonwood, and various grasses and forbs.

Mixed Chaparral Mixed chaparral is a common habitat type and is scattered throughout all portions of the Shasta Lake and vicinity portion of the primary study area. This habitat often occurs on exposed slopes and/or in disturbed areas, including areas subject to wildfires and historic mining activities. Mixed chaparral is typically characterized by dense shrub stands dominated by white leaf manzanita, buck brush, toyon *(Heteromeles arbutifolia),* California buckeye, Brewer's oak *(Quercus garryana* var. *breweri),* California bay *(Umbellularia californica),* interior live oak, Lemmon's ceanothus *(Ceanothus lemmonii),* birch-leaf mountain mahogany *(Cercocarpus betuloides),* holly-leaf redberry *(Rhamnus ilicifolia),* yerba santa *(Eriodictyon californicum),* and poison oak. Few herbaceous plants occur in this habitat. Mixed chaparral 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 Montane hardwood is a common tree habitat type and is scattered throughout all portions of the Shasta Lake and vicinity portion of the primary study area. The montane hardwood stands are typically characterized by moderate to dense stands of California black oak, canyon live oak, and occasional interior live oak. The understory is variable, although often sparse in the evergreen (live oak) stands because of a typically dense overstory canopy. 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 Virginia opossum. In moist areas, many amphibians and reptiles are found in the duff layer, including ensatina (salamander) (*Ensatina eschscholtzii*) and western skink.

Montane Hardwood–Conifer Montane hardwood–conifer is a common tree habitat type and is scattered throughout all portions of the Shasta Lake and vicinity portion of the primary study area. Montane hardwood–conifer is a complex forest type generally characterized by a complex of hardwood and conifer tree species. Stand composition varies, depending on numerous physical and geographic factors, and can include California black oak, canyon live oak, interior live oak, Oregon white oak (*Quercus garryana*), gray pine, ponderosa

pine, Douglas-fir, sugar pine, and knobcone pine. Understory species are generally moderate to dense and include white leaf manzanita, buck brush, California buckeye, western redbud *(Cercis occidentalis)*, California bay, poison oak, birch-leaf mountain mahogany, Brewer's oak, and snowdrop bush. The ground layer varies and is dominated by various grasses and forbs, including pussy ears, soaproot, Pacific hound's tongue, and slender wild oat.

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, and 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, including ensatina and western fence lizards, inhabit the duff layer. Snakes, including the western rattlesnake and sharp-tailed snake (*Contia tenuis*), also are found in this habitat.

Montane Riparian Montane riparian is the dominant riparian habitat type and is scattered throughout all portions of the Shasta Lake and vicinity portion of the primary study area. Montane riparian habitat occurs as thin stringers and large patches along most stream corridors and is characterized as a sparse overstory of white alder (*Alnus rhombifolia*), Fremont cottonwood (*Populus fremontii*), or big leaf maple (*Acer macrophyllum*), along with a fairly dense mid-story and herbaceous layer. The mid-story is dominated by red osier dogwood (*Cornus sericea*), arroyo willow (*Salix lasiolepis*), narrow-leafed willow (*S. exigua*), red willow *(S. laevigata*), spicebush (*Calycanthus occidentalis*), mock orange, button willow (*Cephalanthus occidentalis*), American dogwood (*Cornus cericea*), California ash (*Fraxinus dipetala*), and mugwort (*Artemesia douglasiana*). Brambles of Himalayan blackberry (*Rubus armeniacus*) and California blackberry (*R. ursinus*) often engulf broader, low-gradient riparian areas. Lianas, including California grape and greenbriar (*Smilax californica*), grow into the canopy.

Riparian habitats are among 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 inhabit riparian communities, including the deer mouse, raccoon, Virginia opossum, and several bat species.

Ponderosa Pine Ponderosa pine is the most common conifer habitat type in the Shasta Lake and vicinity portion of the primary study area and is scattered throughout all portions of the area. This habitat is characterized by open to dense conifer stands dominated by ponderosa pine. Associated species include occasional Douglas-fir, sugar pine, incense cedar, canyon live oak, and California black oak. Associated understory species vary and include redbud, buck brush, mock orange, poison oak, snowdrop bush, and white leaf manzanita. The ground layer ranges from open to moderate and is dominated by various grasses and forbs.

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, and snags and hollow logs provide shelter for species such as the Virginia opossum, western spotted skunk (*Spilogale gracilis*), and several bat species.

Riverine Riverine habitat includes the free-flowing portions of the rivers and larger streams tributary to Shasta Lake. The riverine habitat is highly variable and ranges from moderately to well-confined stream reaches with low to steep gradient. Most riverine habitat is dominated by run-and-riffle habitats, with bedrock, boulder, cobble, gravel, and sand substrates. The vegetation in the active stream channel is sparse, with occasional clumps of torrent sedge (*Carex nudata*) and Indian rhubarb (*Darmera peltata*).

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 (*Mergus merganser*), and belted kingfisher (*Ceryle alcyon*). Many mammals in the surrounding upland habitats use the riverine areas, including raccoon, gray fox, black-tailed deer, and many bat species.

Urban Urban habitat consists of various human-made features scattered throughout the Shasta Lake and vicinity portion of the primary study area, including resorts and a portion of the visitor center complex at Shasta Dam. These features are typically a combination of buildings, pavement areas with manicured landscaping, and lawns. 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 starling (*Sturnus vulgaris*), rock dove (*Columba livia*), and house mouse (*Mus musculus*). Native species that are able to use these habitats include the western fence lizard, American robin (*Turdus migratorius*), Brewer's blackbird (*Euphagus cyanocephalus*), northern mockingbird (*Mimus polyglottos*), mourning dove, house finch (*Carpodacus mexicanus*), California ground squirrel, black-tailed hare, and striped skunk (*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 following section provides a description of the wildlife habitats that exist along the Sacramento River throughout the primary study area, and a detailed discussion of potential Sacramento River downstream habitat restorations areas.

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. Overall, the quantity and variety of wildlife species now inhabiting the area have been reduced since agricultural and residential development permanently removed much of the native and natural habitat. Most affected have been wildlife species associated with riparian habitats, which have declined substantially and been highly altered by land use, water resources development, and land management practices. Wildlife species associated with grassland and oak woodland habitats have also been affected by habitat loss resulting from habitat conversions to residential, commercial, and agricultural uses; cattle grazing; and other compounding factors, such as lack of oak regeneration, spread of Sudden Oak Death Syndrome, and competition from invasive species. The region also supports a variety of nonnative plant and animal species, some of which are detrimental to survival of native species.

Habitats present in this portion of the primary study area are riparian woodland, riparian scrub, oak woodland, chaparral, annual grassland, agriculture, and urban. (See the *Wildlife Resources Technical Report* for a description of the plant and wildlife species typical of these habitats.) Riparian habitat has been designated by the CDFW as a sensitive habitat in California because of its limited abundance and high value to wildlife.

Potential Sacramento River Downstream Habitat Restoration Areas As a component of the SLWRI, Reclamation proposes to restore and/or enhance riparian and riverine habitats at six locations along the lower Sacramento River

below Shasta Dam. These six locations occur generally between the city of Redding and Reading Island, Shasta County, California. The purpose of the restoration effort is to improve spawning and rearing habitat for anadromous fish occurring in the Sacramento River. These six locations are referred to as the potential Sacramento River downstream habitat restoration areas (Figure 13-2).

The potential Sacramento River downstream habitat restoration areas are characterized by habitats typical of riparian and riverine areas along the Sacramento River below Shasta Dam. These habitats were also mapped and classified using the Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988). Habitats present in the potential Sacramento River downstream habitat restoration areas are summarized in Table 13-3, and shown in Figures 13-4a through 13-4f. General habitat descriptions for these locations are also described below.

Table 13-3. Summary of Wildlife Habitats in the Potential Sacramento River Downstream Habitat Restoration Areas

Habitat	Area (Acres[1])						
	Henderson	Tobiasson Island	Shea Island Complex	Kapusta Island	Anderson River Park	Reading Island	Total
Annual grassland	2.50	13.73	2.61	18.15	7.83	0.00	44.82
Barren	0.31	1.10	0.00	0.00	0.55	0.00	1.96
Freshwater emergent wetland	3.73	0.28	0.54	0.43	11.05	15.33	31.36
Mixed chaparral	0.00	0.00	0.00	0.00	2.80	0.00	2.80
Orchard	0.00	0.00	0.00	0.00	0.00	0.55	0.55
Riverine	0.66	1.33	3.45	8.07	0.00	0.47	13.98
Valley-foothill riparian	13.12	9.06	28.97	25.08	57.90	24.78	158.90
Valley oak woodland	0.00	13.26	0.00	13.33	26.85	50.48	103.92
Total	20.32	38.76	35.57	65.06	106.96	91.61	358.29

Note:
[1]Acreage values are approximate.

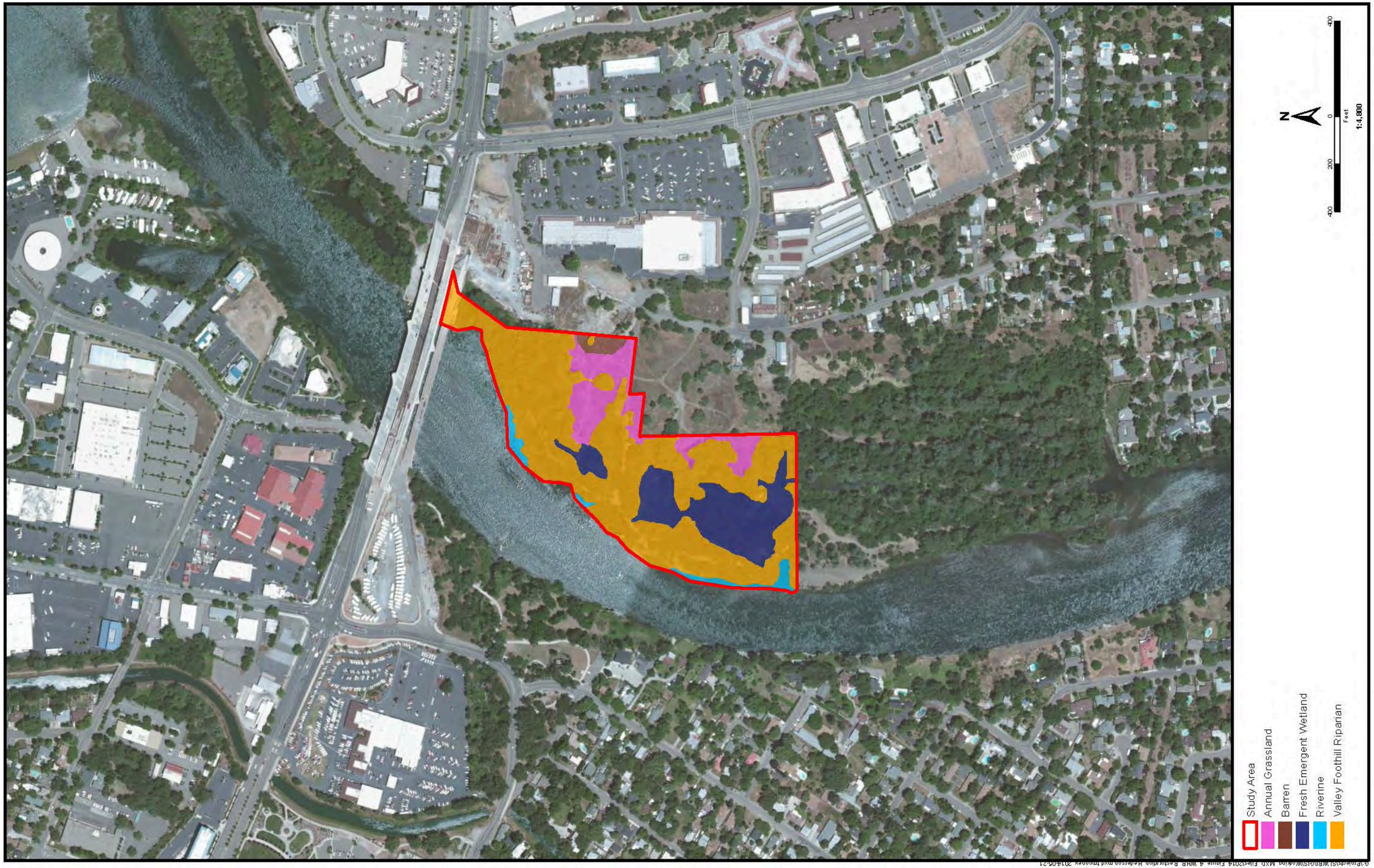

Figure 13-4a. California Wildlife Habitat Relationship Types – Henderson Open Space

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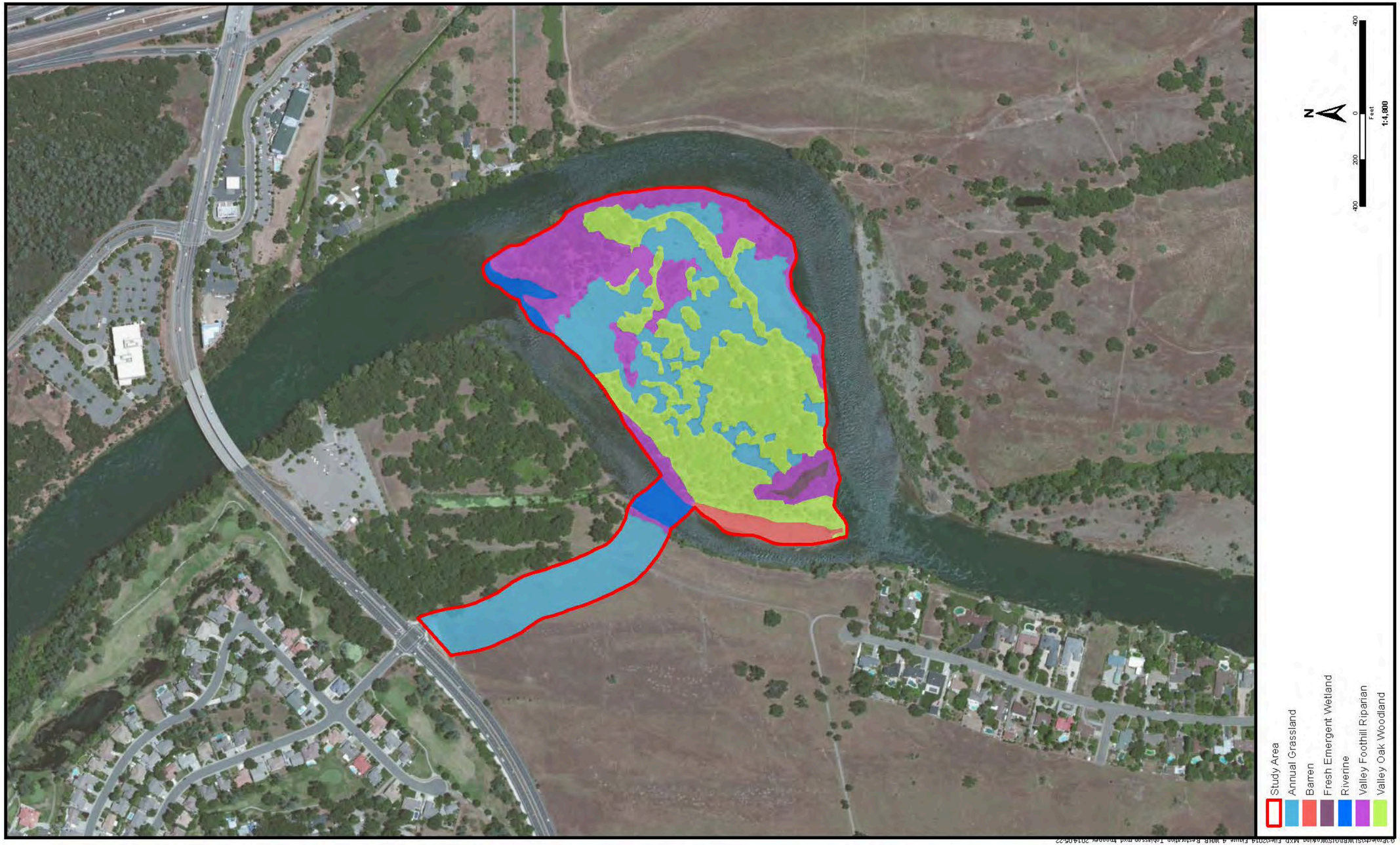

Figure 13-4b. California Wildlife Habitat Relationship Types – Tobiasson Island

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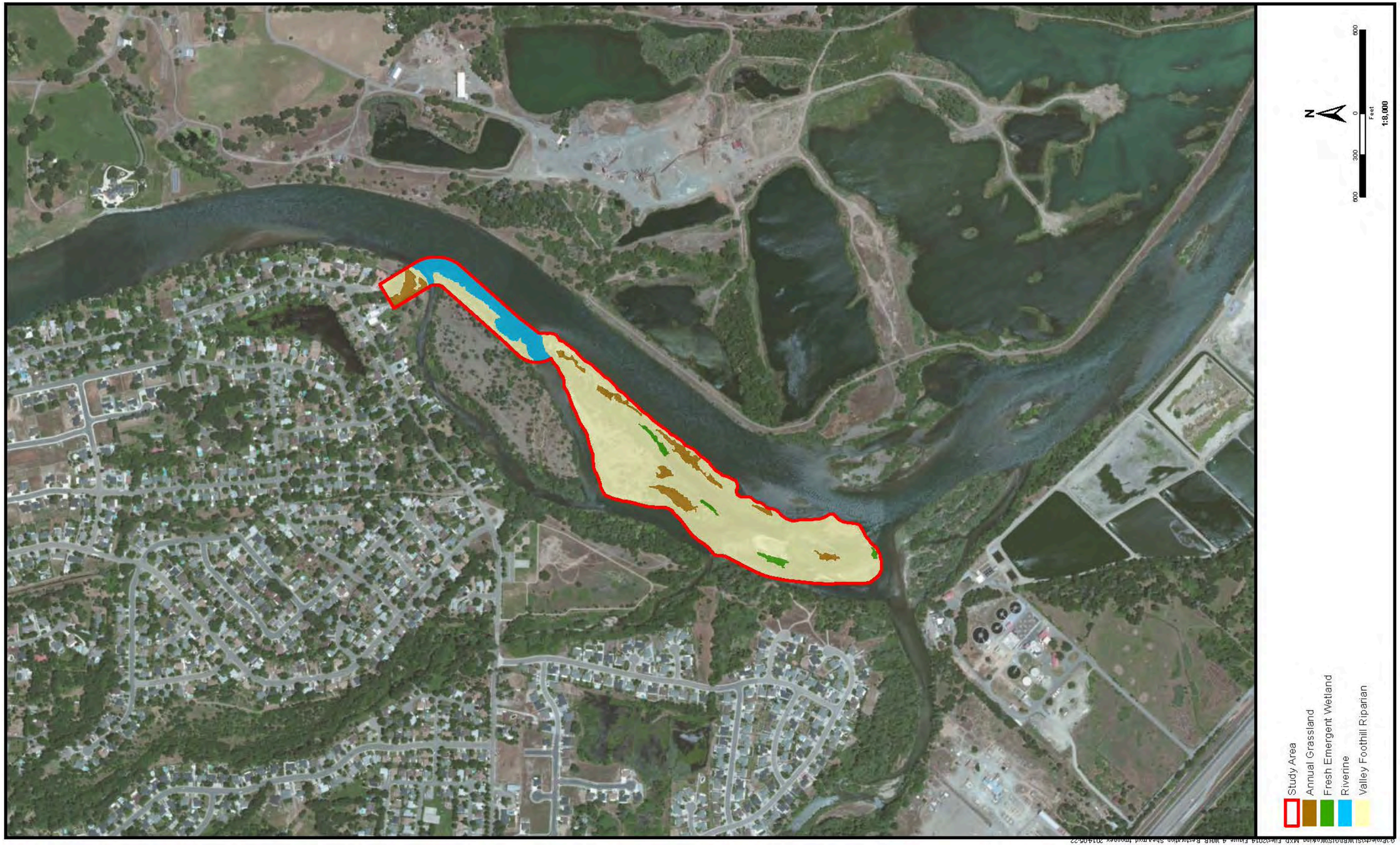

Figure 13-4c. California Wildlife Habitat Relationship Types – Shea Island Complex

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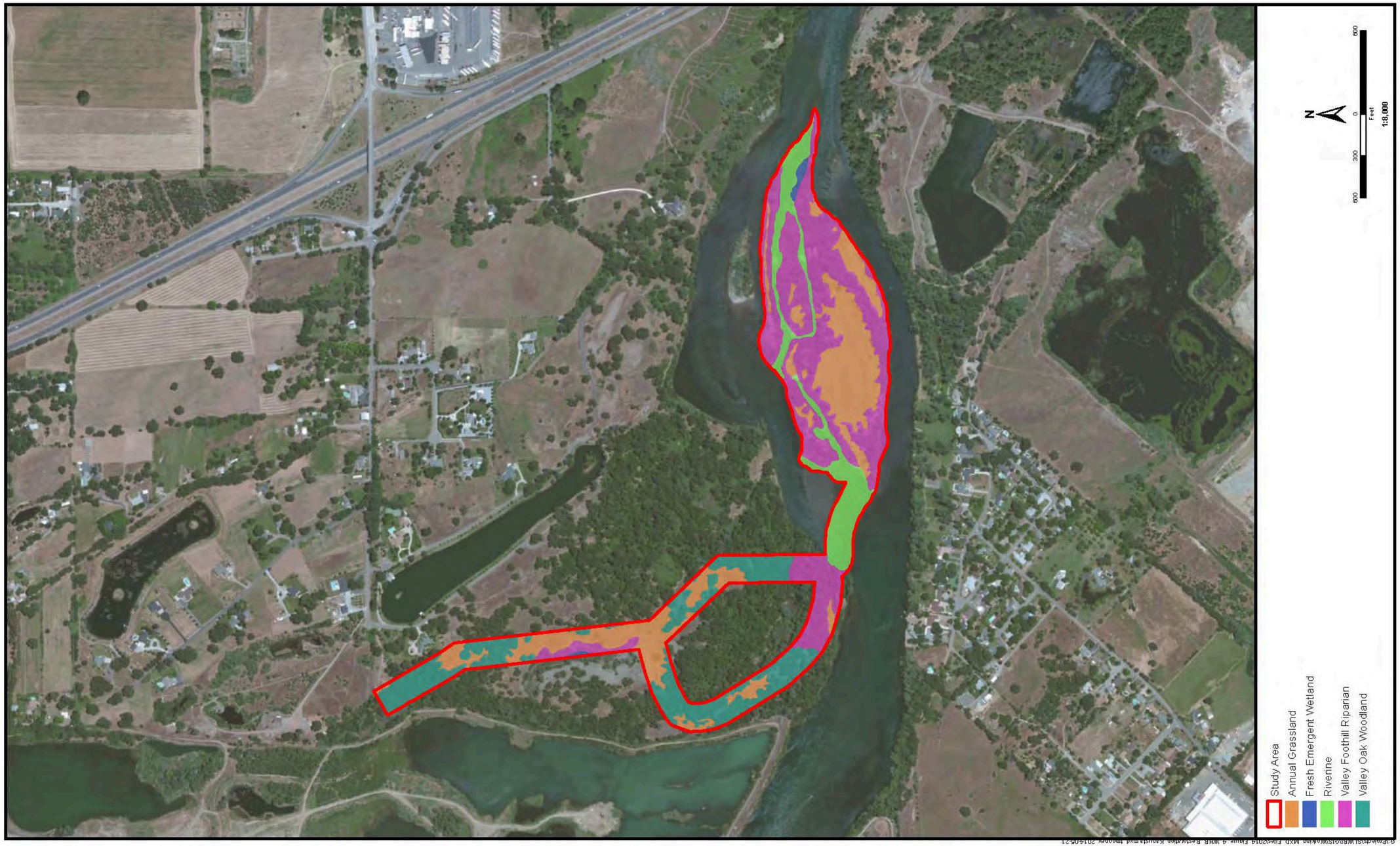

Figure 13-4d. California Wildlife Habitat Relationship Types – Kapusta Island

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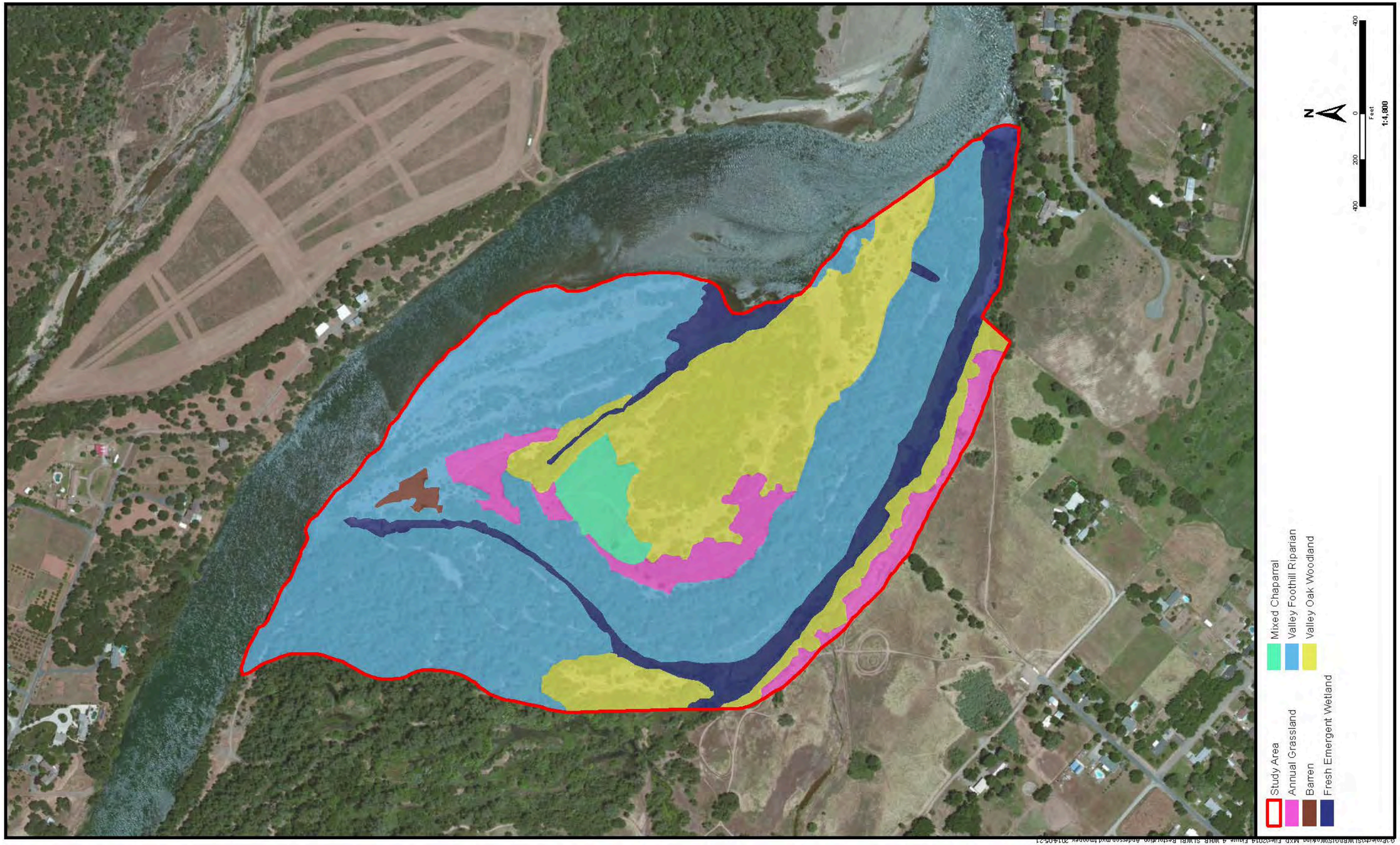

Figure 13-4e. California Wildlife Habitat Relationship Types – Anderson River Park

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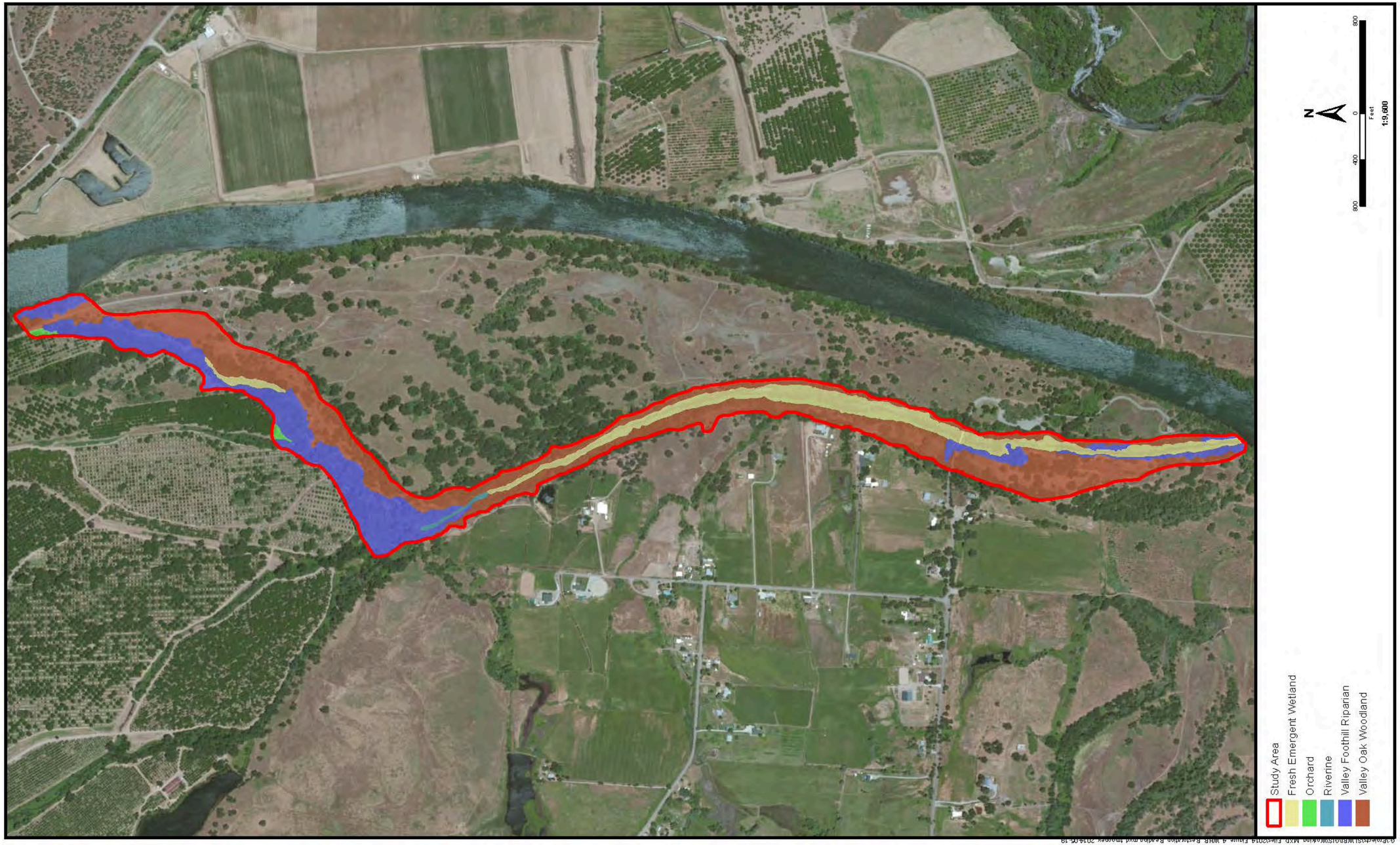

Figure 13-4f. California Wildlife Habitat Relationship Types – Reading Island

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Many of the same wildlife habitats found in the Shasta Lake and vicinity portion of the primary study area also occur in the potential Sacramento River habitat restoration areas. However, the species composition, structure, and overall function of these areas are significantly different, as these areas are situated in a separate geographic setting and region. Habitats occurring in the potential Sacramento River habitat restoration areas include annual grassland, barren, freshwater emergent wetland, mixed chaparral, orchard, riverine, valley-foothill riparian, and valley oak woodland.

Annual Grassland Annual grasslands are uncommon in the potential Sacramento River habitat restoration areas and occur as open ruderal areas and vegetated gravel bars. This plant community is characterized by moderate to dense cover of annual grasses and forbs including black mustard (*Brassica nigra*), California poppy (*Eschscholzia californica*), ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), wild oat (*Avena barbata*), rose clover (*Trifolium hirtum*), long beaked storks bill (*Erodium botrys*), turkey mullein (*Croton setigeris*), Oregon golden aster (*Heterotheca oregona*), and tall sock-destroyer (*Torilis arvensis*).

Barren Barren habitat occurs on gravel bars and is characterized by open areas of gravel and cobble substrates. Vegetation is typically absent, although in some barren areas sparse opportunistic grasses/forbs or weedy species may occur.

Freshwater Emergent Wetland Freshwater emergent wetlands occur along the margins of backwater sloughs and other wetland features, and as small inclusions in valley-foothill riparian habitats. These wetlands are characterized by dense stands of broadleaf cattail (*Typha latifolia*), with reed canarygrass (*Phalaris arundinacea*), horsetail (*Equisetum* sp.), smartweed (*Persicaria* sp.), sedges (*Carex* spp.), rushes (*Juncus* spp.), and dallisgrass (*Paspalum dilatatum*). Submergent vegetation dominated by parrot's feather (*Myriophyllum aquaticum*) and water primrose (*Ludwigia peploides*) grow in the deep water portions of the wetlands.

Mixed Chaparral Mixed chaparral is uncommon in the potential Sacramento River habitat restoration areas and only occurs at the Anderson River Park site. This habitat consists of shrub patches in open rocky areas in the central portion of the study area dominated by California yerba santa (*Eriodictyon californicum*) and wright's buckwheat (*Eriogonum wrightii*). Other associated species include Oregon golden aster, naked buckwheat (*Eriogonum nudum*), slender wild oat, mousetail, ripgut grass, soft chess, and red brome (*Bromus madritensis* ssp. *rubens*).

Orchard Orchard habitat is uncommon in the potential Sacramento River habitat restoration areas and only occurs at the Reading Island site. This habitat consists of a small portion of a walnut orchard extending into a portion of the northern site boundary. The walnut orchard is mature and well maintained.

Vegetation includes an overstory of walnut trees and ground cover of various grasses and forbs.

Riverine Riverine habitat occurs at each potential Sacramento River habitat restoration area and consists of portions of active Sacramento River channel within and/or around each site. The riverbed is dominated by primarily gravel, cobble, and boulder substrates.

Valley-foothill Riparian Valley-foothill riparian is the dominant habitat in the potential Sacramento River habitat restoration areas and occurs as moderate to dense stands of mainly riparian trees and shrubs. Many tree and shrub species occur including Fremont cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), Oregon ash (*Fraxinus latifolia*), white alder (*Alnus rhombifolia*), narrowleaf willow (*Salix exigua*), shining willow (*Salix lasiandra*), Goodding's black willow (*Salix gooddingii*), black locust (*Robinia pseudoacacia*), and silver wattle (*Acacia dealbata*). Understory vegetation is moderate to dense and includes Himalayan blackberry (*Rubus armeniacus*), California grape (*Vitis californica*), Santa Barbara sedge (*Carex barbarae*), giant reed (*Arundo donax*), mugwort (*Artemisia douglasii*), horsetail, and Johnson grass (*Sorghum halepense*).

Valley Oak Woodland Valley oak woodland is uncommon in the potential Sacramento River habitat restoration areas and only occurs at the Anderson River Park site and a small portion of the Tobiasson Island site. This habitat occurs above the active floodplain of the Sacramento River and is characterized by a moderate overstory of valley oak (*Quercus lobata*) with occasional interior live oak (*Quercus wislizenii*), foothill pine (*Pinus sabiniana*), narrowleaf willow, shining willow, Fremont cottonwood, Oregon ash, and tree of heaven (*Ailanthus altissima*). Dominant understory vegetation includes western redbud (*Cercis occidentalis*), California coffee berry (*Frangula californica*), mugwort, winter vetch (*Vicia villosa*), Santa Barbara sedge, ripgut grass, common ragweed (*Ambrosia artemisiifolia*), and Bermuda grass (*Cynodon dactylon*).

Lower Sacramento River and Delta

The roughly 300 miles of the Sacramento River can be subdivided into distinct reaches. The reaches in the lower Sacramento River and Delta portion of the extended study area are discussed separately below because of differences in morphology, riparian vegetation, and habitat functions.

Sacramento River from Red Bluff Pumping Plant to the Delta Most habitat types and many of the wildlife species found in the upper Sacramento River portion of the primary study area 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 segment of the extended study area between Red Bluff Pumping Plant and the Delta includes a diverse array of wildlife habitats – 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: a variety of resident and migratory waterfowl, raptors, and songbirds, plus a variety of mammals, amphibians, and reptiles that inhabit both aquatic and upland habitats.

Sacramento–San Joaquin River Delta Delta wetlands are considered to be among the most productive wildlife habitats in California. These wetlands consist of permanent saline, brackish, and freshwater marshes; seasonal freshwater wetlands; open water; tidal and nontidal marshes, and emergent wetlands; and seasonally flooded agricultural cropland, such as rice fields (CALFED 2000a). (See the *Wildlife Resources Technical Report* for a discussion of the plant and wildlife species typical of Delta wetlands.)

San Joaquin River Basin to the Delta 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 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.

CVP/SWP Service Areas

The CVP and 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 2000a). The agricultural land and urban development that dominate the CVP and SWP service areas, respectively, can support many wildlife species, most of which are highly adapted to these disturbed environments.

13.1.2 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, these include 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 CDFW as fully protected or species of special concern; species identified by USFS as sensitive, or endemic; species identified by the U.S. Department of the Interior, Bureau of Land Management (BLM) as sensitive; species designated by the *Northwest Forest Plan* (NWFP) as survey and manage (S&M); other animals protected by the California Fish and Game Code; and those designated as Multi-Species Conservation Strategy (MSCS) covered species by the CALFED Bay-Delta Program (CALFED).

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 government
- Proposed or petitioned for Federal listing as threatened or endangered
- State or Federal candidates for listing as threatened or endangered
- Identified by CDFW as a species of special concern
- Considered sensitive or endemic by USFS
- Considered sensitive by BLM
- Considered S&M species by NWFP
- 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 CDFW special-status species lists for Shasta County; review of the CALFED MSCS list; review of other appropriate literature; discussions with BLM, CDFW, DWR, USFS, and USFWS 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 of the *Wildlife Resources Technical Report*, which provides a general comparison of habitat requirements for each species and the general habitats 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 Reclamation since 2002 were used to determine the likelihood of their presence in the primary study area above Shasta Dam (Table 13-4).

The S&M species include all species included in the January 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines* (U.S. Department of Agriculture and U.S. Department of the Interior 2001) (2001 S&M Record of Decision [ROD]) The current S&M species list is from the 2001 S&M ROD and includes species listed in the 2001 S&M ROD *Survey and Manage Standards and Guidelines and Category Assignment* (BLM December 2013). For the purposes of this evaluation, S&M species of concern include taxa that are designated as Category A and C by the current category

assignment. These categories include taxa that require what are known as pre-disturbance (i.e., pre-project) surveys.

The CNDDB was reviewed for records of special-status plant species in or near the Shasta Lake and vicinity portion of the primary study area. The CNDDB is a database consisting of historical observations of special-status plant species, wildlife species, and natural communities. The CNDDB is limited to reported sightings and is not a comprehensive list of special-status species that could occur in a particular area.

Table 13-4. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area

Common Name	Scientific Name	Status[1]	Potential for Occurrence
Western bumble bee	*Bombus occidentalis*	USFS S	Various habitats with abundant flowering vegetation from spring through fall.
Church's sideband	*Monadenis churchi*	S&M	Potentially occurring in mixed conifer and conifer/woodland habitats. Many known occurrences in the Shasta Lake and vicinity portion of the study area.
Shasta sideband	*Monadenia troglodytes troglodytes*	FP, USFS S, S&M, MSCS m	Endemic to Shasta County. Potentially occurring in mixed conifer and woodland habitats, especially near limestone. Species occurs in limestone on the McCloud Arm.
Wintu sideband	*Monadenia troglodytes wintu*	FP, USFS S, S&M	Endemic to Shasta County. Potentially occurring in mixed conifer and woodland habitats, especially near limestone. Known to occur between the Pit and Squaw Creek arms and at Mountain Gate.
Oregon shoulderband	*Helminthoglypta hertlenii*	S&M	Potentially occurring in mixed conifer and conifer/woodland habitats. Many known occurrences in the Shasta Lake and vicinity portion of the study area.
Shasta chaparral	*Trilobopsis roperi*	FP, USFS S, S&M	Endemic to Shasta County. Potentially occurring in mixed conifer and conifer/woodland habitats. Known occurrences in the Shasta Lake and vicinity portion of the study area.
Shasta hesperian	*Vespericola shasta*	FP, USFS S, S&M	Endemic to the southeastern Klamath Mountains. Potentially occurring in mixed conifer and conifer/woodland habitats (riparian and/or riverine habitats). Known occurrences in the Shasta Lake and vicinity portion of the study area.
Shasta salamander	*Hydromantes shastae*	CT, USFS S, S&M, MSCS m, BLMS	Only known from the southeastern Klamath Mountains. Potentially occurring in mixed conifer, woodland, and chaparral habitats, especially near limestone. Known occurrences in 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 the McCloud Arm and the upper Sacramento Arm tributaries outside the study area boundaries (CDFG 2003).

Table 13-4. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area (contd.)

Common Name	Scientific Name	Status[1]	Potential for Occurrence
California red-legged frog	*Rana draytonii*	FT, CSC, MSCS m	Requires aquatic habitat for breeding; also uses a variety of other habitat types, including riparian and upland areas. The Shasta Lake and vicinity portion of the study area is outside the current species range. A USFWS habitat assessment is in preparation to determine habitat suitability.
Foothill yellow-legged frog	*Rana boylii*	CSC, USFS S, MSCS m, BLMS	Potentially occurring in stream habitats. Known occurrences scattered throughout the Shasta Lake and vicinity portion of the primary study area.
Northwestern pond turtle	*Actinemys marmorata*	CSC, USFS S, MSCS m	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.
Great blue heron	*Ardea herodias*	MSCS m	Known to breed in nearshore wooded habitat in the Turntable Bay area of Shasta Lake.
Cooper's hawk	*Accipiter cooperi*	MSCS m	Potentially occurring in mixed conifer and conifer/woodland habitats.
Northern goshawk	*Accipiter gentilis*	CSC, USFS S, BLMS	Potentially occurring in mixed conifer habitats. Known to occur in the upper McCloud Arm.
Bald eagle	*Haliaeetus leucocephalus*	FD, FB, CE, CP, USFS S, MSCS m, BLMS	Occur in riverine and lacustrine habitats. Common at Shasta Lake, and a substantial number of nests occur in 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*	MSCS m	Occur in riverine and lacustrine habitats. Common at Shasta Lake, and many known nests occur in the Shasta Lake and vicinity portion of the primary study area and vicinity.
American peregrine falcon	*Falco peregrinus anatum*	FD, CD, CP, MSCS m	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. A historical nest site occurs in the cliffs near Shasta Caverns and a "new" nest site is believed to occur in cliffs along the Sacramento Arm of Shasta Lake. Another nest site is located south of Shasta Lake at Gray Rocks, near Mountain Gate.
Long-eared owl	*Asio otus*	CSC, MSCS m	Potentially occurring in coniferous forest habitats.

Table 13-4. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area (contd.)

Common Name	Scientific Name	Status[1]	Potential for Occurrence
Northern spotted owl	*Strix occidentalis caurina*	FT, MSCS m	Potentially occurring in coniferous forest habitats. The species has been recorded within 0.5 mile of the study area along the Squaw Creek Arm. Potential dispersal habitat occurs in the Shasta Lake and vicinity portion of the primary study area. No designated critical habitat occurs in the Shasta Lake and vicinity portion of the primary study area.
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.
Willow flycatcher	*Empidonax traillii*	CE, USFS S, MSCS r	Uncommon migrant in riparian habitat; unlikely to nest in 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. Nests along the Pit River Arm. Shasta Lake is one of the few known breeding sites in interior northern California.
Yellow warbler	*Dendroica petechia brewsteri*	CSC, MSCS r	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 m	Potentially occurring in riparian habitats. Known occurrences in and near the Shasta Lake and vicinity portion of the primary study area.
Pallid bat	*Antrozous pallidus*	CSC, USFS S, BLMS	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the 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. Known occurrence from a cave on the Backbone Arm in the Shasta Lake and vicinity portion of the primary study area.
Spotted bat	*Euderma maculatum*	CSC, BLMS	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.
Western red bat	*Lasiurus blossevillii*	CSC	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the Shasta Lake and vicinity portion of the primary study area.
Long-eared myotis	*Myotis evotis*	BLMS	Potentially occurring in a wide variety of forest habitats throughout the study area.
Yuma myotis	*Myotis yumanensis*	BLMS	Potentially occurring in a wide variety of forest habitats throughout the study area.

Table 13-4. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area (contd.)

Common Name	Scientific Name	Status[1]	Potential for Occurrence
Fringed myotis	*Myotis thysanodes*	USFS S	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the Shasta Lake and vicinity portion of the primary study area.
Western mastiff bat	*Eumops perotis*	CSC, MSCS m (*californicus* subspecies only), BLMS	Potentially occurring in mixed conifer and conifer/woodland habitat throughout the Shasta Lake and vicinity portion of the primary study area.
Ringtail	*Bassariscus astutus*	CP, MSCS m	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.
American marten	*Martes americana*	USFS S	Potentially occurring in mixed conifer habitats.
Pacific fisher	*Martes pennanti*	FC, CSC, USFS S, BLMS	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.

Note:
[1]Status Definitions

Key:
BLMS = U.S. Department of the Interior, Bureau of Land Management sensitive
CD= California delisted
CE = California endangered
CP = California fully protected
CSC = California species of special concern
CT = California (State) listed as threatened
FB = Federal Bald and Golden Eagle Protection Act
FC = Federal candidate for listing
FD = Federally delisted
FP = Federally petitioned for listing
FPD = Proposed for Federal delisting
FT = Federally listed as threatened
m = Maintain. Ensure that any adverse effects on the species that could be associated with implementation of CALFED Bay-Delta Program actions will be fully offset through implementation of actions beneficial to the species.
MSCS = Multi-Species Conservation Strategy covered species
r = Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations in the Multi-Species Conservation Strategy focus area.
USFS M = U.S. Forest Service survey and manage species
USFS S = U.S. Forest Service sensitive

Species accounts for special-status wildlife in the Shasta Lake and vicinity portion of the primary study area are described in detail in Attachment 2 of the *Wildlife Resources Technical Report*. Figures 13-5a through 13-5f depict the known locations of special-status wildlife species in the primary study area above Shasta Dam located during various surveys conducted by Reclamation and from USFS records. Figures 13-6a through 13-6f depict the known locations of special-status terrestrial mollusks.

Summary of Wildlife Investigations

Terrestrial Mollusk Surveys (Survey and Manage) Reclamation has conducted three survey efforts for S&M terrestrial mollusk species in the Shasta Lake and vicinity portion of the primary study area. These include protocol-level efforts during 2002 to 2003 and 2005 along selected portions of the Shasta Lake shoreline, surveys conducted in 2010 at the relocation areas. Additionally, many other terrestrial mollusk locations have been found incidentally during numerous other biological survey tasks throughout the Shasta Lake and vicinity portion of the primary study area. Six S&M terrestrial mollusk species have been found to date: Church's sideband (*Monadenia churchi*), Shasta sideband (*Monadenia troglodytes troglodytes*), Wintu sideband (*Monadenia troglodytes wintu),* Oregon shoulderband (*Helminthoglypta hertlenii*), Shasta chaparral (*Trilobopsis roperi*), and Shasta hesperian (*Vespericola shasta*). Church's sideband and Oregon shoulderband were the most commonly occurring terrestrial mollusk species, as they were found at 325 and 220 locations, respectively. Shasta hesperian was found at 69 locations, while Shasta sideband and Shasta chaparral were found at 29 locations each. Wintu sideband was the least commonly occurring terrestrial mollusk species and was found at 2 locations (Figures 13-6a through 13-6f).

Shasta Salamander Surveys Reclamation has conducted three survey efforts for Shasta salamander in the Shasta Lake and vicinity portion of the primary study area. These include survey efforts during 2003 and 2006 to 2007 along selected portions of the Shasta Lake shoreline and surveys performed in 2010 and 2011 at the relocation areas. Additionally, several other Shasta salamander locations have been found incidentally during other biological survey tasks throughout the Shasta Lake and vicinity portion of the primary study area. Collectively, Shasta salamanders have been found at 39 locations during the survey efforts. These findings and other known locations show that this species occurs in all arms of Shasta Lake in both limestone and nonlimestone habitats (Figures 13-5a through 13-5f).

Bald Eagle/Osprey Surveys Reclamation mapped all known bald eagle and osprey nests in the Shasta Lake and vicinity portion of the primary study area in 2007 and 2010. Additional data, including diameter of nest trees, nest tree height, nest height, proximity to the high-water mark, surrounding vegetation, and shoreline erosion rating, were recorded for the bald eagle nests. Twenty-eight bald eagle nests and 54 osprey nests were located. Reclamation continued surveys and coordination with the USFS through 2013 to maintain current bald eagle and osprey nest site locations. Currently, 32 bald eagle and 54 osprey nest sites are known within or near the Shasta Lake and vicinity portion of the primary study area (Figures 13-5a through 13-5f).

Neotropical Migrant Bird Surveys Reclamation conducted a breeding bird survey in the Shasta Lake and vicinity portion of the primary study area in 2007. Additionally, 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 breeding neotropical migrant species. Sixty-seven bird species were detected during these surveys, including 38 neotropical migrant species.

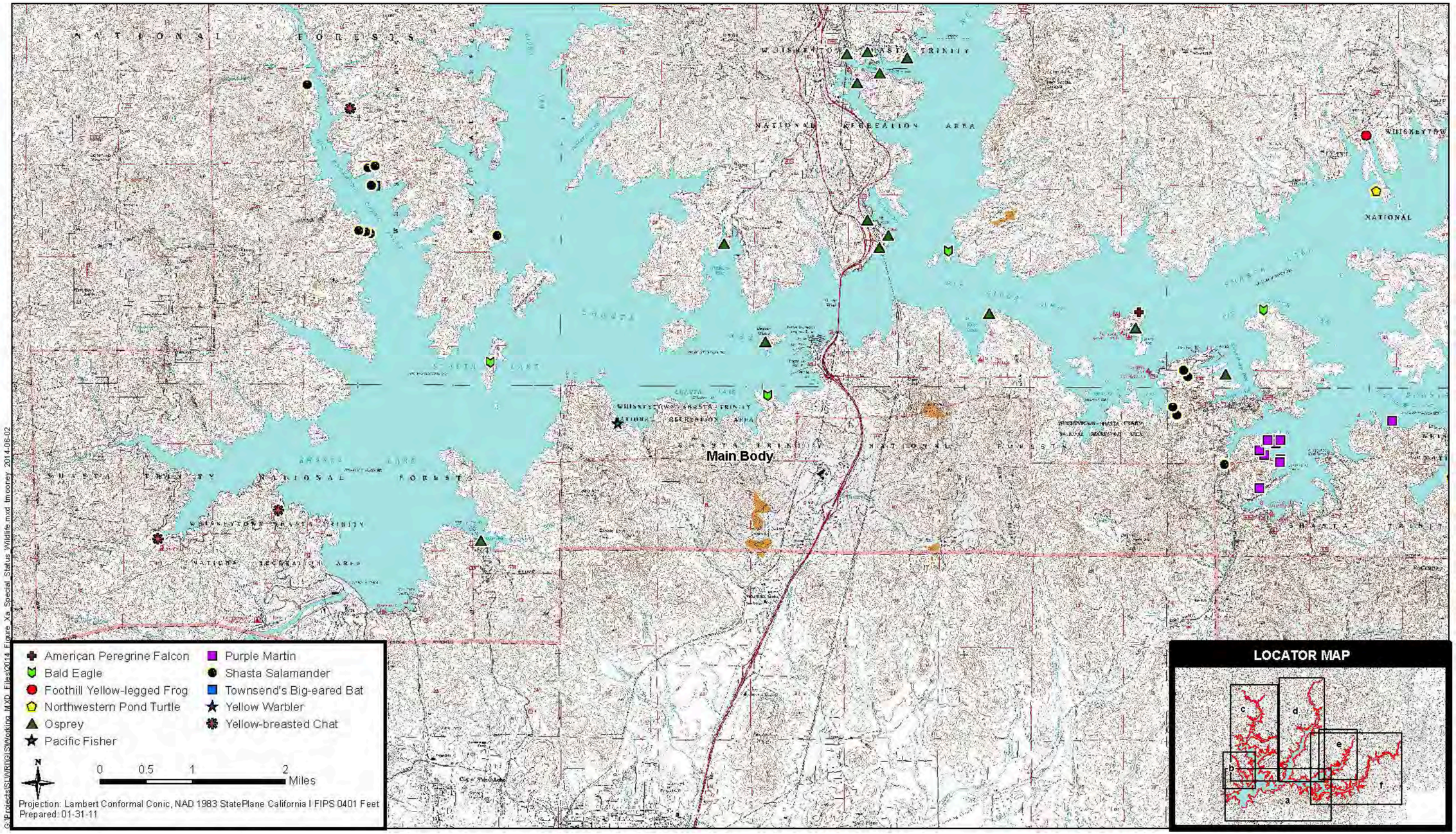

Figure 13-5a. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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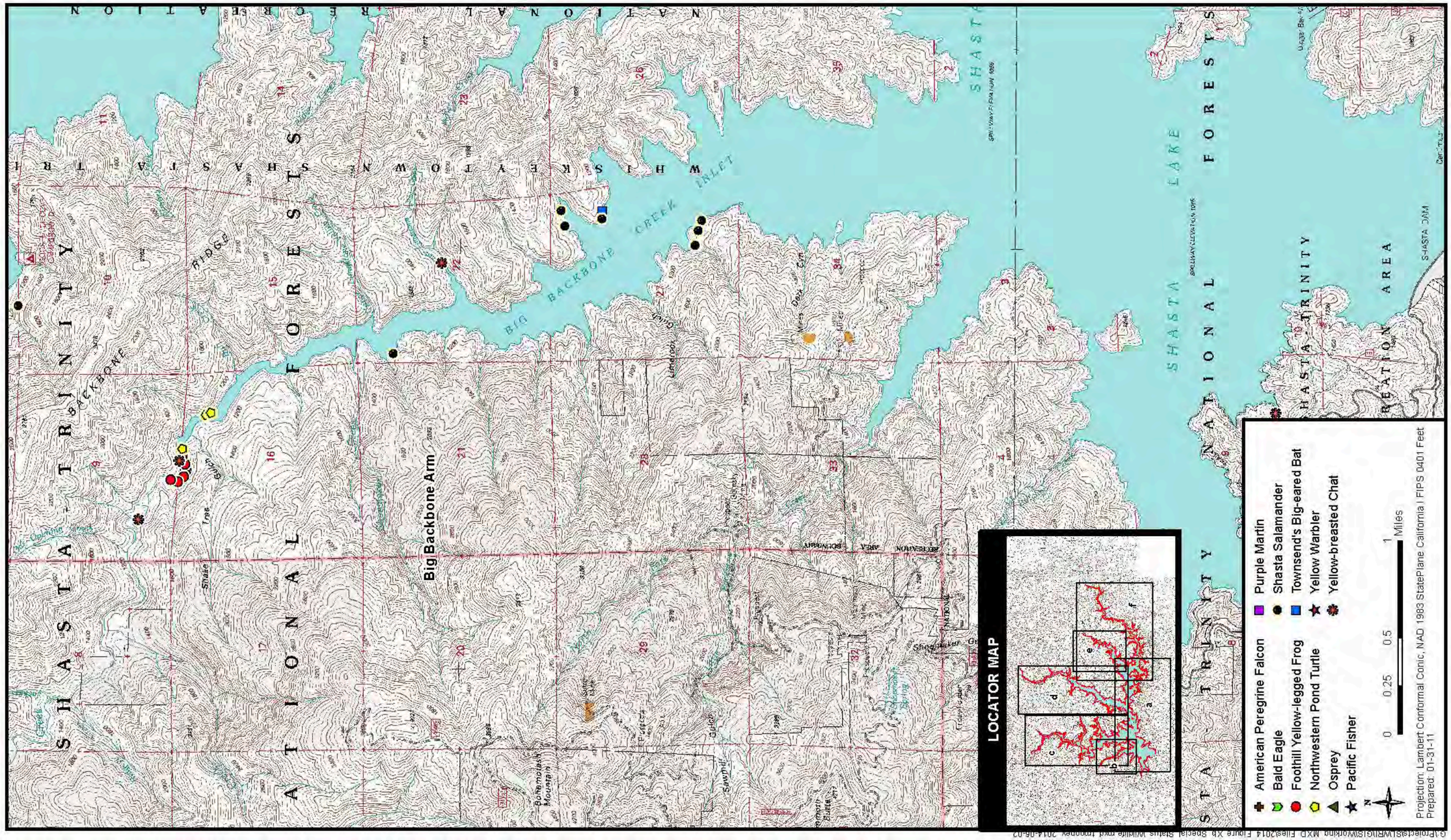

Figure 13-5b. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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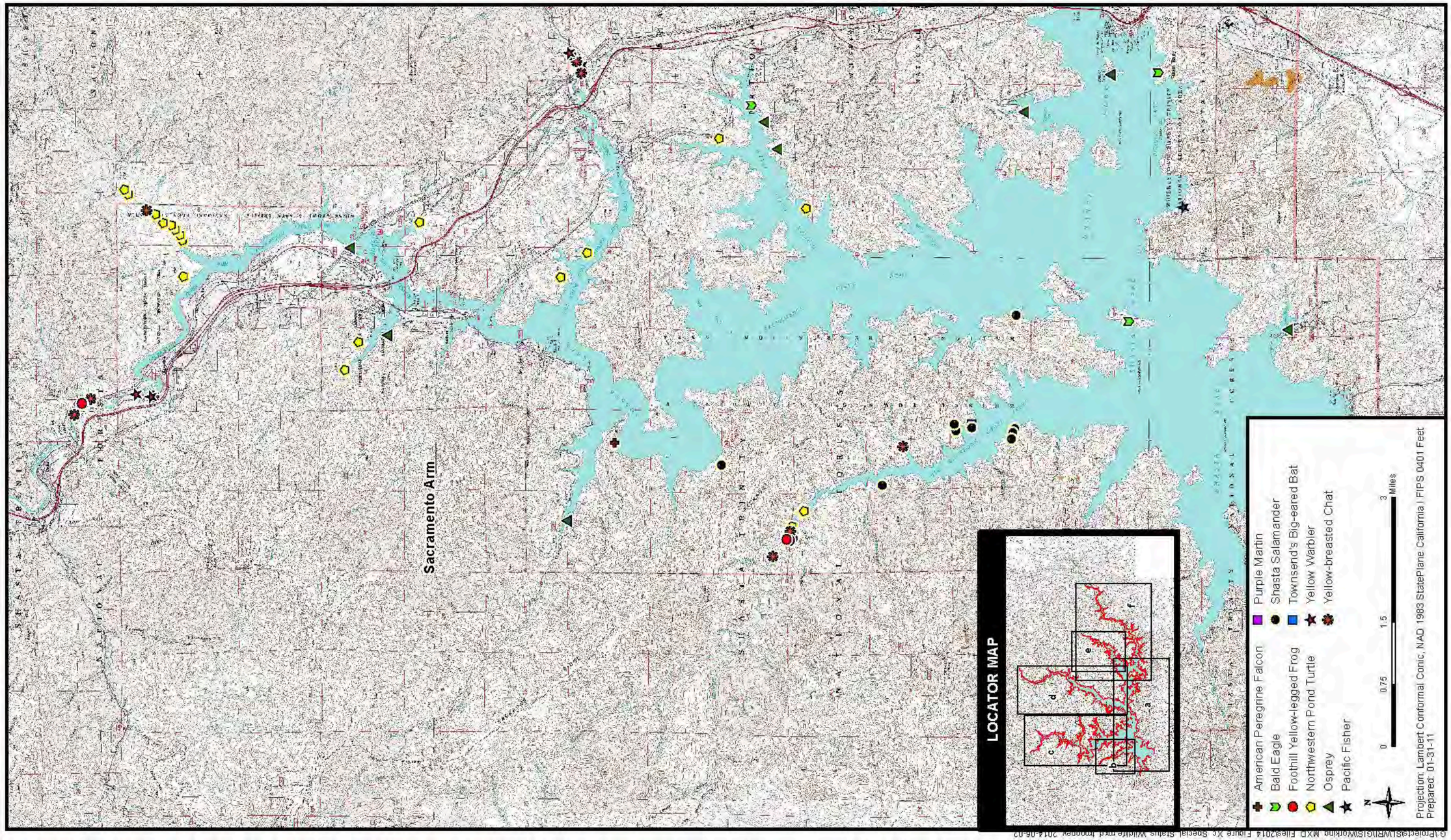

Figure 13-5c. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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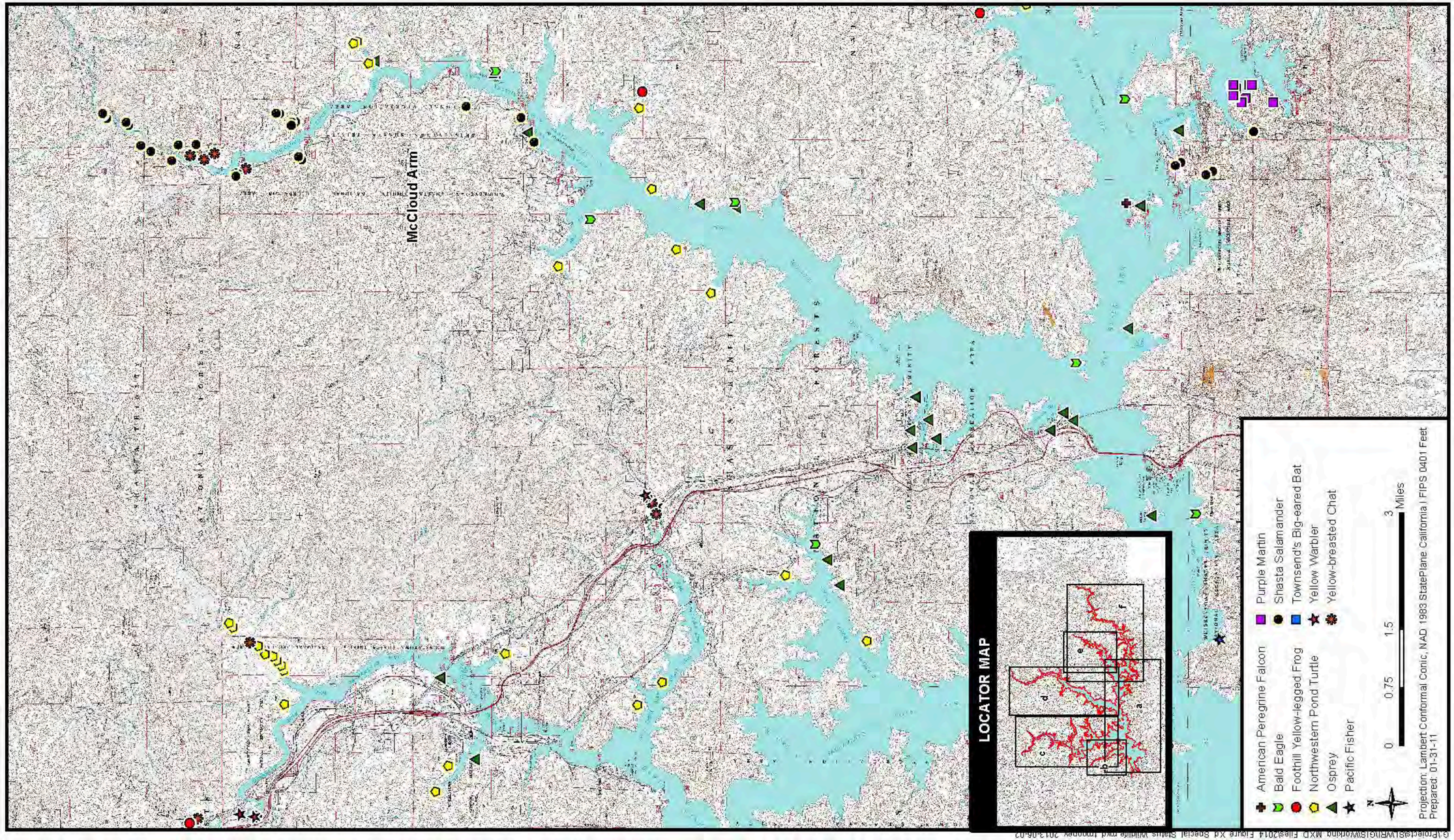

Figure 13-5d. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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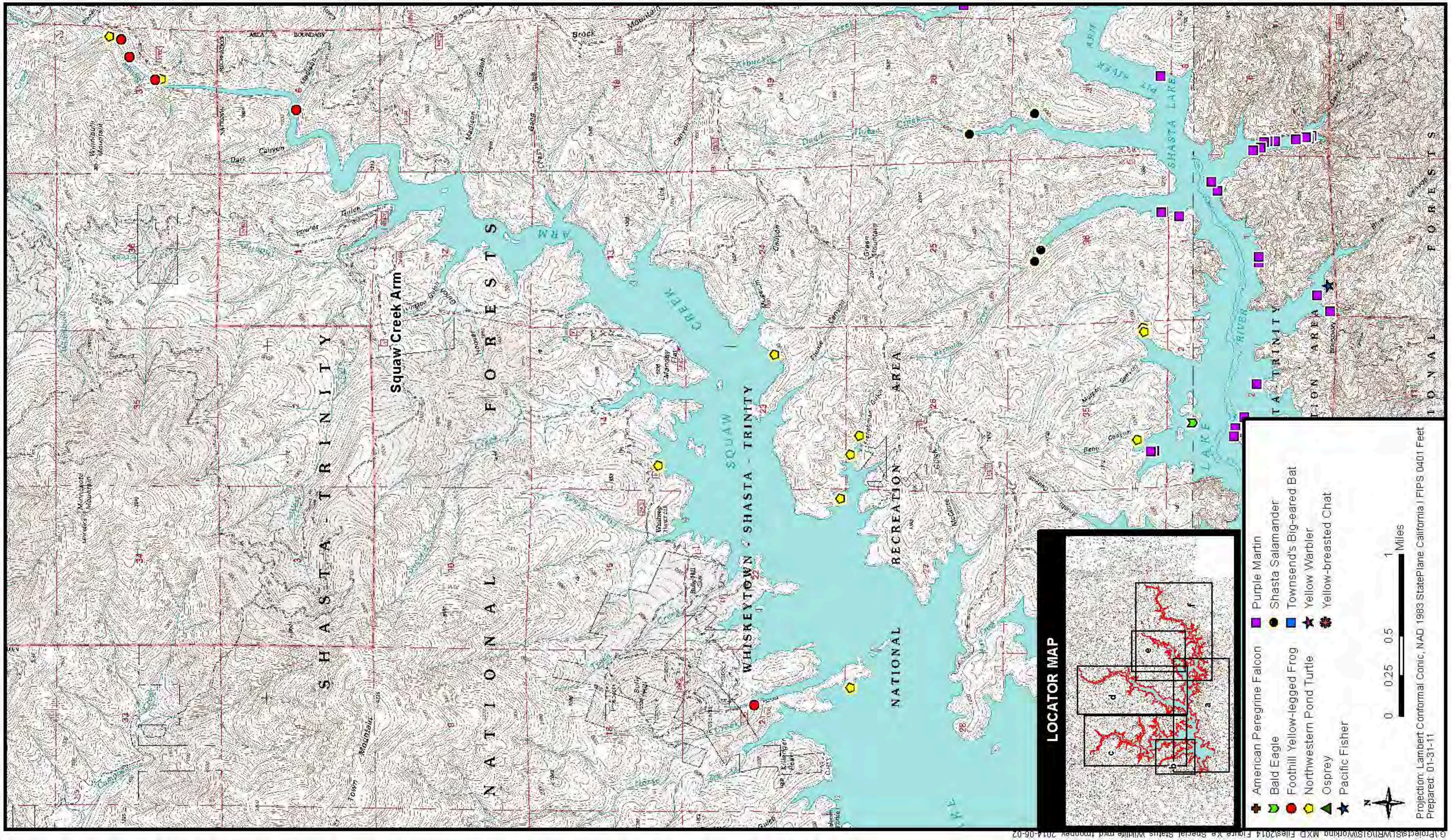

Figure 13-5e. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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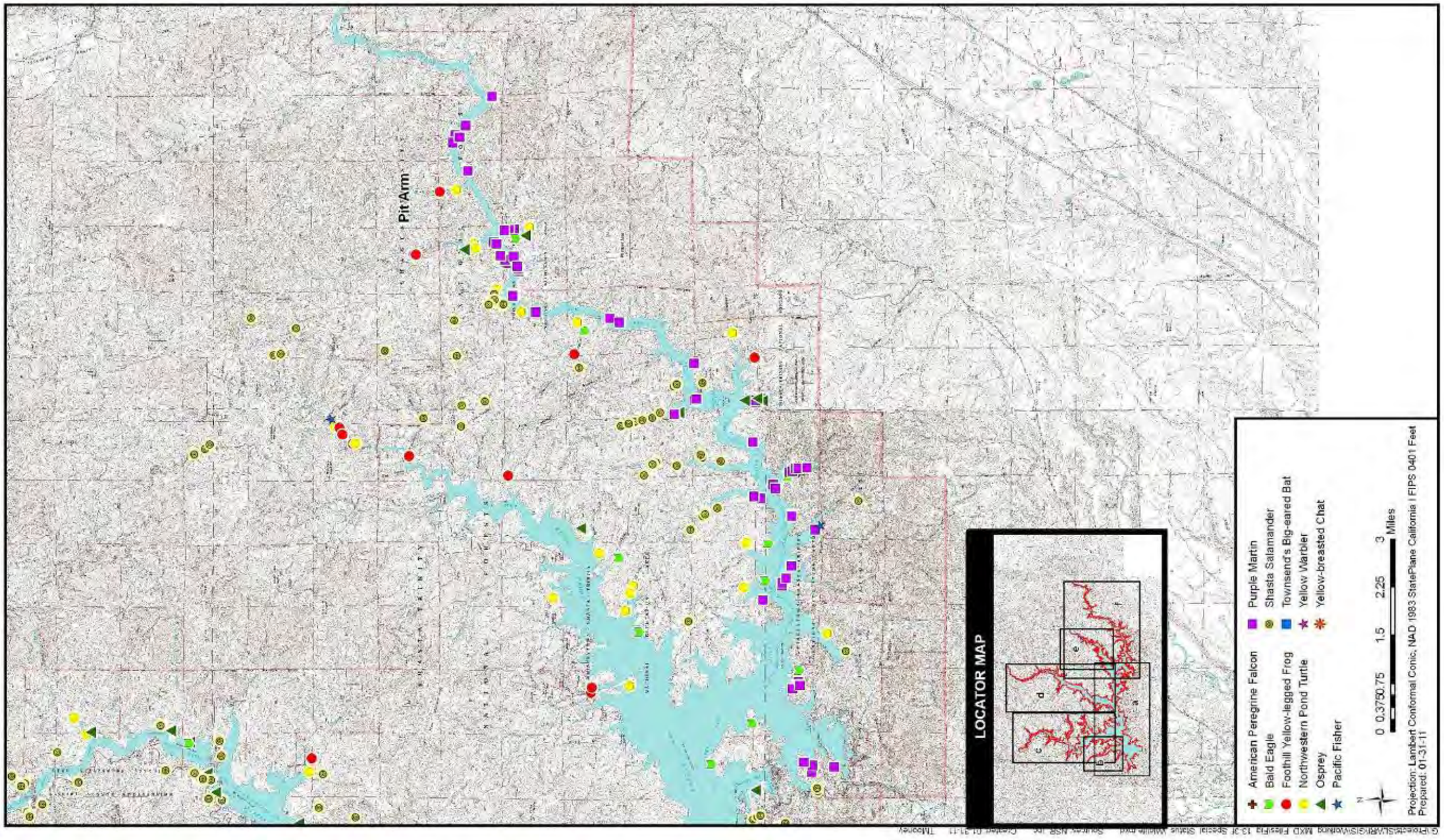

Figure 13-5f. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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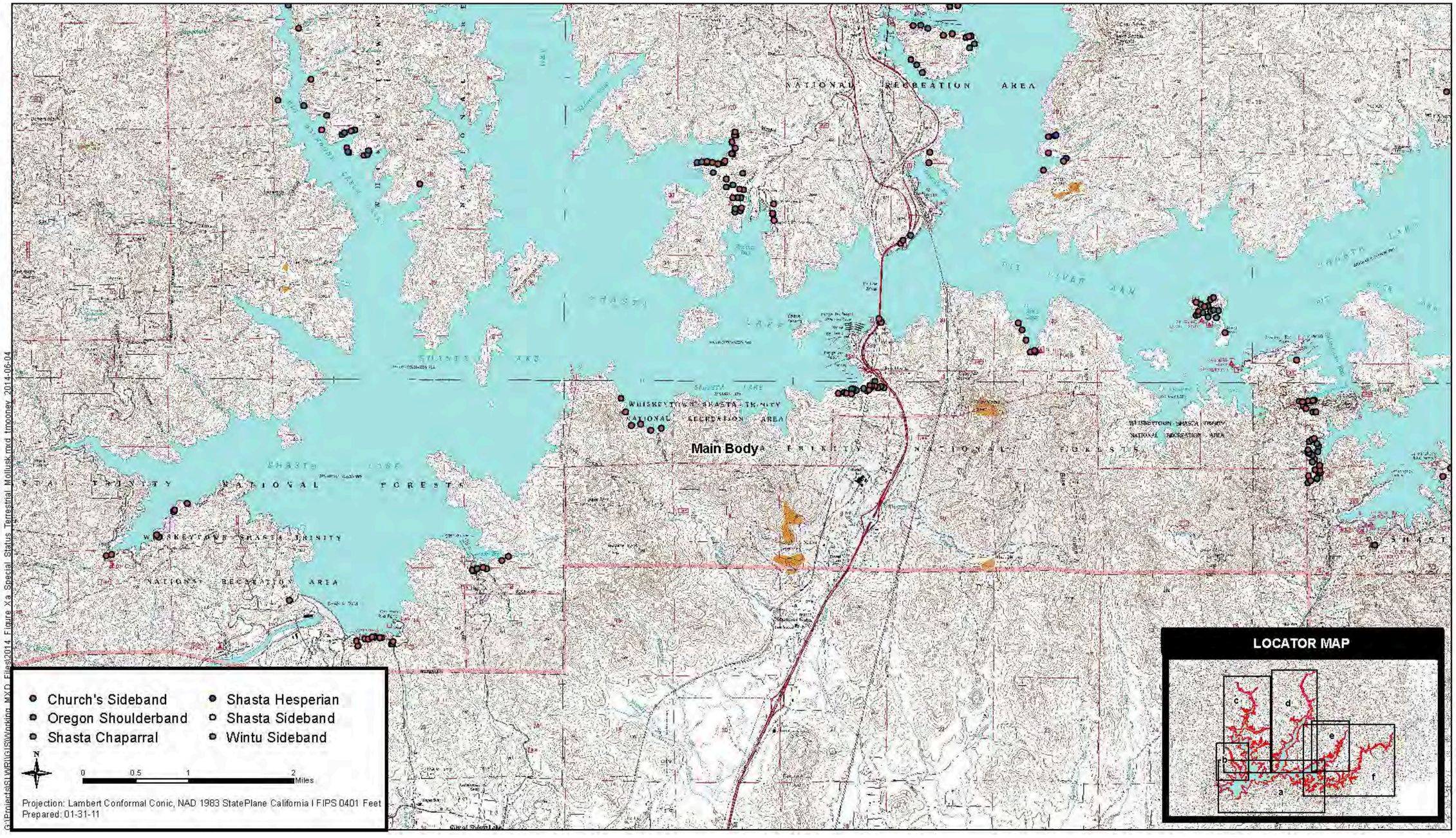

Figure 13-6a. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity

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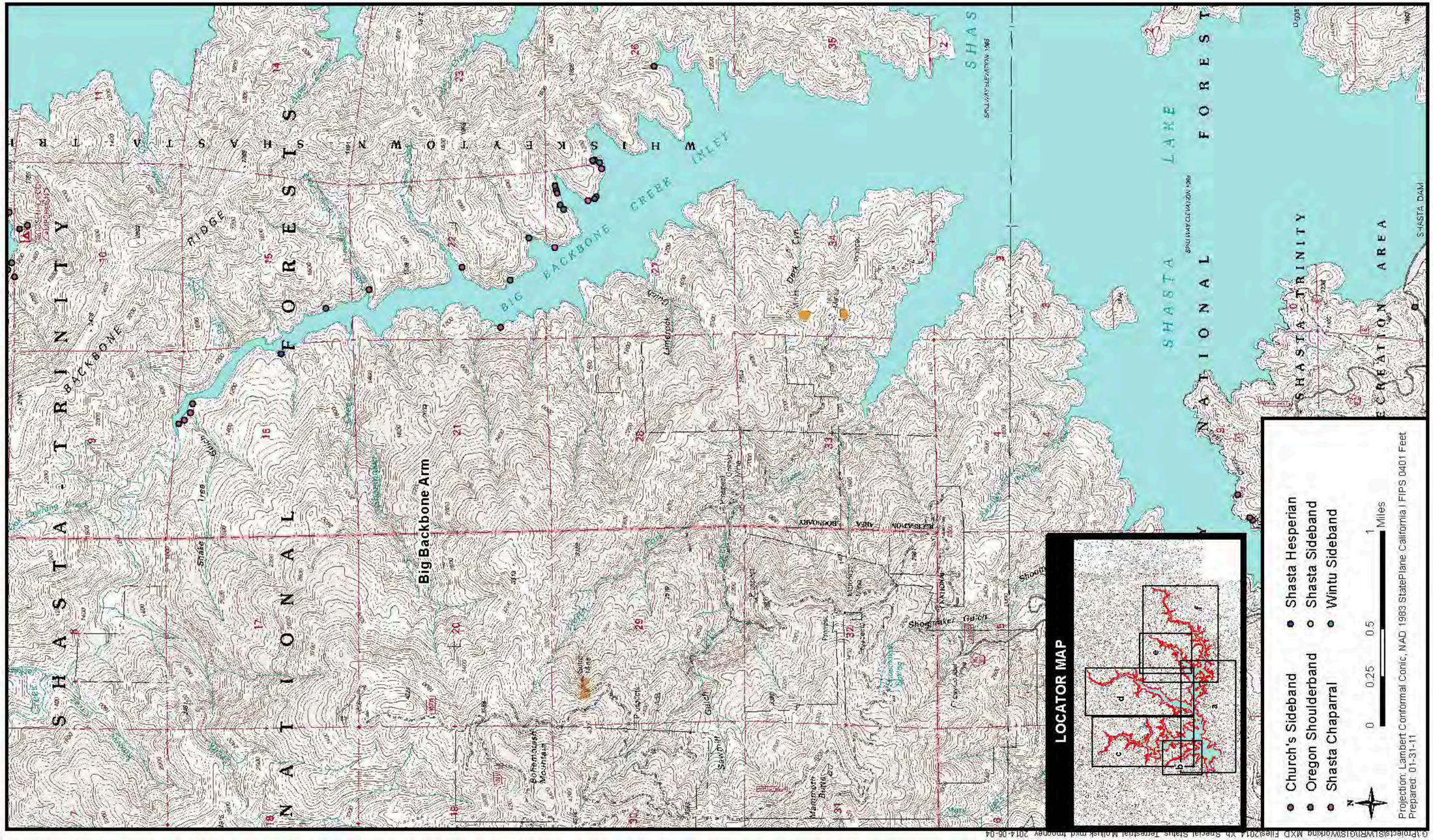

Figure 13-6b. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity

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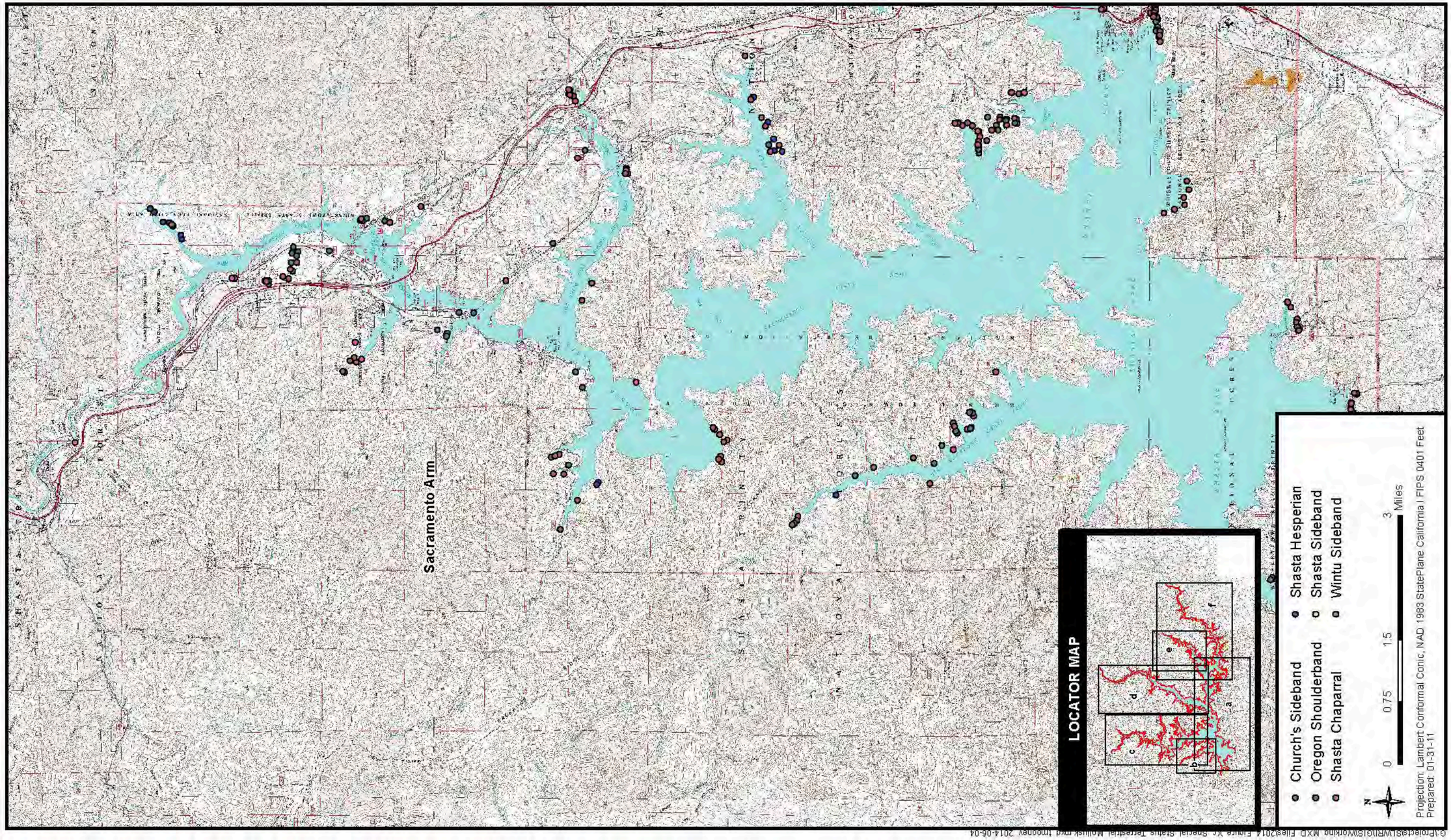

Figure 13-6c. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity

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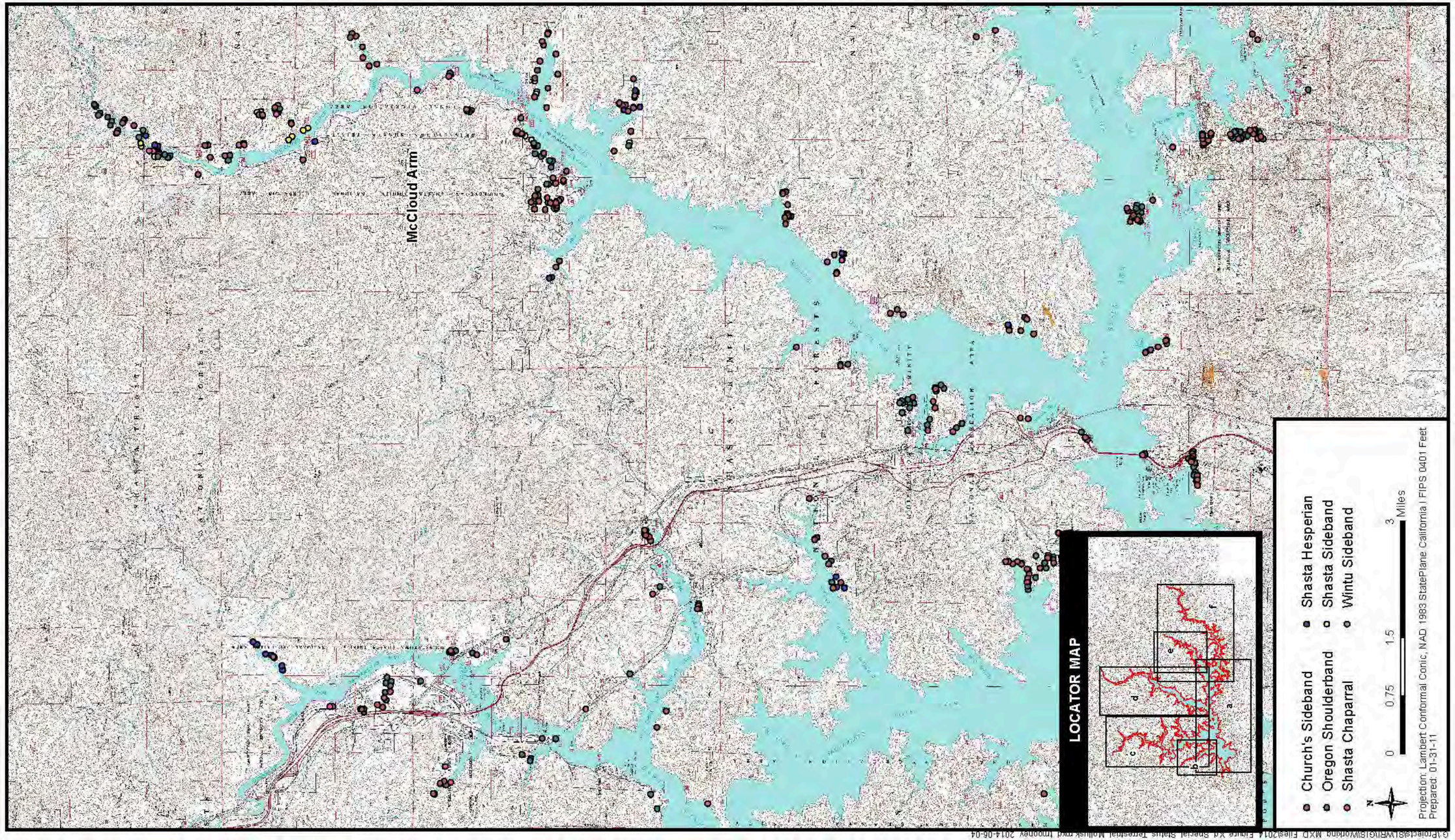

Figure 13-6d. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity

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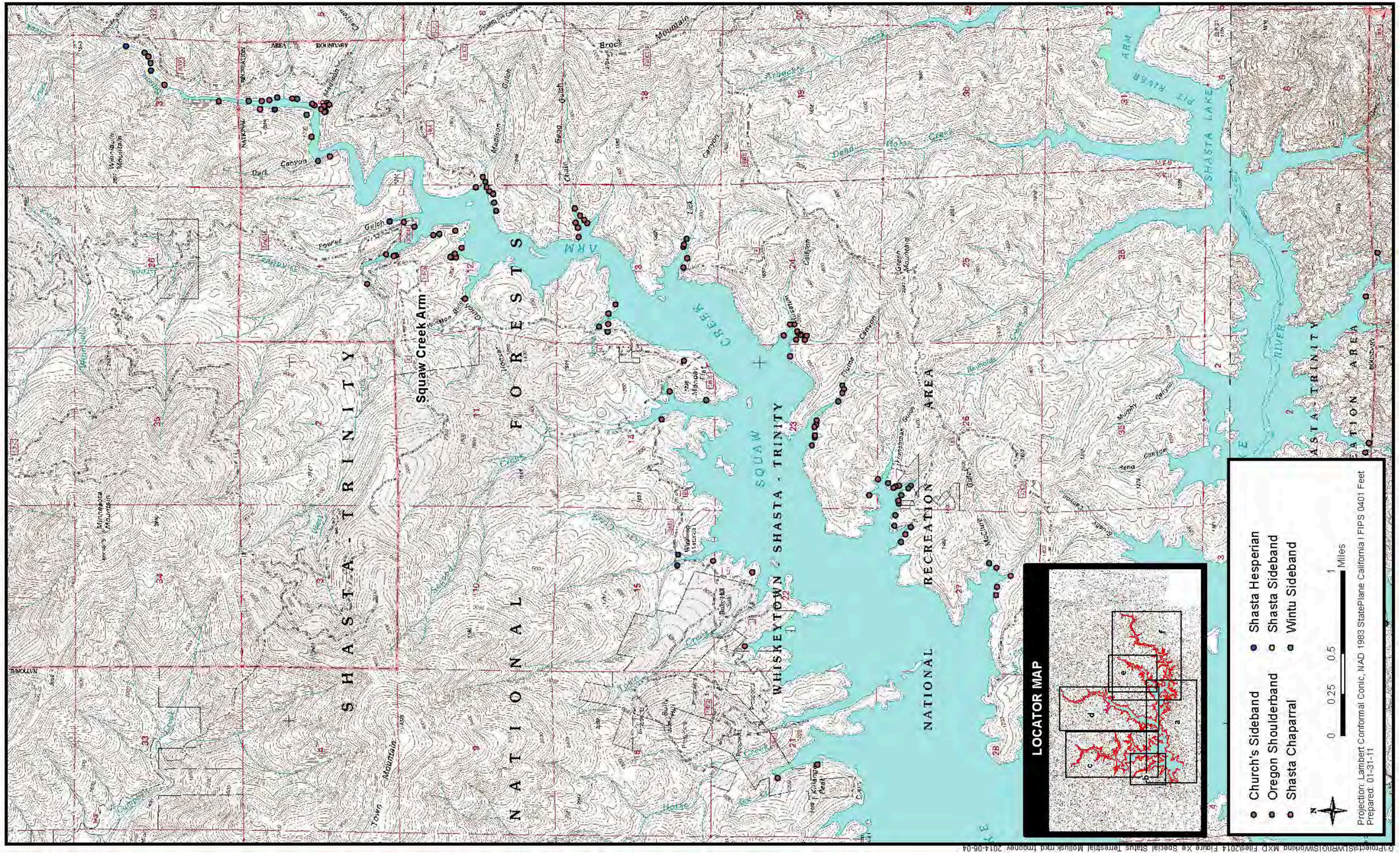

Figure 13-6e. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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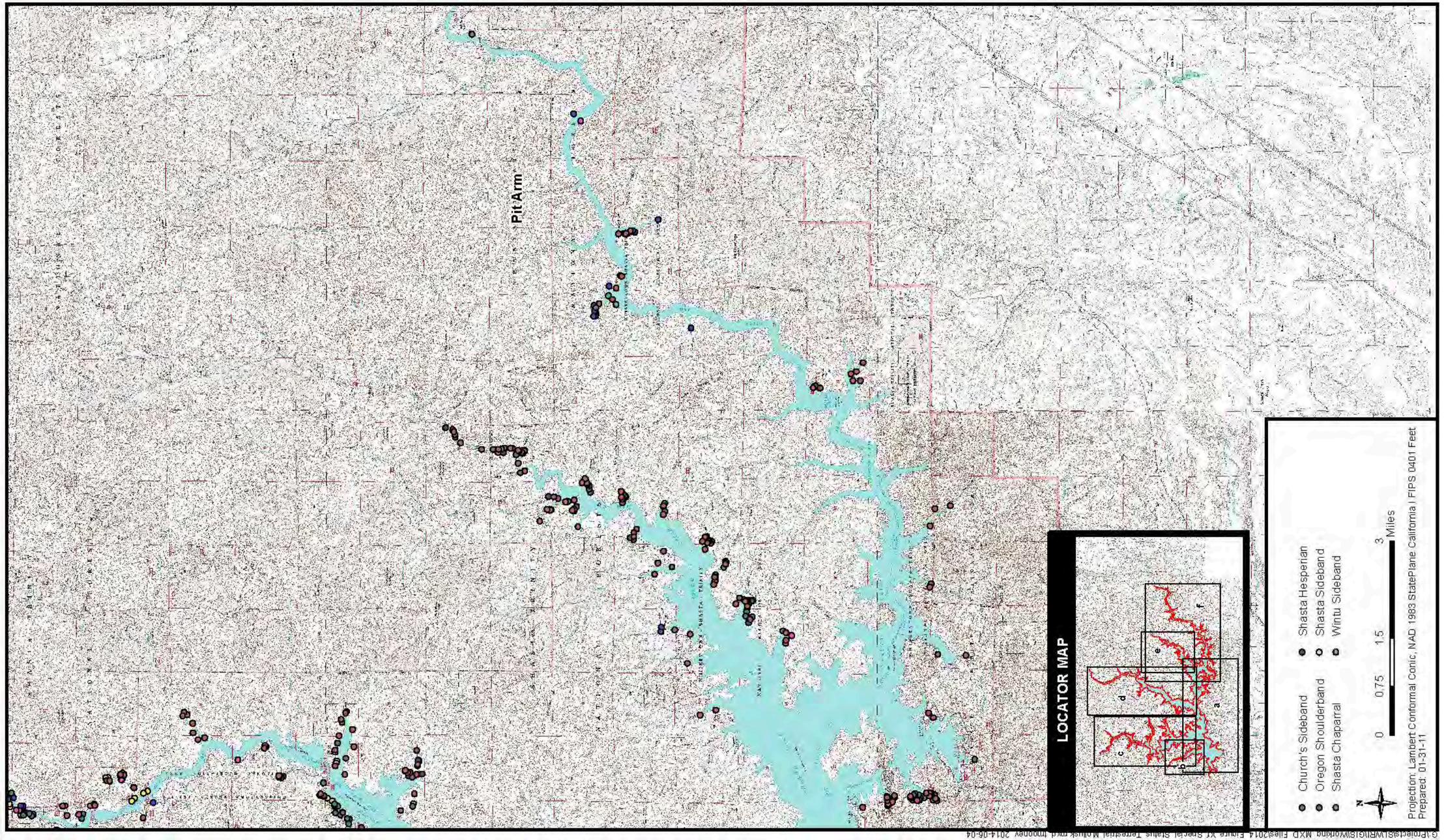

Figure 13-6f. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity

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These surveys also provided a basic understanding of purple martin ecology in the Shasta Lake and vicinity portion of the primary study area. Purple martin monitoring has continued through 2013, providing additional information on species distribution and habitat use (Figures 13-5d through 13-5f). The nesting purple martin population has totaled 18, 21, 24, 28, 42,27, and 17 pairs from 2007 through 2013, respectively. Most nest sites occur in flooded snags located in the reservoir; however, monitoring results show an increase in use of upland nest sites. Limited historical information from purple martin surveys information from 1978 to 2001 showed 14 to 19 nesting pairs at Shasta Lake. During the monitoring period, the nesting purple martin population showed small increases from 2007 through 2010, a large increase in 2011, and then generally returned to 2009 and 2010 levels in 2012. For unknown reasons a marked decrease to 17 pairs occurred in 2013, a population size similar to historic numbers. The 2007 to 2013 monitoring results initially show a stable to increasing population, followed by a decrease and return to more historic levels.

Forest Carnivore Surveys Reclamation conducted surveys for sensitive forest carnivore species (forest carnivores) in the Shasta Lake and vicinity portion of the primary study area during 2003 to 2005. The specific sensitive forest carnivore species (i.e., "target species") surveyed included 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. Pacific fisher was detected at 13 locations scattered in all areas of the Shasta Lake and vicinity portion of the primary study area, except the McCloud Arm (Figures 13-5a through 13-5f). Forest carnivore surveys conducted during 2007 and 2010 along the McCloud Arm for this project and another unrelated project detected Pacific fisher and found that the species occurs in all areas of the Shasta Lake and vicinity portion of the primary study area. Additionally, the ringtail, a California fully protected species, was detected in all areas of the Shasta Lake and vicinity portion of the primary study area during the forest carnivore surveys.

The Pacific fisher survey results provide additional information on habitat use and distribution of the species in Northern California. The survey findings represent the southeastern-most Pacific fisher occurrences in the Klamath region. Additionally, these findings show Pacific fishers in areas generally (previously) not considered habitat in California, including open second-growth conifer, hardwood–conifer, and hardwood habitats that have extensive chaparral components. Pacific fishers were also detected in forest habitats that were barren or semi-barren 50 to 60 years ago because of historical copper mining and smelting activities, and near commercial, rural residential, and industrial development areas.

California Red-Legged Frog Assessment Reclamation conducted a California red-legged frog habitat assessment in the Shasta Lake and vicinity portion of the primary study area in 2010 and 2012. In consultation with the USFWS, an assessment area was developed and field surveys of aquatic habitats were

conducted in accordance with *Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog* (USFWS 2005a). The results suggest only one feature may represent potential California red-legged frog breeding habitat. A California red-legged frog habitat assessment report was submitted to the USFWS.

Upper Sacramento River (Shasta Dam to Red Bluff)

The following section provides a detailed discussion of wildlife species of concern specific to the potential Sacramento River downstream habitat restorations areas, as well as the wildlife species of concern known to occur or with potential to occur along the Sacramento River throughout the rest of the primary study area.

A list of special-status wildlife species with the potential to occur in the primary study area from Shasta Dam to the Red Bluff Pumping Plant (Table 13-5) was compiled based on habitat suitability and known occurrences within the area covered in the Shasta Dam, Redding, Enterprise, Cottonwood, Balls Ferry, Bend, and Red Bluff East U.S. Geological Survey 7.5-minute quadrangle maps (CNDDB 2012; USFWS 2011). This list also includes species that are identified by USFS as sensitive, or endemic; identified by BLM as sensitive; designated by the NWFP as S&M; or designated as MSCS covered species. See the *Wildlife Resources Technical Report* for a description of the life history of special-status wildlife species known or likely to occur in the area and figures depicting the recorded locations of special-status species.

Table 13-5. 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 Pumping Plant

Common Name	Scientific Name	Status[1]	Potential for Occurrence
Invertebrates			
Conservancy fairy shrimp	*Branchinecta conservatio*	FE, MSCS	Unlikely to occur. No suitable habitat is present along the river corridor.
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FPD, FT, MSCS	Known to occur. Elderberry shrubs are present within the riparian woodland community along the Sacramento River.
Vernal pool tadpole shrimp Critical Habitat	*Lepidurus packardi*	FE, MSCS	Unlikely to occur. No suitable habitat is present along the river corridor. Critical habitat does not occur within the river corridor.
Vernal pool fairy shrimp Critical Habitat	*Branchinecta lynchi*	FT, MSCS	Unlikely to occur. No suitable habitat is present along the river corridor. Critical habitat does not occur within the river corridor.
Amphibians			
Shasta salamander	*Hydromantes shastae*	CT, BLM S, USFS S	Unlikely to occur. Suitable habitat generally is not found within the river corridor downstream from Shasta Dam.
California red-legged frog	*Rana aurora draytonii*	FT, CSC, MSCS	Could occur along the Sacramento River if suitable habitat is present
Foothill yellow-legged frog	*Rana boylii*	CSC, USFS S, MSCS	Could occur along the Sacramento River if suitable habitat is present
Western spadefoot toad	*Spea hammondii*	CSC, MSCS	Unlikely to occur. No suitable habitat is present along the Sacramento River corridor.
Reptiles			
Giant garter snake	*Thamnophis gigas*	FT, CT, MSCS	Unlikely to occur in the primary study area; however, known to occur in the extended study area.
Western pond turtle	*Actinemys (Clemmys) marmorata*	CSC, USFS S, MSCS	Known to occur. Suitable habitat is present in the primary study area.
Birds			
Cackling goose *(Aleutian Canada goose)*	*Branta hutchinsii leucopareia*	FD, MSCS	Unlikely to occur within the banks of the Sacramento River where flows could be altered.
American peregrine falcon *(nesting)*	*Falco peregrinus anatum*	CP, USFS S, MSCS	Unlikely to nest in this portion of the study area; however, may forage in areas of open water with large concentrations of waterbirds.
Bald eagle (nesting and wintering)	*Haliaeetus leucocephalus*	FD, CE, CP, USFS S, MSCS	Known to occur along the Sacramento River in the primary study area.
Bank swallow (nesting)	*Riparia riparia*	CT, MSCS	Known to occur along the Sacramento River in the primary study area.
Black-crowned night heron (rookery)	*Nycticorax nycticorax*	BLM S, MSCS	Could nest in trees adjacent to the Sacramento River.

Table 13-5. 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 Pumping Plant (contd.)

Common Name	Scientific Name	Status[1]	Potential for Occurrence
California gull (nesting colony)	*Larus californicus*	MSCS	Not within breeding range. Could occur in the study area during winter or migration.
Cooper's hawk (nesting)	*Accipiter cooperii*	MSCS	Could occur. Suitable nesting and foraging habitat is present in the primary study area.
Double-crested cormorant (rookery)	*Phalacrocorax auritus*	MSCS	Could nest in trees adjacent to the Sacramento River.
Golden eagle	*Aquila chrysaetos*	CP, BLM S, MSCS	No suitable nesting habitat along the Sacramento River. Unlikely to forage along the river corridor.
Great blue heron (rookery)	*Ardea herodius*	MSCS	Could nest in trees adjacent to the Sacramento River.
Great egret (rookery)	*Casmerodius albus*	MSCS	Could nest in trees adjacent to the Sacramento River.
Greater sandhill crane (nesting and wintering)	*Grus canadensis tabida*	CT, CP, MSCS	Unlikely to breed in the primary study area. Unlikely to use the Sacramento River corridor during winter or migration.
Least bittern (nesting)	*Ixobrychus exilis*	CSC, MSCS	Could nest along the Sacramento River if suitable habitat is present.
Lesser sandhill crane (wintering)	*Grus canadensis canadensis*	CSC	Does not breed in California. Unlikely to use the Sacramento River corridor during winter or migration.
Little willow flycatcher (nesting)	*Empidonax traillii brewsteri*	CE, MSCS	Unlikely to breed in the primary study area because of the area's elevation, but may use riparian woodlands during migration.
Loggerhead shrike (nesting)	*Lanius ludovidianus*	CSC	Likely to nest and forage in woodlands and scrub habitats in the primary study area.
Long-billed curlew (nesting)	*Numenius americanus*	MSCS	Does not breed in the primary study area. Unlikely to use the Sacramento River corridor during winter or migration.
Long-eared owl (nesting)	*Asio otus*	CSC, MSCS	Does not nest in lowland Central Valley areas. Unlikely to forage along the Sacramento River corridor where flows would be altered.
Northern harrier (nesting)	*Circus cyaneus*	CSC, MSCS	Likely to occur. Suitable nesting and foraging habitat is present in the primary study area.
Northern spotted owl (nesting) (critical habitat)	*Strix occidentalis caurina*	FT, MSCS	Unlikely to occur along the Sacramento River corridor because of a lack of suitable habitat. Critical habitat does not occur in the primary study area.
Osprey (nesting)	*Pandion haliaetus*	MSCS	Known to nest along the Sacramento River in the primary study area.
Purple martin (nesting)	*Progne subis*	CSC	Could occur. Potentially suitable habitat is present along the Sacramento River corridor.
Short-eared owl (nesting)	*Asio flammeus*	CSC, MSCS	Could occur. Potentially suitable habitat is present in the primary study area.

Table 13-5. 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 Pumping Plant (contd.)

Common Name	Scientific Name	Status[1]	Potential for Occurrence
Snowy egret (rookery)	*Egretta thula*	MSCS	Could nest in trees adjacent to the Sacramento River.
Swainson's hawk (nesting)	*Buteo swainsoni*	CT, USFS S, MSCS	Could occur. Suitable nesting and foraging habitat is present in the primary study area.
Tricolored blackbird (nesting colony)	*Agelaius tricolor*	CSC, MSCS	Could occur. Potentially suitable habitat is present in the primary study area.
Western yellow-billed cuckoo (nesting)	*Coccyzus americanus occidentalis*	FT, CE, USFS S, MSCS	Likely to nest and forage in the primary study area.
Western burrowing owl (burrow sites)	*Athene cunicularia hypugea*	CSC, MSCS	Unlikely to occur along the Sacramento River corridor because of a lack of suitable nesting habitat.
White-tailed kite (nesting)	*Elanus leucurus*	CP, MSCS	Likely to occur. Suitable nesting and foraging habitat is present in the primary study area.
Yellow-breasted chat (nesting)	*Icteria virens*	CSC, MSCS	Likely to nest and forage in the primary study area
Yellow warbler (nesting)	*Setophaga (Dendroica) petechia*	CSC, MSCS	Could nest and forage in the primary study area. Likely to use riparian woodlands during migration.
Pacific fisher	*Martes pennanti*	FC, CSC, USFS S	Unlikely to occur. No suitable habitat is available along the Sacramento River corridor.
Ringtail	*Bassariscus astutus*	CP, MSCS	Could occur. Potentially suitable habitat is present along the Sacramento River corridor.
Pallid bat	*Antrozous pallidus (roosting)*	CSC, BLM S, USFS S	Could occur. Potentially suitable habitat is present in woodland in the primary study area.
Western mastiff bat (roosting)	*Eumops perotis californicus*	CSC, BLM S, MSCS	Unlikely to roost along the Sacramento River corridor because suitable roost sites are lacking.

Key:
BLM = U.S. Department of the Interior, Bureau of Land Management
CE = California endangered
CSC = California Species of Special Concern
CP = California fully protected
CT = California threatened
FC = Federal candidate for listing
FD = Federally delisted
FE = Federally endangered
FPD = Proposed for Federal delisting
FT = Federally listed as threatened
S = Sensitive
MSCS = Multi Species Conservation Strategy
USFS = U.S. Department of Agriculture, Forest Service

Biological Resource Assessments for Potential Sacramento River Downstream Habitat Restoration Areas Reclamation conducted biological resource assessments at each of the six potential Sacramento River downstream habitat restoration areas during 2013. The assessments include botanical surveys for special-status plants and noxious weeds, vegetation and wildlife habitat

mapping, general wildlife surveys, breeding bird surveys, California red-legged frog habitat assessments, and delineations of Waters of the U.S. The biological resource assessment results are included as Attachments 12-17 to the Wildlife Resources Technical Report in the Biological Resources Appendix. Potentially occurring special-status wildlife species at the potential Sacramento River downstream habitat restoration areas are documented in Attachments 18-23 to the Wildlife Resources Technical Report in the Biological Resources Appendix

Table 13-6. Wildlife Species of Concern in the Potential Sacramento River Downstream Habitat Restoration Areas

Common Name	Scientific Name	Status	Potential for Occurrence
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	Potentially occurring in blue elderberry shrubs.
California red-legged frog	*Rana draytonii*	FT, CSC, MSCS m	Potentially occurring at restoration sites or locations in the vicinity with potential breeding habitat present.
Western pond turtle	*Actinemys marmorata*	CSC, USFS S, MSCS m	Potentially occurring in stream or other wetland habitats. Adjacent upland habitats are potential nesting areas.
Double-crested cormorant	*Phalacrocorax auritus*	MSCS m	Commonly occurs in the general vicinity in riverine and adjacent riparian habitats. No known rookery sites at any potential Sacramento River downstream habitat restoration areas.
Great egret	*Ardea alba*	MSCS m	Commonly occurs in the general vicinity in riverine and adjacent riparian habitats. No known rookery sites at any potential Sacramento River downstream habitat restoration areas.
Great blue heron	*Ardea herodias*	MSCS m	Commonly occurs in the general vicinity in riverine and adjacent riparian habitats. No known rookery sites at any potential Sacramento River downstream habitat restoration areas.
Black-crowned night heron	*Nycticorax nycticorax*	MSCS m	Commonly occurs in the general vicinity in riverine and adjacent riparian habitats. No known rookery sites at any potential Sacramento River downstream habitat restoration areas.
Cooper's hawk	*Accipiter cooperi*	MSCS m	Potentially occurring in forested riparian and woodland habitats.
Bald eagle	*Haliaeetus leucocephalus*	FD, FB, CE, CP, USFS S, MSCS m, BLMS	Occurs year-round in the vicinity. Two known nests in the general vicinity of the potential Sacramento River downstream habitat restoration areas
Osprey	*Pandion haliaetus*	MSCS m	Commonly occurs in the general vicinity of the potential Sacramento River downstream habitat restoration areas. No known nests at any potential Sacramento River downstream habitat restoration areas.

Table 13-6. Wildlife Species of Concern in the Potential Sacramento River Downstream Habitat Restoration Areas (contd.)

Common Name	Scientific Name	Status	Potential for Occurrence
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FT, CE	Occurs only along the upper Sacramento Valley portion of the Sacramento River from Colusa to Red Bluff, the Feather River in Sutter Co., the South Fork Kern River in Kern Co., the Owen's River in Inyo Co., and along the Santa Ana, Amargosa, and lower Colorado Rivers. Riparian forest habitats in the potential Sacramento River downstream habitat restoration areas provide potential nesting habitat; however, these areas is located approximately 24 miles north of the northern extent of the known species geographic range.
Barrows goldeneye	*Bucephala islandica*	—/SC	Winter visitor to bays, lagoons, estuaries, freshwater lakes and large fast-moving rivers. Formerly nested in California at high mountain lakes. Regularly occurs on the Sacramento River in the Redding area during winter.
Willow flycatcher	*Empidonax traillii*	CE, USFS S, MSCS r	Uncommon migrant species in riparian habitat; may occur briefly during migration. No potentially nesting habitat present.
Yellow warbler	*Dendroica petechia brewsteri*	CSC, MSCS r	Potentially occurring in riparian habitats.
Yellow-breasted chat	*Icteria virens*	CSC, MSCS m	Potentially occurring in riparian habitats.
Pallid bat	*Antrozous pallidus*	CSC, USFS S, BLMS	Potentially occurring in riparian forest and woodland habitats.
Townsend's big-eared bat	*Plecotus townsendii*	CSC, USFS S	Potentially occurring in riparian forest and woodland habitats.
Western red bat	*Lasiurus blossevillii*	CSC	Potentially occurring in riparian forest and woodland habitats.
Ringtail	*Bassariscus astutus*	CP, MSCS m	Potentially occurring in riparian forest and woodland habitats.

Key:
BLM S = U.S. Department of the Interior, Bureau of Land Management sensitive
CD= California delisted
CE = California endangered
CP = California fully protected
CSC = California species of special concern
CT = California threatened
FB = Federal Bald and Golden Eagle Protection Act
FC = Federal candidate for listing
FD = Federally delisted
FP = Federally petitioned for listing
FPD = Proposed for Federal delisting
FT = Federally listed as threatened
m = Maintain. Ensure that any adverse effects on the species that could be associated with implementation of CALFED Bay-Delta Program actions will be fully offset through implementation of actions beneficial to the species.
MSCS = Multi-Species Conservation Strategy covered species
r = Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations in the Multi-Species Conservation Strategy focus area.
USFS M = U.S. Department of Agriculture, Forest Service survey and manage species
USFS S = U.S. Department of Agriculture, Forest Service sensitive

Lower Sacramento River and Delta

Numerous special-status wildlife species are associated with riparian, floodplain, and side-channel wetland habitats along the Sacramento River and

in the Delta (Table 13-7). However, as stated above, the roughly 300 miles of the Sacramento River can be subdivided into distinct reaches. The reaches in the extended study area are discussed separately below because of differences in morphology, riparian vegetation, and habitat functions. The sensitive species discussed in this section are representative species selected from the many species present in the extended study area and are presented as examples to illustrate the breadth of resources. The *Wildlife Resources Technical Report* contains a comprehensive list of all sensitive wildlife species in the extended study area that have been reported to the CNDDB.

Table 13-7. Representative Sensitive Wildlife Species of Riparian and Perennial Wetland Communities Along the Sacramento River and in the Delta

Common Name	Scientific Name	Status[1]	Habitat Description
Invertebrates			
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	Elderberries in riparian woodlands or savanna communities.
Reptiles			
Western pond turtle	*Actinemys (Clemmys) marmorata*	CSC	Ponds, lakes, rivers, streams, creeks, marshes, and irrigation ditches with abundant vegetation and either rocky or muddy bottoms, in woodland, forest, and grassland.
Giant garter snake	*Thamnophis giga*	FT CT	Marshes, sloughs, drainage canals, and irrigation ditches, especially around rice fields, and occasionally in slow-moving creeks from sea level to 400 feet. Prefers locations with vegetation close to the water for basking.
Birds			
Tricolored blackbird	*Agelaius tricolor*	CSC	*Foraging:* On ground in croplands, grassy fields, flooded land, and along edges of ponds. *Nesting:* Dense cattails, tules, or thickets near fresh water.
Swainson's hawk	*Buteo swainsoni*	CT	*Foraging:* Open desert, grassland, or cropland containing scattered, large trees or small groves. *Nesting:* Open riparian habitat, in scattered trees or small groves in sparsely vegetated flatlands. Usually found near water in the Central Valley.
Northern harrier	*Circus cyaneus*	CSC	*Nesting:* Tall grasses and forbs in emergent wetland, along rivers or lakes, grasslands, grain fields, or on sagebrush flats several miles from water.
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FT CE	*Nesting:* Extensive deciduous riparian thickets or forests with dense, low-level or understory foliage adjacent to slow-moving watercourses, backwaters, or seeps. Willow is almost always a dominant component of the vegetation. In the Sacramento Valley, also uses adjacent walnut orchards.
Yellow warbler	*Setophaga (Dendroica) petechia*	CSC	*Nesting*: Low, open-canopy riparian deciduous woodlands with a heavy brush understory; sometimes in montane shrubbery in open conifer forests.

Table 13-7. Representative Sensitive Wildlife Species of Riparian and Perennial Wetland Communities Along the Sacramento River and in the Delta (contd.)

Common Name	Scientific Name	Status[1]	Habitat Description
White-tailed kite	*Elanus leucurus*	FP	*Foraging:* Undisturbed, open grasslands, meadows, farmlands, and emergent wetlands. *Nesting:* Large groves of dense, broad-leafed deciduous trees close to foraging areas.
Greater sandhill crane	*Grus canadensis tabida*	CT FP	*Foraging: Open grasslands, grain fields, and open wetlands.* *Roosting: In flocks standing in moist fields or in shallow water.* *Nesting: Open habitats with shallow lakes and fresh emergent wetlands.*
Bald eagle	*Haliaeetus leucocephalus*	CE FP	*Foraging: Large bodies of water or free-flowing rivers with abundant fish and adjacent snags or other perches.* *Nesting: Large, old-growth trees or snags in remote, mixed stands near water.*
Yellow-breasted chat	*Icteria virens*	CSC	*Foraging and nesting:* Riparian thickets of willow and other brushy species near streams or other watercourses.
California black rail	*Laterallus jamaicensis coturniculus*	CT FP	*Foraging and nesting:* Tidal emergent wetlands dominated by pickleweed, in the high wetland zones near upper limit of tidal flooding, or in brackish marshes supporting bulrushes and pickleweed. In freshwater, usually found in bulrushes, cattails, and saltgrass adjacent to tidal sloughs.
Suisun song sparrow	*Melospiza melodia maxillaries*	CSC	*Foraging:* The bare surface of tidally exposed mud among tules and along slough margins in brackish marshes. *Nesting:* Along edges of sloughs and bays supporting mixed stands of bulrush, cattail, and other emergent vegetation.
Bank swallow	*Riparia riparia*	CT	*Foraging:* Open riparian areas, grassland, wetlands, water, and cropland. *Nesting:* Vertical banks and cliffs with fine-textured or sandy soils near streams, rivers, ponds, and lakes.
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	CSC	*Foraging:* Fresh emergent wetland and sometimes along shorelines and in nearby open fields, preferably on moist ground. *Nesting:* Dense emergent wetland of cattails and tules, often along border of lake or pond.

Table 13-7. Representative Sensitive Wildlife Species of Riparian and Perennial Wetland Communities Along the Sacramento River and in the Delta (contd.)

Common Name	Scientific Name	Status[1]	Habitat Description
Mammals			
Pallid bat	*Antrozous pallidus*	CSC	*Foraging:* Relatively open oak woodlands, over water near riparian and upland forests and woodlands, and orchards and vineyards. *Roosting:* Rocky outcrops, cliffs, and crevices.
Western mastiff bat	*Eumops perotis*	CSC	*Foraging:* Over water in broad, open areas near riparian and upland forests and woodlands. *Roosting:* Crevices in vertical cliffs, usually granite or consolidated sandstone, and in broken terrain with exposed rock faces.
Western red bat	*Lasiurus blossevillii*	CSC	*Foraging:* Over water edges in open areas near riparian and upland forests and woodlands; orchards. *Roosting:* Trees along edges or in habitat mosaics in a variety of habitats and orchards.
Townsend's big-eared bat	*Plecotus townsendii*	CSC	*Foraging:* Water edges in open areas near riparian and upland forests and woodlands. *Roosting:* Caves, mines, tunnels, buildings, or other human-made structures in woodlands. Prefers mesic habitats.
Salt-marsh harvest mouse	*Reithrodontomys raviventris*	FE CE FP	Salt marsh dominated by pickleweed and salt grass. Generally requires nonsubmerged, salt-tolerant vegetation for escape during high tides.

Source: CNDDB 2012

Note:

[1] Status definitions:

Key:
CE = California listed as endangered
CSC = California species of special concern
CT = California listed as threatened
FC = federal candidate for listing
FE = Federally listed as endangered
FP = California fully protected
FT = Federally listed as threatened

Sacramento River from Red Bluff Pumping Plant to the Delta Many of the special-status wildlife species described above for the upper Sacramento River have the potential to occur in the middle and lower reaches of the Sacramento River. Wildlife species listed under the Federal Endangered Species Act (ESA) and/or California Endangered Species Act (CESA) that have the potential to occur in a portion of the extended study area from Red Bluff Pumping Plant to the Delta include valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), giant garter snake (*Thamnophis gigas*), bald eagle (*Haliaeetus leucocephalus*), Swainson's hawk (*Buteo swainsoni*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), willow flycatcher (*Empidonax traillii*), and bank swallow (*Riparia riparia*).

Sacramento–San Joaquin River Delta Many special-status species are known or likely to occur in the Delta because of the presence of extensive wetland habitats. Tidal marshes and emergent wetlands support several special-status wildlife species: California black rail (*Laterallus jamaicensis coturniculus*), California clapper rail (*Rallus longirostris obsoletus*), greater

sandhill crane (*Grus canadensis tabida*), 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 (*Agelaius tricolor*). 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 (*Lepidurus packardi*) and vernal pool fairy shrimp (*Branchinecta lynchi*). The valley elderberry longhorn beetle has been found in the Delta region on McCormack-Williamson and New Hope tracts (CNDDB 2012).

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. Remnant native vegetation patches are likely to support a high diversity of wildlife species. More than 100 special-status wildlife and plant species occur in the San Joaquin River region. Most of the special-status wildlife species are associated with grasslands (which include vernal pools), freshwater emergent wetlands, lakes, and rivers that occur on the valley floor. Many of the species have been listed by Federal and State wildlife agencies because of habitat losses associated with agricultural development and water projects.

CVP/SWP Service Areas

The CVP and SWP service areas are dominated by agricultural land and urban development. These areas support many wildlife species, most of which are highly adapted to these altered environments. The conflict between urban growth and conservation of native habitat has resulted in the listing of a number of wildlife species that were threatened with extinction. The region also supports a variety of exotic species, some of which are detrimental to survival of native 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/or CESA and that could occur within the CVP and SWP service areas.

13.1.3 Other Wildlife Resources

Shasta Lake and Vicinity

Critical Deer Range Critical black-tailed deer winter range for the McCloud Flats and Cow Creek herds is located in the Shasta Lake and vicinity portion of

the primary study area in all five arms of the lake. Critical fawning range also is found along the south-facing slopes of Little Sugarloaf Creek (CDFG 1998). Critical deer winter range can include movement corridors, staging areas where deer congregate, and habitats with high-quality winter forage or other elements that help deer to survive the winter. Winter ranges are at lower elevations and are fewer in number than summer ranges, and thus are more vulnerable to human impact. Deer from different summer ranges may use common winter ranges when breeding typically occurs, which contributes to genetic diversity (CDFG 1998).

USFWS Habitat Evaluation Procedure Analysis Reclamation is working with USFWS to complete a Habitat Evaluation Procedure analysis to help quantify potential project impacts and meet Fish and Wildlife Coordination Act consultation requirements. To date, Habitat Evaluation Procedure studies and analyses have been completed for part of the Shasta Lake and vicinity portion of the primary study area. Additional planning and coordination are ongoing.

Incidental Observations Reclamation maintains a database of special-status wildlife species incidentally observed during all biological surveys performed since 2002. The incidental species observations include the foothill yellow-legged frog, western pond turtle (*Actinemys marmorata*), osprey (*Pandion haliaetus*), peregrine falcon (*Falco peregrinus anatum*), yellow-breasted chat (*Icteria virens*), yellow warbler (*Dendroica petechia brewsteri*), and Townsend's big-eared bat (*Plecotus townsendii*) (Figures 13-5a through 13-5f).

Upper and Lower Sacramento River, Delta, and CVP/SWP Service Areas
For the upper and lower Sacramento River, Delta, and CVP/SWP service areas, no other wildlife resources were evaluated in addition to wildlife habitats, wildlife, and special-status wildlife as described previously in Sections 13.1.1 and 13.1.2.

13.2 Regulatory Framework

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.

13.2.1 Federal

Federal Endangered Species Act
Pursuant to the ESA, USFWS and 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 U.S. 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 designated critical habitat. If a Federal action may affect a listed species or its designated critical habitat, the responsible Federal agency must enter into formal consultation with USFWS or NMFS, depending on the species.

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 designated critical habitat, thereby protecting areas necessary for the conservation of the species.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC 661–667e, as amended) 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 NMFS 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 further defined "disturb" under the act as follows (72 *Federal Register* 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, generally January through August.

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 *Federal Register* 31141–31155 (June 5, 2007)). With the delisting of the bald eagle from the ESA 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 CFR, includes several hundred species, essentially all native birds. Loss of nonnative species, such as house sparrows (*Passer domesticus*), European starlings (*Sturnus vulgaris*), and rock pigeons (*Columba livia*), 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 Shasta-Trinity National Forest. The following goals, standards, and guidelines related to wildlife resource issues associated with the study area were excerpted from the *Shasta-Trinity National Forest Land and Resource Management Plan* (USFS 1995).

Biological Diversity

Goals (STNP 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 (STNF 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 (STNF 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 (STNF 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 (STNF 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 USFS sensitive species consistent with individual species recovery plans.

U.S. Forest Service Survey and Manage

Standards and Guidelines The 1994 ROD for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and Standards and Guidelines for Management for Late-Successional and Old-Growth Related Species in the Range of the Northern Spotted Owl (NWFP ROD) amended or was incorporated into BLM and USFS land management plans to require certain actions for rare amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropods that occupy late-successional and old-growth forests (USFS and BLM 1994). These rare species were identified in Appendix C of the NWFP ROD collectively as S&M species. The NWFP ROD also established protection buffers on matrix lands for certain species (i.e., protection buffer species) that were not on the 1994 S&M list and required that those buffers be managed as

part of the Late Successional Reserve network. Four survey strategies were developed to guide management of S&M species: (1) manage known sites, (2) survey before ground-disturbing activities, (3) conduct extensive surveys, and (4) conduct general regional surveys.

The NWFP ROD also established overall objectives for managing S&M species populations that were referred to as "persistence objectives." These objectives were based on the USFS viability provision in the 1982 National Forest System Land and Resource Management Planning Regulation for the National Forest Management Act of 1976. This provision is targeted toward vertebrate species, but also was applied to nonvertebrate species to the greatest extent practicable, as described in the NWFP ROD. The provision generally states that the USFS will manage habitat "to maintain viable populations of existing native and desired non-native vertebrate species in the planning area" (36 CFR 219.19). Although the viability standard is part of the USFS planning regulations, the protections for S&M species were also applied to BLM lands in the NWFP ROD with a goal of protecting the long-term health and sustainability of all Federal forests within the range of the northern spotted owl and the species that inhabit them. Because of the uncertainty associated with the continued persistence of species due to natural factors, the NWFP ROD noted that compliance with the planning regulations is not subject to precise numerical interpretations and cannot be fixed at any single threshold; rather, "as in any administrative field, common sense and agency expertise must be applied" (NWFP ROD, p. 44).

The 2001 S&M ROD (USFS and BLM 2001) modified the management direction provided in the NWFP ROD for S&M and protection buffer species and amended BLM and USFS land management plans in the range of the northern spotted owl accordingly. The list of S&M species was also modified to remove 72 species in all or part of their range because new information indicated they were secure or otherwise did not meet the basic criteria for S&M. Species remaining on the list were assigned to one of six categories using the following criteria: their relative rarity, the ability to reasonably and consistently locate occupied sites during surveys before habitat- disturbing activities, and the level of information known about the species or group of species. The 2001 S&M ROD also removed the direction specific to protection buffer species, excluding these species from S&M Standards and Guidelines requirements. As part of the 2001 Standards and Guidelines, objectives, criteria, and management direction were defined for each category. Specific criteria were also established to add, remove, or change species categories based on new information and as part of the annual species review processes.

In 2004 and again in 2007, the BLM and USFS issued a ROD to eliminate the S&M requirements of the 2001 S&M ROD and to provide protection for species on the S&M lists by managing them under the agencies' special-status species programs. As a result of litigation, the requirements of the 2001 S&M ROD were reinstated. In a subsequent court-mandated settlement agreement (USFS

and BLM 2011), the list of S&M species was modified. The settlement agreement also made the following modifications: (1) acknowledged existing exemption categories (2006 Pechman Exemptions), (2) updated the 2001 S&M species list, (3) established a transition period for application of the species list, and (4) established new exemption categories (2011 Exemptions). Agency decisions made after September 30, 2012, are required to use the 2011 S&M list. Some species considered in the S&M program also occur on non-Federal lands. The requirements of the 1994 NWFP ROD and 2001 S&M ROD as modified under the 2011 Settlement Agreement apply only to lands managed by the BLM and USFS within the range of the northern spotted owl. The 2011 Settlement Agreement was later struck down by the court and the S&M program has reverted to the requirements of the 2001 S&M ROD with the 2006 Pechman Exemptions still intact.

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 NRA, contains management guidance intended to achieve or maintain a desired condition (USFS 2014). These strategies take into account opportunities, management recommendations for specific projects, and mitigation measures needed to achieve specific goals. The following guidance relative to wildlife resource issues associated with the project site were excerpted from the management guide.

Maintaining Key Wildlife Habitat Components

- Limestone outcrops within the Shasta Unit are recognized as a unique habitat component for various wildlife species. The cool moist microclimate present within these outcrops provides the habitat to escape the hot, dry summer season. Maintaining limestone habitats is a top priority within the NRA. Actions which could negatively impact limestone habitats (road building, dozer-line construction, piling and burning) will be avoided if limestone habitats would be degraded.

- Due to the important role down woody material and snags play in the ecosystem, design projects to maintain large down logs and large snags. In general, down logs and snags will be retained unless they pose a direct risk to public safety. It is recognized that projects implementing prescribed fire will directly impact large snags and logs. These projects are encouraged, as they are essential in maintaining a healthy and diverse ecosystem. It is also recognized that the effects of prescribed fire on snags and down logs is a dynamic process, as fire will consume some snags and logs, but also some trees are killed by fire, which provides for recruitment of new snags and logs.

- 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 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 other special-status 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 CDFW and the USFWS regarding habitat management of wildlife species inhabiting the National Recreation Area. Consultation with USFWS will continue regarding habitat management for threatened and endangered species.

U.S. Bureau of Land Management Resource Management Plan

BLM manages a number of public land areas within the primary study area, including the Shasta/Chappie Off-Highway Vehicle Area west of Shasta Dam. These areas fall under the Northern California BLM district and the resource management plan of the Redding BLM field office. The purpose of BLM's resource management plans is to provide overall direction for managing and allocating public resources in the planning area. BLM is responsible for administering the following strategies related to resource issues common to the portion of the Redding Resource Area lands located near the study area and vicinity (BLM 1992, 1993, 2005).

- Provide a regional opportunity for motorized recreation with a focus within the Shasta/Chappie Off-Highway Vehicle Area.

- Enhance non-motorized recreation opportunities within the area via a greenway connecting Redding to Shasta Dam along the Sacramento River.

- Maintain or improve the long-term sustained yield of forest products available from commercial forest lands.
- Improve the long-term condition and protection of deer winter range habitat.
- Maintain special-status species habitat.
- Maintain the existing scenic quality of the areas.
- Maintain opportunities to explore and develop freely available minerals on public lands.

Section 404 of the Clean Water Act

USACE 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 11312 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 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.

13.2.2 State

California Endangered Species Act

Under the CESA, CDFW has the responsibility for maintaining a list of endangered and threatened species (California Fish and Game Code Section 2070). CDFW also maintains a list of "candidate species," which are species for which CDFW has issued a formal notice that they are under review for addition to the list of endangered or threatened species. In addition, CDFW 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, CDFW 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 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 CDFW would be in the form of an incidental take permit or as a consistency determination (Fish and Game Code Section 2080.1(a)). Fish and Game Code Section 2080.1(a) authorizes CDFW to accept a Federal biological opinion (BO) 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 California Fish and Game Code Section 3503, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided in other sections. 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 California Fish and Game Code Sections 3511, 4700, 5050, and 5515, which list 37 fully protected species. These statutes prohibit take or possession at any time of fully protected species. CDFW is unable to authorize incidental take of fully protected species when activities are proposed in areas inhabited by those species. CDFW 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 CDFW, pursuant to California Fish and Game Code Section 1602. 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. CDFW's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife. A CDFW 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 (regional water boards). Each of the regional water boards 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 regional water boards' 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 regional water boards have 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 regional water board.

California Department of Fish and Wildlife Species Designations

CDFW 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 CDFW 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.

13.2.3 Regional and 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 (Tehama County 2009).

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 (Sutter County 2010).

Sacramento County's general plan contains goals and policies that promote management, protection, and restoration of natural habitats and sensitive species of plants and animals throughout the county (Sacramento County 2011). This includes policies for "no net loss" of riparian and oak woodland. The Sacramento County general plan includes specific setbacks from streams that can be 200 feet wide; development within setbacks is prohibited except for passive recreation and stormwater facilities in the outside-most 50 feet. 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.

Chapter 12.56, "Trees Generally," of 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 (Yolo County 2009).

13.2.4 Federal, State, and Local Programs and Projects

California Bay-Delta Authority

The California Bay-Delta Authority (CBDA) was established as a State agency in 2003 to oversee implementation of CALFED for the numerous Federal and State agencies working cooperatively to improve the quality and reliability of California's water supplies while restoring the Bay-Delta ecosystem. The July 2000 CALFED *Final Programmatic EIS/EIR* (CALFED 2000c) analyzed a range of alternatives to address these needs and included a MSCS to provide a framework for compliance with ESA, CESA, and Natural Community Conservation Planning Act. The August 2000 CALFED Programmatic ROD identified 12 action plans, including Ecosystem Restoration, Watersheds, and Water Supply Reliability, among others (CALFED 2000d). The 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. In 2009, the California Legislature passed sweeping water reform legislation, including the establishment of the Delta Stewardship Council (DSC). The DSC was transferred all the responsibilities, programs, staff and most of the funding from the CBDA, and the CBDA was dissolved. The DSC was also given additional mandates, including the development of a Delta Plan to guide activities and programs of State and local programs in the legal Delta through a consistency determination process.

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 CDFW, USFWS, the Central Valley RWQCB, 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 U.S. 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 (*Setophaga petechia*) and song sparrows (*Melospiza melodia*), advocating a continuous riparian corridor along lower Clear Creek.

Sacramento River Advisory Council

In 1986 the California Legislature passed Senate Bill 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* (Resources Agency 2003). This action also resulted in formation in May 2000 of the Sacramento River Conservation Area 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 Resources Agency, and ex-officio members from six Federal and State resource agencies.

Sacramento River Conservation Area Program

The Sacramento River Conservation Area 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* (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* (Resources Agency 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 Red Bluff Diversion Dam (completed)
- 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, ongoing monitoring)
- 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 (ongoing)

Sacramento River National Wildlife Refuge

The Sacramento River National Wildlife Refuge (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 *Environmental Assessment for Proposed Restoration Activities on the Sacramento River National Wildlife Refuge* (USFWS 2001; 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 2005b) 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 CDFW 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* prepared in 2004.

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 and data collection and 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 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. The Sacramento Watersheds Action Group has successfully worked with local groups, agencies, and organizations to fund and complete restoration projects on the Sacramento River and tributaries downstream from 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. The Sacramento Watersheds Action Group 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. This organization 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 CDFW, 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. This organization'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.

13.3 Environmental Consequences and Mitigation Measures

This section 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 the *Wildlife Resources Technical Report*. Mitigation measures are presented (as needed) to reduce impacts to a less-than-significant level.

13.3.1 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 analysis.

Where specific habitat data were not available, suitable habitat data defined by California Wildlife Habitat Relationships (CWHR) were used to determine impacts.

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 could 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.
- With the exception of Arbuckle Flat, no vegetation would be removed along the Pit Arm upstream from Painter Creek.
- 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 has the potential to 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, including construction-related changes at the potential restoration sites
- Temporary or permanent disturbance of habitat at restoration and gravel augmentation sites
- Mortality of individuals of special-status species at restoration and gravel augmentation sites

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 the Red Bluff Pumping Plant and within the extended study area that may be affected by altered hydrologic flows. It is assumed that construction-related activities at the dam, their effects, and mitigation were considered in the "Shasta Lake and Vicinity" section.

The assessment of potential effects on resources downstream from Keswick Dam was based on review of the output from the SLWRI 2012 Version CalSim-II model. Monthly averages by water year type[1] were reviewed for substantial trends in stage or flow that could alter habitat used by sensitive species or affect species directly. Trend data generated by CalSim-II were considered representative of the potential changes resulting from the project alternatives. A change of less than 2 percent (plus or minus) was considered essentially equivalent to baseline operations and therefore not a substantial change. When monthly average values were changed more than 2 percent, the alternative was considered to result in a substantial change in a species habitat or directly affect the species. Monthly flow results were used to simulate mean daily flows. The use of monthly averages in the evaluation was considered more representative of potential long-term changes in flows than values from the individual months. Results for individual months (e.g., December 1944) were not used in this analysis because the extreme values presented there are sometimes artifacts of model operations and not indicative of how the system would actually operate. See Section 12.3, "Methods and Assumptions," in Chapter 12, "Botanical Resources and Wetlands," for a more detailed discussion of this modeling. The differences in flow regime among the alternatives are described in detail in Chapter 6, "Hydrology, Hydraulics, and Water Management." A more detailed description of the SLWRI 2012 Version CalSim-II model, the modeling

[1] Throughout this document, water year types are defined according to the Sacramento Valley Index Water Year Hydrologic Classification, unless specified otherwise.

methodology used to evaluate this project, and key assumptions are provided in the Modeling Appendix.

The CALFED Ecosystem Restoration Program's Sacramento River Ecological Flows Study (TNC et al. 2008) was also consulted during the evaluation of impacts. This report summarizes the results of a multifaceted analysis conducted to determine the effects of the proposed (18.5-foot) raise of Shasta Dam and the proposed North-of-the-Delta Offstream Storage Reservoir facilities on several focal species, including western pond turtle and bank swallow. CalSim data were also used as inputs for this study; hypothetical flow scenarios were based on historical flows recorded at three locations along the Sacramento River. An appendix to this report is the "Linkages Report" (Stillwater Sciences 2007), which focused the mainstem Sacramento River corridor between Keswick Dam and Colusa. The Linkages Report sought to define how flow characteristics (e.g., magnitude, timing, duration, and frequency) and associated management actions (e.g., gravel augmentation, changes in bank armoring) influence the creation and maintenance of habitats for several native species that occur in the Sacramento River corridor.

The SLWRI 2012 Version CalSim-II model was used to aid in the evaluation of potential impacts of the project alternatives on water-related resources, including riparian habitats along the upper and lower Sacramento River and in the Delta. This computer modeling used historical data about California hydrology to represent the variety of weather and hydrologic patterns, including wet periods and droughts, under which water storage and conveyance facilities would be operated. Two scenarios (base cases) of water demands, storage, and conveyance were used in the modeling runs: 2005 facilities and demands ("existing conditions") and forecasted 2030 demands and reasonably foreseeable projects and facilities ("future conditions"). A modeling run was conducted for each of these base cases combined with each alternative, so that the effects of the No-Action Alternative and other alternatives could be evaluated relative to both existing and future conditions. CalSim-II is a useful tool for this type of comparative analysis. The model is run twice: first to represent a base condition (no action), and second with a specific change (action) to assess the differences in results caused by the input change.

Maximum vs. Likely Area of Impact in Relocation Areas

The relocation areas identified by Reclamation in the 2013 Draft EIS were based on preliminary information, as planning and related engineering designs were incomplete at that time. Habitat impacts disclosed for the relocation areas in the June 2013 Draft EIS assumed complete impact (i.e., 100% loss) within all the relocation areas. Since that time, Reclamation revised the relocation area boundaries by conducting additional planning and design that in many cases reduced the size of the relocation areas. Additionally, Reclamation designed infrastructure and other activities within the revised relocation areas to avoid wetlands and other sensitive resources, and reduce habitat impacts to the extent feasible.

Since final relocation area planning and designs are incomplete, each relocation area contains a “maximum” and “likely” impact area. The maximum area of impact is defined as the maximum area potentially impacted by project activities occurring within the relocation areas, while the likely impact area represents Reclamation’s best estimate of the actual impact (i.e., “most likely”). For the purposes of this Administrative Final EIS, habitat impacts are based on the assumption of complete loss within the likely impact areas. Table 13-8 shows a comparison of the maximum and likely CWHR habitats in the relocation areas.

Table 13-8. Summary of "Maximum and Likely" CWHR Wildlife Habitats in the Relocation Areas

Plant Series	Area (Acres)													
	Main Body		Big Back-bone Arm		Sacramento Arm		McCloud Arm		Squaw Creek Arm		Pit Arm		Total	
	Max	Likely	Max	Likely	Max	Likely	Max	Likely	Max	Likely	Max	Likely	Max	Likely
Annual grassland	4.79	0.40	0.00		26.46	4.95	9.75	0.53	0.84	0.70	0.23	0.01	42.07	6.59
Barren	22.37	12.46	0.00		72.18	11.97	29.71	5.38	11.53	0.00	12.06	2.96	147.86	32.76
Blue oak–foothill pine	1.91	0.01	0.00		0.00	0.00	0.00	0.00	0.00	0.00	7.24	2.35	9.16	2.36
Blue oak woodland	0.00	0.00	0.00		0.00	0.00	3.68	0.00	0.00	0.00	0.92	0.00	4.59	0.00
Closed-cone pine–cypress	0.11	0.05	0.00		41.98	5.65	9.63	2.23	1.94	0.23	12.50	0.94	66.15	9.11
Douglas-fir	0.00	0.00	0.00		0.00	0.00	3.02	0.00	0.00	0.00	0.00	0.00	3.02	0.00
Mixed chaparral	12.65	3.36	0.00		56.11	3.95	26.92	4.11	4.44	1.70	33.98	9.63	134.11	22.77
Montane hardwood	35.81	19.73	0.00		137.77	20.89	148.13	21.64	6.34	0.24	0.13	0.13	328.17	62.63
Montane hardwood–conifer	104.31	24.69	0.00		117.35	19.27	221.40	33.48	29.04	2.61	30.09	6.62	502.19	86.66
Montane riparian	0.34	0.08	0.00		1.35	0.33	3.08	0.25	0.23	0.04	0.02	0.02	5.02	0.72
Ponderosa pine	156.24	79.56	0.00		398.26	96.79	272.10	47.58	43.08	16.04	22.09	0.77	891.77	240.74
Riverine	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban	20.66	15.64	0.00		228.60	217.29	0.48	0.27	0.00	0.00	0.57	0.57	250.30	233.76
Total	**359.20**	**155.98**	**0.00**		**1080.05**	**381.09**	**727.90**	**115.47**	**97.44**	**21.56**	**119.83**	**24.00**	**2384.42**	**698.10**

Key:
CWHR = California Wildlife Habitat Relationships
Max = maximum

13.3.2 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 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 ESA. An environmental document prepared to comply with 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 EIS must be prepared. An EIS must identify reasonable means to "mitigate adverse environmental impacts" (40 E 1502.16(h)). 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" (CEQA Section 15382). CEQA also requires that the environmental document propose feasible measures to avoid or substantially reduce significant environmental effects (CEQA Section 15126.4(a)).

The following significance criteria were developed based on guidance provided by the State CEQA Guidelines, and consider the context and intensity of the environmental effects as required under NEPA. 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
- 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 CDFW or USFWS
- Interfere substantially with the movement of any native resident or migratory 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. Impact conclusions are made using the significance criteria described above and include consideration of the "context" of the action and the "intensity" (severity) of its effects in accordance with NEPA guidance (40 CFR 1508.27).

13.3.3 Topics Eliminated from Further Consideration

No topics related to wildlife resources that are included in the significance criteria listed above were eliminated from further consideration. All relevant topics are analyzed below.

13.3.4 Direct and Indirect Effects

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

- Inundating existing habitat around Shasta Lake and causing habitat loss

- Causing construction-related effects at Shasta Dam and around Shasta Lake

- Altering flow regimes downstream from Shasta Lake and downstream from other reservoirs with altered operations

- Increasing water supply reliability, which in turn could contribute to human population growth or changes in agricultural land uses in the CVP and 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, Reclamation would not pursue an action to enlarge Shasta Dam. No new facilities would be constructed at Shasta Dam and no facilities around Shasta Lake would be relocated to accommodate higher lake levels; thus, there would be no construction-related impacts. In addition, releases from Shasta Dam or other CVP reservoirs would not change as a result of a Shasta Dam enlargement. Reasonably foreseeable projects identified elsewhere in this EIS, however, would occur and have effects on wildlife but those effects are unknown or largely speculative for many such projects, and therefore are not addressed in detail below.

Shasta Lake and Vicinity

Impact Wild-1 (No-Action): Impacts on 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. Mitigation is not required for the No-Action Alternative.

Impact Wild-2 (No-Action): Impacts on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat No impacts 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. Mitigation is not required for the No-Action Alternative.

Impact Wild-3 (No-Action): Impacts on the Northwestern Pond Turtle and Its Habitat 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. Mitigation is not required for the No-Action Alternative.

Impact Wild-4 (No-Action): Impacts on the American Peregrine Falcon No impact on the American peregrine falcon would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-5 (No-Action): Impacts on 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. Mitigation is not required for the No-Action Alternative.

Impact Wild-6 (No-Action): Impacts on Dispersal 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. Mitigation is not required for the No-Action Alternative.

Impact Wild-7 (No-Action): Impacts on the Purple Martin and Its Nesting Habitat No impacts or loss of nesting habitat for the purple martin would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-8 (No-Action): Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat No impacts or loss of foraging and nesting habitat for the willow flycatcher, Vaux's swift, yellow warbler, and yellow-breasted chat would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-9 (No-Action): Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat No impact or loss of foraging and nesting habitat for the long-eared owl, northern goshawk, Cooper's hawk, great blue heron, and osprey would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-10 (No-Action): Impacts on Habitat for the Pacific Fisher No take or loss of habitat for the Pacific fisher would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-11 (No-Action): Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, Yuma Myotis, and Fringed myotis), the American Marten, and Ringtail and Their Habitat No impact or loss of habitat for special-status bats (the pallid bat, spotted bat, western red bat, western mastiff bat, Townsend's big-eared bat, long-eared myotis, Yuma Myotis, and fringed myotis), the American marten, and ringtail would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-12 (No-Action): Impacts on Special-Status Terrestrial Mollusks (Church's Sideband, Shasta Sideband, Wintu Sideband, Oregon Shoulderband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat No impact or loss of habitat for special-status terrestrial mollusks (Church's sideband, Shasta sideband, Wintu sideband, Oregon shoulderband, Shasta chaparral, and Shasta hesperian) would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-13 (No-Action): Permanent Loss of Wildlife Habitat and Western Bumble Bee Habitat No permanent loss of habitat would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-14 (No-Action): Impacts on Other Birds of Prey (e.g., red-tailed hawk and Red-shouldered Hawk) and Migratory Bird Species (e.g., American Robin, Anna's Hummingbird) and their Foraging and Nesting Habitat No impact or loss of foraging and nesting habitat for other birds of prey and migratory bird species would occur because the project would not be

constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-15 (No-Action): Impacts on Critical Deer Winter and Fawning Range No loss of deer winter and fawning range would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-16 (No-Action): Impacts on California Red-Legged Frog No loss of California red-legged frog habitat would occur because the project would not be constructed. No impact would occur. Mitigation is not required for the No-Action Alternative.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-17 (No-Action): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Effects on riparian vegetation in the upper Sacramento River area from continuing the existing dam operation under the No-Action Alternative would not have a substantial adverse effect on special-status wildlife. This impact would be less than significant.

Implementing the No-Action Alternative would not result in changes to existing facilities or 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 Chapter 12, “Botanical Resources and Wetlands.” Operation of the dam has decreased early successional riparian communities and increased the extent of mid-successional riparian communities. Although early and mid-successional riparian vegetation provides different habitat values and some shifts in species use may occur, implementing the No-Action Alternative would not have a substantial adverse effect on special-status wildlife associated with riparian vegetation, nor would it be likely to cause a population to be eliminated. Therefore, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Wild-18 (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 existing conditions because only very small changes in flows greater than 30,000 cfs (a magnitude that strongly affects bank erosion and meander migration) would occur along the upper Sacramento River (see Section 12.3, “Environmental Consequences and Mitigation Measures” in Chapter 12, “Botanical Resources and Wetlands” [reference Impact Bot-7 (No-Action)]) and would result in no change to the ongoing geomorphic processes in the upper Sacramento River (see Section 11.3, “Environmental Consequences and Mitigation Measures ,” in Chapter 11, “Fisheries and Aquatic Ecosystems” [reference Impact Aqua-14 (No-Action)]).

Because water from high-flow events would be captured and stored and would be metered out in an even fashion, dam operations under the No-Action Alternative would continue with only very small changes in flows and no changes to the ongoing geomorphic processes along the upper Sacramento River. Therefore, future conditions for bank swallows are not expected to differ substantially from existing conditions. Therefore, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Wild-19 (No-Action): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime The No-Action Alternative would not alter vernal pool hydrology or affect vernal pool–associated wildlife in the upper Sacramento River area. Because the No-Action Alternative would not affect this resource, no impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-20 (No-Action): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area Riparian habitat conditions along the upper Sacramento River under the No-Action Alternative would not differ from baseline conditions. The No-Action Alternative would not conflict with existing plans promoting conservation, protection, and restoration of riparian habitat. Local plans and policies that influence riparian management would remain in place and continue to be locally enforced. Because conditions would not differ from the existing baseline, no impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-21 (No-Action): Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program Under the No-Action Alternative, the gravel augmentation program would not be implemented. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-22 (No-Action): Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration Projects Under the No-Action Alternative, none of the restoration work described in Chapter 2, “Alternatives,” would be conducted downstream from Shasta Dam. Thus, special-status wildlife species found in riparian habitat would not be affected. No impact would occur. Mitigation is not required for the No-Action Alternative.

Lower Sacramento River and Delta

Impact Wild-23 (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 Effects on riparian vegetation in the lower Sacramento River and Delta areas from continuing the existing dam operation under the No-Action Alternative would not have a substantial adverse effect on special-status wildlife. 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 continue to alter the structure and species composition of riparian habitat along the lower Sacramento River and into the Delta resulting from continued operation of Shasta Dam. Dam operation, which has led to a 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, the No-Action Alternative would affect habitats used by special-status wildlife species because early- and mid-successional riparian vegetation provides 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. Mitigation is not required for the No-Action Alternative.

Impact Wild-24 (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 existing conditions because only very small changes in flows greater than 30,000 cfs (a magnitude that strongly affects bank erosion and meander migration) would occur along the uppermost portion of the lower Sacramento River (see Section 12.3, “Environmental Consequences and Mitigation Measures” in Chapter 12, “Botanical Resources and Wetlands” [reference Impact Bot-14 (No-Action)]) and no project-related alteration of river flows would occur in the lower Sacramento River (see Section 11.3, “Environmental Consequences and Mitigation Measures” in Chapter 11, “Fisheries and Aquatic Ecosystems” [reference Lower Sacramento River, Tributaries, Delta, and Trinity River subsection under No-Action Alternative)]). This impact would be less than significant.

This impact would be similar to Impact Wild-18 (No-Action) for the primary study area. Dam operations under the No-Action Alternative would continue with only very small changes in flows and the ongoing geomorphic processes along the lower Sacramento River.. Although ongoing dam operations tend to result in the loss of eroding banks during winter flood flows, which could limit the formation of suitable nesting habitat for bank swallow, the future conditions for bank swallows are not expected to differ substantially from existing conditions. Therefore, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Wild-25 (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 The No-Action Alternative would not affect the hydrology of vernal pools or have an adverse effect on vernal pool–associated wildlife species in the lower Sacramento River and Delta area. Because the No-Action Alternative would not affect this

resource, no impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Wild-26 (No-Action): Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta Riparian habitat conditions along the lower Sacramento River or in the Delta would not differ from baseline under the No-Action Alternative. The No-Action Alternative would not conflict with existing plans promoting conservation, protection, and restoration of riparian habitat along the lower Sacramento River and in the Delta. Because conditions would not differ from the existing baseline, no impact would occur. Mitigation is not required for the No-Action Alternative.

CVP/SWP Service Areas

Impact Wild-27 (No-Action): Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes Changes to CVP and SWP water deliveries that would occur while the existing dam operation continues under the No-Action Alternative would not have a substantial adverse effect on special-status wildlife. This impact would be less than significant.

This impact would be similar to Impact Wild-17 (No-Action) for the primary study area and Impact Wild-21 (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 and SWP service areas could change because of several reasonably foreseeable projects that could 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. For these reasons, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

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 Programmatic ROD. In addition to the common features above, CP1 primarily involves raising Shasta Dam 6.5 feet, an elevation change that would increase the reservoir's full 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 increased anadromous fish survival.

Shasta Lake and Vicinity

Impact Wild-1 (CP1): Take and Loss of Habitat for the Shasta Salamander
Ground-disturbing activities and vegetation removal associated with dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas could result in direct take of the Shasta salamander, a State-listed species, USFS sensitive species, S&M species, MSCS-covered species, and BLM sensitive species. Additionally, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant.

Collectively, 38 Shasta salamander occurrences are known within the impoundment and relocation areas surveyed by Reclamation. Shasta salamanders have been found or are known to occur in nearly every CWHR habitat present along each arm. These known locations occur in CWHR habitats characterized by the presence (limestone habitat) or absence (nonlimestone habitat) of limestone substrate. Within the impoundment area, the presence of the Shasta salamander is presumed in all CHWR habitats, except “non-habitat” barren areas (e.g., paved parking lots, boat ramps). For the purposes of this impact analysis, all CWHR habitats in the impoundment and relocation areas are stratified as limestone or nonlimestone habitat.

Inundation resulting from a 6.5-foot dam raise would result in a loss of approximately 8 acres of limestone habitat and 1,187 acres of nonlimestone habitat. Impacts on limestone and nonlimestone habitats in the impoundment area are summarized in Table 13-9.

Table 13-9. Impacts on Suitable Habitat for the Shasta Salamander in the Impoundment Area (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Limestone	0.00	0.82	0.00	5.43	0.00	1.50	7.75
Nonlimestone	222.31	42.48	343.21	199.40	121.55	258.72	1187.67
Total	222.31	43.30	343.21	204.83	121.55	260.22	1195.42

Note:
[1] Acreage values are approximate.

Direct mortality of Shasta salamanders would 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. Construction activities in relocation areas would result in a loss of up to approximately 1 acre of limestone habitat and 424 acres of nonlimestone habitat. This impact would be significant. Impacts on limestone and nonlimestone habitat by CWHR type providing suitable habitat in the relocation areas are summarized in Table 13-10.

Mortality of individuals could occur over multiple years during project implementation if ground-disturbing activities are conducted during the wet season. This impact would be significant. Mitigation for this impact is proposed in Section 13.3.5.

Table 13-10. Impacts on Suitable Habitat for the Shasta Salamander in Relocation Areas

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Limestone	0.00	0.00	0.00	0.96	0.00	0.00	0.96
Nonlimestone	127.48	0.00	146.88	108.34	20.86	20.45	424.03
Total	127.48	0.00	146.88	109.30	20.86	22.09	424.99

Note:
[1] Acreage values are approximate.

Impact Wild-2 (CP1): Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat Ground-disturbing activities and vegetation removal associated with dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas could result in direct take of the foothill yellow-legged frog, a California species of special concern, a USFS sensitive species, an MSCS-covered species, and a BLM sensitive species, and the tailed frog, a California species of special concern. Operation of equipment in or adjacent to riverine or riparian habitat would result in direct impacts on these species. In addition, inundation caused by the raising of Shasta Dam would result in the conversion of suitable riverine and riparian habitat to unsuitable lacustrine habitat. These impacts would be potentially significant.

Foothill yellow-legged frogs occur in many perennial streams within the impoundment area. They have been found in streams on all arms and the main body of the lake. Tailed frogs have not been found during surveys, but there are known occurrences in the McCloud and upper Sacramento arms. CWHR habitat types, montane riparian and riverine, are suitable habitat where these species might occur.

Individual foothill yellow-legged frogs and tailed frogs will not be affected by the inundation caused by the raise of the dam. These animals will be able to swim upstream to suitable habitat.

Although frogs may move out of harm’s way, direct take of foothill yellow-legged frog and tailed frog could also occur as a result of project-associated construction activities in or near suitable aquatic habitat. Potential construction impacts include mortality of individuals because of equipment use and vehicle traffic within suitable aquatic and upland habitat. The potential for direct take would be temporary, occurring only during project construction. Project implementation could result in the degradation of suitable aquatic habitat

because of increased erosion, sedimentation, or accidental fuel leaks and spills. These impacts would be potentially significant.

Mortality of individuals could occur over multiple years during project implementation if construction activities are conducted in perennial streams. This impact would be potentially significant.

Implementation of a 6.5-foot dam raise would result in inundation of approximately 35 acres of habitat for the foothill yellow-legged frog and tailed frog. Approximately 0.72 acre of suitable habitat would be lost because of vegetation removal associated with dam construction and construction in the relocation areas. Summaries of suitable habitat loss by arm are presented in Table 13-11. Mitigation for this impact is proposed in Section 13.3.5.

Table 13-11. Impacts on Suitable Habitat for the Foothill Yellow-Legged and Tailed Frog in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Riverine	0.00	0.35	2.30	3.81	0.59	0.00	7.04
Total	1.54	2.83	18.22	8.41	1.17	2.59	34.75
Relocation Areas							
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Total	0.08	0.00	0.33	0.25	0.23	0.02	0.72

Note:
[1] Acreage values are approximate.

Impact Wild-3 (CP1): Impact on the Northwestern Pond Turtle and Its Habitat
Ground-disturbing activities and vegetation removal associated with dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas could result in direct take of the northwestern pond turtle, a California species of special concern, a USFS sensitive species, and an MSCS-covered species. These impacts would be potentially significant.

Individual northwestern pond turtles will not be impacted by the inundation caused by the raise of the dam. Lacustrine and riverine are suitable habitats for the northwestern pond turtle.

The northwestern pond turtle occurs throughout the perimeter of the impoundment area. In addition to aquatic habitats, this species uses upland habitats for nesting and overwintering. Nests are generally located on south-facing slopes of less than 60 degrees averaging 200 meters (660 feet) from an aquatic site (CDFG 1994). Thus, loss of upland habitats adjacent to suitable

aquatic habitat (within approximately 660 feet) could adversely affect this species.

Direct take of northwestern pond turtle eggs or juveniles could occur during the first inundation of habitat above 1,070 feet above msl. Turtles may lay eggs in suitable habitat that subsequently becomes inundated, resulting in the death of the eggs or overwintering juveniles. In addition, inundation caused by the raising of Shasta Dam would result in the conversion of suitable habitat to unsuitable lacustrine habitat. These impacts would be potentially significant.

Direct take of northwestern pond turtles could also occur as a result of project-associated construction activities in or near suitable aquatic and upland habitat. Potential construction impacts include mortality of individuals because of equipment use and vehicle traffic within suitable aquatic and upland habitat. In addition, project implementation could result in the degradation of suitable aquatic habitat because of increased erosion, sedimentation, or accidental fuel leaks and spills. Additionally, it is assumed that all vegetation will be removed within the relocation areas.

Mortality of individuals could occur over multiple years during project implementation if construction activities are conducted in suitable aquatic and upland habitat. This impact would be potentially significant.

Implementation of a 6.5-foot raise of the dam would result in conversion of approximately 35 acres of suitable habitat for the northwestern pond turtle. Approximately 7 acres of riverine habitat would be converted to lacustrine habitat. Because there are equally valuable components lost or gained in either habitat, the quality of the habitat would not be compromised. However, maximum lake elevation is infrequent and would not benefit the species throughout the remainder of the year. Thus, the conversion of suitable habitats to lacustrine habitat remains an impact on northwestern pond turtle habitat.

Approximately 0.72 acre of suitable aquatic habitat would be lost because of vegetation removal associated with dam construction and construction of the relocation areas. Summaries of suitable habitat lost by arm are presented in Table 13-12.

Table 13-12. Impacts on Suitable Habitat for the Northwestern Pond Turtle in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Riverine	0.00	0.35	2.30	3.81	0.59	0.00	7.04
Total	1.54	2.83	18.22	8.41	1.17	2.59	34.75
Relocation Areas							
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Total	0.08	0.00	0.33	0.25	0.04	0.02	0.72

Note:
[1]Acreage values are approximate.

Impact Wild-4 (CP1): Impact on the American Peregrine Falcon Construction activities and vegetation removal associated with dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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 fully protected and MSCS-covered species. This impact would be potentially significant.

Cliffs within the Shasta Lake and vicinity portion of the primary study area provide suitable nesting habitat for the peregrine falcon. Overstory and complete vegetation removal is expected to occur within the impoundment area in suitable cliff habitat. Thus, overstory vegetation removal occurring in or near suitable cliff habitat during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests. Additionally, because of the steep terrain, trees would be yarded by helicopter. Noise generated by chainsaws and helicopter yarding could cause the abandonment of nests, resulting in the incidental loss of fertile eggs or nestlings. This impact would be potentially significant.

No known eyries would be inundated by a 6.5-foot raise in lake elevation; however, 8.5 vertical feet (full pool) of cliff habitat would be inundated. Peregrine falcons nest on sheer cliffs ranging in height from 75 to 2,000 feet. Eyries are generally located between 40 and 80 percent of total cliff height (Pagel 1992). Based on the large area required for suitable nesting habitat for peregrine falcons, impacts on suitable cliff habitat for nesting would be less than significant. The conversion of uplands to lacustrine habitat would not adversely affect foraging habitat for the species because they frequently forage over water.

Impacts on nesting American peregrine falcons could occur over multiple years during project implementation if construction activities were conducted in or

adjacent to active nests. This impact would be potentially significant. Construction or vegetation removal related to relocation areas is not anticipated to occur in suitable cliff habitat. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-5 (CP1): Take and Loss of Habitat for the Bald Eagle Ground-disturbing activities and vegetation removal associated with dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas in addition to inundation caused by the raising of Shasta Dam during the nesting season would result in the loss of nest and perch trees used by the bald eagle, a State-listed, fully protected, and USFS sensitive species, MSCS-covered species, and a BLM sensitive species. This impact would be significant.

Typically, 24 to 28 pairs nest in the vicinity of Shasta Lake. Vegetation removal within the impoundment area could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of bald eagle nests. Noise generated by vegetation removal, such as noise caused by helicopter yarding and chainsaw use, could also lead to nest abandonment, resulting in the incidental loss of fertile eggs or nestlings. The loss of nesting and foraging habitat would be a potentially significant impact.

Three known bald eagle nest trees would be affected by inundation with a 6.5-foot dam raise. When inundation occurs, nest trees within the impoundment area would die. Because peak inundation generally occurs in late April or early June, nest trees would be flooded toward the end of the nesting season. If eagles were nesting in these trees, it would be likely that young would fledge before the nest tree died from the effects of inundation. Because of inundation timing, it is not likely that individuals would be affected. Because bald eagles generally use the same nest for multiple years, the loss of nest trees would be a significant impact.

Inundation could also affect erosion and bank stability, which could affect nest trees that are in close proximity to the impoundment area. This would be a potentially significant impact.

The increase in lake elevation may increase access to eagle nests by recreational boaters. The increase in noise and human disturbance may lead to nest abandonment and the incidental loss of fertile eggs or young. Additionally, habitat inundated within the impoundment area would result in a loss of roosting and potential nest trees. This impact would be significant.

One eagle nest is located in the relocation area at Gregory Beach. Removal of nest trees would be a potentially significant impact. Additionally, one nest occurs near the Bailey Cove trail, which could be impacted by noise generated by vegetation removal activities. Vegetation removal and additional construction activities in the relocation areas would result in the same impacts

on nesting bald eagles as described for vegetation removal activities proposed in the impoundment areas. This impact would be significant.

Impacts on nesting bald eagles could occur over multiple years during project implementation if construction activities are conducted at or adjacent to active nest sites. This impact would be significant.

Dam construction, vegetation removal, and inundation resulting from a 6.5-foot dam raise would result in a loss of approximately 979 acres of bald eagle nesting and roosting habitat in the impoundment area and 393 acres in the relocation areas. Potential nest and roost trees occur in blue oak woodland, blue oak–foothill pine, Douglas-fir, Klamath mixed conifer, montane hardwood, montane hardwood–conifer, montane riparian, and ponderosa pine habitats and are typically found in trees with diameters greater than 24 inches. Impacts on suitable bald eagle habitat by CWHR type in the impoundment area and relocation areas are summarized in Table 13-13.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-13. Impacts on Suitable Habitat for the Bald Eagle in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	2.21	2.21
Blue oak–foothill pine	4.96	0.00	0.00	0.00	1.40	16.35	22.71
Douglas-fir	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	5.51	5.51
Montane hardwood	39.08	18.13	86.75	34.61	9.44	39.49	227.49
Montane hardwood–conifer	34.65	0.50	69.23	66.31	55.70	89.81	316.21
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Ponderosa pine	108.93	15.36	84.75	81.20	25.06	61.89	377.19
Total	189.17	36.46	256.65	186.73	92.18	217.86	979.05

Table 13-13. Impacts on Suitable Habitat for the Bald Eagle in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	Mc Cloud Arm	Squaw Creek Arm	Pit Arm	Total
Relocation Areas							
Blue oak–foothill pine	0.01	0.00	0.00	0.00	0.00	2.34	2.35
Montane hardwood	19.73	0.00	20.89	21.64	0.24	0.13	62.63
Montane hardwood–conifer	24.69	0.00	19.27	33.48	2.61	6.62	86.66
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Ponderosa pine	79.56	0.00	96.79	47.58	16.04	0.77	240.74
Total	124.07	0.00	137.28	102.95	18.93	9.88	393.11

Note:
[1] Acreage values are approximate.

Impact Wild-6 (CP1): Loss of Dispersal Habitat for the Northern Spotted Owl
Construction activities and vegetation removal associated with the dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in the loss of northern spotted owl dispersal habitat, a species Federally listed as threatened and an MSCS-covered species. This impact would be potentially significant.

Reclamation conducted a habitat analysis within the Shasta Lake and vicinity portion of the primary study area to determine potential project impacts to northern spotted owl habitat. The analysis was performed using a GIS-based habitat model developed by the USFS northern California forests in coordination with the USFWS. The USFS developed this model using the Existing Vegetation data (EVEG) created by the USFS Remote Sensing Lab. The habitat model is referred to as NSO EVEG and defines potential northern spotted owl habitat by incorporating the vegetation data and specific northern spotted owl habitat attributes, including overstory canopy cover, proportion of conifer and hardwood trees, average tree diameter, vegetation alliance, elevation, geographic location, and ecologic setting. Using the vegetation data and northern spotted owl habitat attributes, the NSO EVEG model designates polygons as potential northern spotted owl dispersal, nesting/roosting, and foraging habitats, or non-habitat. Reclamation queried the NSO EVEG model within the Shasta Lake and vicinity portion of the primary study area to determine the amount and location(s) of potential northern spotted owl dispersal, nesting/roosting, and foraging habitats.

Dam construction, vegetation removal, and construction in the relocation areas, and inundation resulting from a 6.5-foot dam raise would result in a loss of northern spotted owl dispersal habitat, including approximately 437 acres in the

impoundment area and 340 acres in the relocation areas. Impacts on potential northern spotted owl dispersal habitat in the impoundment area and relocation areas are summarized in Table 13-14. No nesting/roosting or foraging habitat occurs in the Shasta Lake and vicinity portion of the primary study area; therefore, no impacts to these habitats would occur.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-14. Impacts on Dispersal Habitat for the Northern Spotted Owl in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Dispersal	66.10	7.12	103.16	107.22	54.25	100.05	437.89
Foraging	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nesting/roosting	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	66.10	7.12	103.16	107.22	54.25	100.05	437.89
Relocation Areas							
Dispersal	70.00	0.00	167.27	86.24	8.08	9.34	340.92
Foraging	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nesting/roosting	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	70.00	0.00	167.27	86.24	8.08	9.34	340.92

Note:
[1] Acreage values are approximate.

Impact Wild-7 (CP1): Impact on the Purple Martin and Its Nesting Habitat
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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, inundation caused by the raising of Shasta Dam would result in the loss of available nest trees. This impact would be significant.

Shasta Lake supports the largest and one of only a few known purple martin breeding locations in interior northern California. Between 18 and 42 nesting pairs occur at Shasta Lake based on monitoring performed by Reclamation since 2007. The purple martin nest sites are found in flooded snags located in the existing reservoir and adjacent uplands, and occur from the vicinity of Jones Valley east up the Pit Arm. Overstory vegetation removal is proposed for the relocation of the Clikapudi Trail (Jones Valley area). With the exception of Arbuckle Flat, no vegetation removal is proposed on the Pit Arm east of the Painter Creek inlet.

Inundation of the impoundment area would result in the loss of nest trees in the lake and several known upland nest trees. Each nest tree contains several potential nest cavities at various heights above the water. Therefore, with an increase in inundation levels, fewer potential nest cavities could be available from year to year. Loss of nest trees may be temporary, as trees that are inundated would die, become snags, and provide potential nest sites. The temporal loss of nesting snags would be a significant impact.

Overstory vegetation removal is proposed for the relocation of the Clikapudi Trail. This could include removal of snags that are actively used for nesting or could provide nesting habitat for purple martin. Construction activities such as tree removal, site grading, and excavation and vegetation removal, including noise caused by helicopter yarding and chainsaw use during the nesting 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 significant impact.

Impacts on nesting purple martins could occur over multiple years during project implementation if construction activities were conducted at or adjacent to active nest sites. This impact would be significant.

Purple martins forage high in the air and above the tree canopy. Conversion of upland habitats to lacustrine habitat may have an effect on foraging habitat due to the loss of insect-producing vegetation; however, insect production also occurs in lacustrine habitats. Therefore, there would be an insignificant impact on foraging habitat.

Mitigation for all impacts to purple martin is proposed in Section 13.3.5.

Impact Wild-8 (CP1): Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat
Construction activities and vegetation removal associated with dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the willow flycatcher, a State-listed endangered, USFS sensitive, and MSCS-covered species; the Vaux's swift, a California species of special concern; and the yellow warbler and yellow-breasted chat, 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.

Vegetation removal within the impoundment area during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of these species. Noise generated by vegetation removal activities, including helicopter yarding and chainsaw use, could also lead to nest abandonment, resulting in the incidental loss of fertile eggs or

nestlings. This impact would be potentially significant. The loss of nesting and foraging habitat would be a potentially significant impact.

A 6.5-foot dam raise would result in inundation of nesting and foraging habitat for these species. Understory vegetation in 15 percent of the impoundment area would be removed before inundation; the remainder would not survive the inundation. Therefore, inundation of the impoundment area would reduce the nesting habitat for these species. If removal were completed outside of the breeding season, nesting would not be affected. However, 63 percent of vegetation would not be removed and would be inundated. Because peak inundation generally occurs in late April through early June, active nests established before and while lake levels were rising could be flooded. The loss of nests and nesting and foraging habitat from inundation would be a potentially significant impact.

Construction activities, such as tree removal, site grading, excavation, and vegetation removal, at the dam and in relocation areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Additionally, noise generated by project construction activities and vegetation removal, including helicopter yarding and chainsaw use, could lead to nest abandonment resulting in the incidental loss of fertile eggs or nestlings. Vegetation removal in relocation areas would also result in a loss of nesting and foraging habitat. This would be a potentially significant impact.

Impacts on these species could occur over multiple years during project implementation if construction activities were conducted adjacent to active nests. This impact would be potentially significant.

Dam construction, vegetation removal, and inundation resulting from a 6.5-foot dam raise would result in a loss of approximately 954 acres in the impoundment area and 390 acres in the relocation areas of potential nesting and foraging habitat for the Vaux’s swift. These activities would also result in the loss of approximately 28 acres in the impoundment area and 0.72 acre in the relocation areas of willow flycatcher, yellow warbler, and yellow-breasted chat habitat. The loss of habitat for these species would be a potentially significant impact.

Impacts on suitable willow flycatcher, Vaux’s swifts, yellow warblers, and yellow-breasted chats habitat by CWHR type in the impoundment area and relocation areas are summarized in Table 13-15. Mitigation for this impact is proposed in Section 13.3.5.

Table 13-15. Impacts on Suitable Habitat for the Vaux's Swift, Willow Flycatcher, Yellow Warbler, and Yellow-Breasted Chat in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Vaux's Swift							
Douglas-fir	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	5.51	5.51
Montane hardwood	39.08	18.13	86.75	34.61	9.44	39.49	227.49
Montane hardwood–conifer	34.65	0.50	69.23	66.31	55.70	89.81	316.21
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Ponderosa pine	108.93	15.36	84.75	81.20	25.06	61.89	377.20
Total Vaux's Swift Habitat	184.21	36.46	256.65	186.73	90.77	199.30	954.12
Willow Flycatcher, Yellow Warbler, and Yellow-Breasted Chat							
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Total Habitat	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Relocation Areas							
Vaux's Swift							
Montane hardwood	19.73	0.00	20.89	21.64	0.24	0.13	62.63
Montane hardwood–conifer	24.67	0.00	19.27	33.48	2.61	6.62	86.66
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Ponderosa pine	79.56	0.00	96.79	47.57	16.04	0.77	240.74
Total Vaux's Swift Habitat	124.06	0.00	137.28	102.95	18.93	7.54	390.75
Willow Flycatcher, Yellow Warbler, and Yellow-Breasted Chat							
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Total Habitat	0.08	0.00	0.33	0.25	0.04	0.02	0.72

Note:
[1] Acreage values are approximate.

Impact Wild-9 (CP1): Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat Construction activities and vegetation removal associated with the dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the long-eared owl, a California species of special concern and an MSCS-covered species; northern goshawk, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; and the Cooper's hawk, the great blue heron, and the osprey, which are MSCS-covered species. Higher lake levels caused by raising Shasta Dam would result in the loss of foraging and nesting habitat for the long-eared owl, northern goshawk, and Cooper's hawk. This impact would be

potentially significant. Higher lake levels would also result in the loss of nesting habitat for osprey and great blue heron. This impact would be potentially significant. Foraging habitat would increase for osprey and great blue heron. No impact to foraging habitat for these species would occur.

Vegetation removal within the impoundment area during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of these species. Noise generated by vegetation removal activities, including helicopter yarding and chainsaw use, could also lead to nest abandonment, resulting in the incidental loss of fertile eggs or nestlings. This impact would be potentially significant. The loss of nesting and foraging habitat would be a potentially significant impact.

A 6.5-foot dam raise could result in inundation of nest trees and would result in the loss of nesting and foraging habitat for this species. When inundation of the impoundment area occurs, nest trees within the impoundment area would die. Because peak inundation generally occurs in late April through early June, nest trees would be flooded toward the end of the nesting season. If these species were nesting in these trees, it is likely that young would fledge before the nest tree dies from the effects of inundation. Because of inundation timing, it is not likely that individuals would be affected. However, the loss of nesting and foraging habitat would be a potentially significant impact.

The increase in lake elevation could increase access to nests by recreational boaters. The increase in noise and human disturbance could lead to nest abandonment and the incidental loss of fertile eggs or young. This would be a potentially significant impact.

Construction activities, such as tree removal, site grading, excavation, and vegetation removal, at the dam and in relocation areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Additionally, noise generated by project construction activities and vegetation removal, including helicopter yarding and chainsaw use, could lead to nest abandonment, resulting in the incidental loss of fertile eggs or nestlings. Vegetation removal in relocation areas would also result in a loss of nesting and foraging habitat. This would be a potentially significant impact.

Impacts on these species could occur over multiple years during project implementation if construction activities were conducted adjacent to active nests. This impact would be potentially significant.

Dam construction, vegetation removal, and inundation resulting from a 6.5-foot dam raise would result in a loss of approximately 699 acres in the impoundment area and 327 acres in the relocation areas of long-eared owl and northern goshawk nesting and foraging habitat. There would be a loss of approximately

1,072 acres in the impoundment area and 402 acres in the relocation areas of Cooper's hawk and great blue heron nesting and foraging habitat.

Impacts on suitable habitat by CWHR type in the impoundment area and relocation areas are summarized in Table 13-16.

Table 13-16. Impacts on Suitable Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Long-Eared Owl and Northern Goshawk							
Douglas-fir	0.00	Douglas-fir	0.00	Douglas-fir	0.00	Douglas-fir	0.00
Klamath mixed conifer	0.00	Klamath mixed conifer	0.00	Klamath mixed conifer	0.00	Klamath mixed conifer	0.00
Montane hardwood–conifer	34.65	Montane hardwood–conifer	34.65	Montane hardwood –conifer	34.65	Montane hardwood –conifer	34.65
Ponderosa pine	108.93	Ponderosa pine	108.93	Ponderosa pine	108.93	Ponderosa pine	108.93
Total Habitat	143.59	Total Habitat	143.59	Total Habitat	143.59	Total Habitat	143.59
Cooper's Hawk and Great Blue Heron							
Blue oak–foothill pine	4.96	0.00	0.00	0.00	1.40	16.35	22.71
Closed-cone pine-cypress	17.75	0.00	6.30	10.78	23.95	36.71	95.49
Douglas-fir	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	5.51	5.51
Montane hardwood	39.08	18.13	86.75	34.61	9.44	39.49	227.49
Montane hardwood–conifer	34.65	0.50	69.23	66.31	55.70	89.81	316.21
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Ponderosa pine	108.93	15.36	84.75	81.20	25.06	61.89	377.19
Total Habitat	206.91	36.46	262.95	197.51	116.13	252.36	1072.33

Table 13-16. Impacts on Suitable Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Relocation Areas							
Long-Eared Owl and Northern Goshawk							
Douglas-fir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montane hardwood–conifer	24.69	0.00	19.27	33.48	2.61	6.62	86.66
Ponderosa pine	79.56	0.00	96.78	47.58	16.04	0.77	240.74
Total Habitat	104.25	0.00	116.05	81.06	116.05	7.38	327.40
Cooper's Hawk and Great Blue Heron							
Blue oak–foothill pine	0.01	0.00	0.00	0.00	0.00	2.34	2.36
Closed-cone pine-cypress	0.05	0.00	5.65	2.23	0.23	0.94	9.10
Douglas-fir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montane hardwood	19.73	0.00	20.89	21.64	0.24	0.13	62.63
Montane hardwood–conifer	24.68	0.00	19.27	33.48	2.61	6.62	86.66
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Ponderosa pine	79.56	0.00	96.79	47.58	16.04	0.77	240.74
Total Habitat	124.12	0.00	142.93	105.19	19.16	10.82	402.22

Note:
[1] Acreage values are approximate.

Impacts on osprey are similar to those described for the bald eagle (Impact Wild-5 (CP1)) and the other raptors addressed above.

There are 54 osprey nest trees along the perimeter of Shasta Lake. Six nest trees would be affected by a 6.5-foot dam raise. Eleven osprey nests are located in relocation areas. Removal of nest trees would be a potentially significant impact. Because osprey generally use the same nest for multiple years, the loss of 17 nest trees (31 percent of the total in the Shasta Lake and vicinity) between the impoundment area and relocation areas would be a potentially significant impact.

Osprey nests also occur on towers and structures around the dam; otherwise, there is no suitable habitat for raptors near the dam. Blasting may occur in the vicinity of the dam. This would have a similar impact on nesting ospreys as noise generated by helicopter yarding or large construction equipment, which could result in nest abandonment and the loss of fertile eggs or young. This would be a potentially significant impact.

Impact Wild-10 (CP1): Take and Loss of Habitat for the Pacific Fisher
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the Pacific fisher, a Federal candidate for listing, a California species of special concern, a USFS sensitive species, and a BLM sensitive species. Furthermore, take (including mortality of individuals because of destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

Vegetation removal within the impoundment area while Pacific fisher kits (i.e., young) are in natal den trees could result in the incidental loss of kits. Noise generated by vegetation removal activities, including helicopter yarding and chainsaw use, may also lead to abandonment of young. However, females frequently move kits if the natal den is disturbed or threatened. Because females will move kits, it is not likely that individuals would be affected. However, the loss of denning, resting, and foraging habitat would be a potentially significant impact.

A 6.5-foot dam raise could result in inundation of natal den trees and would result in the loss of denning, resting, and foraging habitat for this species. When inundation of the impoundment area occurs, natal den trees within the impoundment area would die. Females frequently move kits if threatened or disturbed. Because females will move kits, it is not likely that individuals would be affected. However, the loss of denning, resting, and foraging habitat would be a potentially significant impact.

Construction activities, such as tree removal, site grading, excavation, and vegetation removal, at the dam and in relocation areas while kits are in natal den trees could result in the incidental loss of kits. Impacts on habitat would be the same as described for the impoundment area. This would be a potentially significant impact.

Impacts on the Pacific fisher could occur over multiple years during project implementation if construction activities were conducted adjacent to denning or resting habitat. This impact would be potentially significant.

Dam construction, vegetation removal, and inundation resulting from a 6.5-foot dam raise would result in a loss of approximately 749 acres of Pacific fisher habitat in the impoundment area. Approximately 330 acres of Pacific fisher habitat would be lost in the relocation areas. This impact would be potentially significant.

Impacts on suitable habitat by CWHR type in the impoundment area and relocation areas are summarized in Table 13-17.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-17. Impacts on Suitable Habitat for the Pacific Fisher in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Blue oak-foothill pine	4.95	0.00	0.00	0.00	1.40	16.35	22.71
Douglas-fir	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	5.51	5.51
Montane hardwood–conifer	34.65	0.50	69.23	66.31	55.70	89.81	316.21
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Ponderosa pine	108.93	15.36	84.75	81.20	25.06	61.89	377.19
Total Habitat	150.08	18.34	169.90	152.12	82.74	176.16	749.34
Relocation Areas							
Blue oak-foothill pine	0.01	0.00	0.00	0.00	0.00	2.35	2.36
Douglas-fir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montane hardwood–conifer	24.69	0.00	19.27	33.48	2.61	6.62	86.66
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Ponderosa pine	96.78	0.00	96.79	47.58	16.04	0.77	240.74
Total Habitat	104.34	0.00	116.39	81.31	18.69	9.75	330.48

Note:
[1] Acreage values are approximate.

Impact Wild-11 (CP1): Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, Yuma Myotis, and Fringed Myotis), the American Marten, and Ringtail and Their Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the pallid bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the western red bat, a USFS sensitive species; the western mastiff bat, a California species of special concern, an MSCS-covered species, and a BLM sensitive species; the Townsend's big-eared bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the long-eared myotis, a BLM sensitive species; the Yuma myotis, a BLM sensitive species; the fringed myotis, a USFS sensitive species; the American marten, a USFS sensitive species; and the ringtail, a State fully protected and MSCS-covered species. Furthermore, take (including mortality of individuals because of destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

Vegetation removal within the impoundment area while young bats are in maternity colonies or kits are in natal den trees could result in the incidental loss of young. Noise generated by vegetation removal activities, including helicopter

yarding and chainsaw use, could also lead to young abandonment. Furthermore, 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 because of the loss of pregnant females. Mortality of young and the loss of reproductive and foraging habitat would be a potentially significant impact.

Inundation of a 6.5-foot dam raise would result in a loss of roosting and foraging habitat for special-status bats (pallid bat, spotted bat, western red bat, western mastiff bat, Townsend's big-eared bat, long-eared myotis, Yuma myotis, and fringed myotis) that roost in hollow trees, snags, bridges, and caves. Loss of young could occur during the first inundation (above 1,070 feet msl) of bat maternity colony habitat because active maternity colonies could be flooded before young are volant (capable of flight). American marten and ringtails, which also use snags, hollow logs, and debris piles for reproduction and cover, could also be impacted. This impact would be potentially significant.

Two known caves, one occupied by Townsend's big-eared bats, are located on the Big Backbone Arm and would be wholly or partially inundated if the dam were raised. Inundation of cave/cliff habitat could result in the loss of Townsend's big-eared bat, western mastiff bat, and long-eared myotis 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 because of the loss of pregnant females.

Spotted bats and long-eared myotis could also roost in crevices and caves in the Shasta Lake and vicinity portion of the primary study area. However, inundation of cave/cliff habitat is less likely to result in a significant impact on these species because they do not roost colonially; thus, inundation of a cave would not result in the loss of an entire maternity colony.

Special-status bats may roost on bridges and could also be affected by bridge modification or removal. Direct impacts, including mortality and the loss of roosting habitat, would be significant.

Construction activities, such as tree removal, site grading, excavation, and vegetation removal, at the dam and in relocation areas while young bats are in maternity colonies or kits are in natal den trees could result in the incidental loss of young. Impacts on habitat would be the same as described for the impoundment area. This would be a potentially significant impact.

Impacts on these species could occur over multiple years during project implementation if construction activities are conducted in or adjacent to reproductive habitat. This impact would be potentially significant.

Foraging habitat for the pallid bat, spotted bat, western mastiff bat, and Townsend's big-eared bat includes Douglas-fir, fresh emergent wetland, lacustrine habitat, montane hardwood, montane hardwood–conifer, montane riparian, and ponderosa pine. These habitats are regionally abundant and therefore impacts on foraging habitat by inundation or vegetation removal in the relocation areas would be less than significant.

Dam construction, vegetation removal, and inundation resulting from a 6.5-foot dam raise would result in the loss of approximately 31 acres of reproductive and roosting habitat for the pallid bat, spotted bat, western mastiff bat, Townsend's big-eared bat, Yuma myotis, and fringed myotis in the impoundment area. Approximately 35 acres of reproductive and roosting habitat for these species would be lost in the relocation areas. Additionally, one limestone cave located on the Big Backbone Arm that is a known Townsend's big-eared bat roost would be affected by flooding. A 6.5-foot dam raise would result in the loss of approximately 1,201 acres of reproductive and roosting habitat for the western red bat and long-eared myotis. Approximately 457 acres of reproductive and roosting habitat for these species would be lost in the relocation areas. These impacts would be potentially significant.

Dam construction, vegetation removal, and inundation resulting from a 6.5-foot dam raise would result in the loss of approximately 1,201 acres of ringtail habitat. Approximately 457 acres of ringtail habitat would be lost in the relocation areas. A 6.5-foot dam raise would result in the loss of approximately 724 acres of American marten habitat in the impoundment area and 328 acres in the relocation areas. These impacts would be potentially significant.

Impacts on suitable habitat by CWHR type in the impoundment area and relocation areas are summarized in Table 13-18.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-18. Impacts on Suitable Habitat for Special-Status Bats, American Marten, and Ringtail in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Townsend's Big-Eared Bat, Spotted Bat, Pallid Bat, Western Mastiff Bat, Yuma Myotis, and Fringed Myotis							
Barren	1.02	0.64[2]	4.04	0.85	0.00	0.59	6.50
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	2.21	2.21
Blue oak–foothill pine	4.96	0.00	0.00	0.00	1.40	16.35	22.71
Total Habitat	5.98	0.00	4.04	0.85	1.40	19.16	31.43
Western Red Bat, Long-Eared Myotis, and Ringtail							
Barren	1.02	0.00	4.04	0.85	0.00	0.59	6.50
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	2.21	2.21
Blue oak–foothill pine	4.96	0.00	0.00	0.00	1.40	16.35	22.71
Closed-cone pine-cypress	17.75	0.00	6.30	10.78	23.95	36.71	95.49
Douglas-fir	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	5.51	5.51
Mixed chaparral	14.83	6.83	80.01	7.32	5.43	5.66	120.07
Montane hardwood	39.08	18.13	86.75	34.61	9.44	39.49	227.49
Montane hardwood–conifer	34.65	0.50	69.23	66.31	55.70	89.81	316.21
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Ponderosa pine	108.93	15.36	84.75	81.20	25.06	61.89	377.19
Total Habitat	222.76	43.30	347.00	205.68	121.56	260.81	1201.01
American Marten							
Douglas-fir	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	3.36	3.36
Montane hardwood–conifer	34.65	0.50	69.23	66.31	55.70	89.81	316.21
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Ponderosa pine	108.93	15.36	84.75	81.20	25.06	61.89	377.19
Total Habitat	145.13	18.34	169.90	152.12	81.34	157.66	724.48

Table 13-18. Impacts on Suitable Habitat for Special-Status Bats, American Marten, and Ringtail in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Relocation Areas							
Townsend's Big-Eared Bat, Spotted Bat, Pallid Bat, Western Mastiff Bat, Yuma Myotis, and Fringed Myotis							
Barren	12.46	0.00	11.97	5.37	0.00	2.96	32.76
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blue oak–foothill pine	0.01	0.00	0.00	0.00	0.00	2.35	2.36
Total Habitat	12.47	0.00	0.00	5.37	0.00	5.34	35.12
Western Red Bat, Long-Eared Myotis, and Ringtail							
Barren	12.46	0.00	11.96	5.37	0.00	2.96	32.76
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blue oak–foothill pine	0.01	0.00	0.00	0.00	0.00	2.35	2.36
Closed-cone pine-cypress	0.05	0.00	5.65	2.23	0.23	0.94	9.11
Douglas-fir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mixed chaparral	3.36	0.00	3.95	4.11	1.70	9.63	22.77
Montane hardwood	19.73	0.00	20.89	21.64	0.24	0.13	62.63
Montane hardwood–conifer	24.69	0.00	19.27	33.48	2.61	6.62	86.66
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Ponderosa pine	79.56	0.00	96.79	47.56	16.04	0.77	240.74
Total Habitat	139.94	0.00	158.84	114.68	20.86	23.42	457.74
American Marten							
Douglas-fir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montane hardwood–conifer	24.69	0.00	19.27	33.49	2.61	6.62	86.66
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.25	0.72
Ponderosa pine	79.56	0.00	96.79	47.58	16.04	47.58	240.74
Total Habitat	104.33	0.00	116.39	81.31	18.69	328.12	328.12

Note:
[1] Acreage values are approximate.

Impact Wild-12 (CP1): Impacts on Special-Status Terrestrial Mollusks (Church's Sideband, Shasta Sideband, Wintu Sideband, Oregon Shoulderband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat All of these species are designated USFS sensitive and/or S&M species, and the Shasta sideband is also an MSCS-covered species. The Shasta Sideband, Wintu Sideband, Shasta Chaparral, and Shasta Hesperian have also been petitioned for Federal listing. Ground-disturbing activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas could result in direct take and/or loss of suitable habitat for special-status terrestrial mollusks.

In addition, the raising of Shasta Dam would result in the inundation of suitable habitat and direct take of these species. This impact would be significant.

These species are found in nearly all CWHR habitats along the lake. The Shasta sideband and Wintu sideband are associated with limestone formations in the McCloud River and in the Pit and Squaw Creek arms, respectively. For the purposes of this impact analysis for Shasta sideband and Wintu sideband, all CWHR habitats in the impoundment and relocation areas are stratified as limestone or nonlimestone habitat. Shasta chaparral occurs in many CWHR habitats and Shasta hesperian is found in riparian habitats.

Vegetation removal in the impoundment areas and construction activities, such as tree removal, site grading, excavation, and vegetation removal at the dam and in relocation areas in suitable habitat, could result in direct take. In addition, these activities and the inundation caused by a 6.5-foot dam raise would result in the mortality of individuals and the permanent loss of suitable habitat.

Dam construction, vegetation removal, and construction in the relocation areas, and inundation resulting from a 6.5-foot dam raise would result in the loss of approximately 1,195 and 425 acres of Church's sideband, Oregon shoulderband, and Shasta chaparral habitat in the impoundment area and relocation areas, respectively. Shasta hesperian habitat loss in the impoundment area and relocation areas would be approximately 28 and 0.72 acre, respectively. The 6.5-foot dam raise would also result in the loss of approximately 5 acres of Shasta sideband habitat in the impoundment area and 0.97 acre in the relocation areas. Wintu sideband habitat loss includes approximately 1.50 acres in the impoundment area. These impacts would be potentially significant.

Impacts on suitable habitat by CWHR type in the impoundment area and relocation areas are summarized in Table 13-19.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-19. Impacts on Suitable Habitat for Special-Status Terrestrial Mollusks in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area: Shasta Sideband							
Limestone	0.00	0.00	0.00	5.43	0.00	0.00	5.43
Impoundment Area: Wintu Sideband							
Limestone	0.00	0.00	0.00	0.00	0.00	1.50	1.50
Impoundment Area: Church's sideband, Oregon Shoulderband, Shasta Chaparral							
Barren	0.57	0.00	0.25	0.00	0.00	0.00	0.81
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	2.21	2.21
Blue oak–foothill pine	4.96	0.00	0.00	0.00	1.40	16.36	22.71
Closed-cone pine–cypress	17.75	0.00	6.30	10.74	23.95	36.71	95.49
Douglas-fir	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	5.51	5.51
Mixed chaparral	14.83	6.83	80.01	7.32	5.43	5.65	120.07
Montane hardwood	39.08	18.13	86.75	34.61	9.44	39.49	227.49
Montane hardwood–conifer	34.65	0.50	69.23	66.31	55.70	89.81	316.21
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Ponderosa pine	108.93	15.36	84.75	81.20	25.06	61.89	377.19
Total Habitat	222.31	43.30	343.21	204.83	121.56	260.23	1195.43
Impoundment Area: Shasta Hesperian							
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Total Habitat	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Relocation Areas: Shasta Sideband							
Limestone	0.00	0.00	0.00	0.97	0.00	0.00	0.97
Relocation Areas: Wintu Sideband							
Limestone	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Relocation Areas: Church's sideband, Oregon Shoulderband, Shasta Chaparral							
Barren	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blue oak–foothill pine	0.01	0.00	0.00	0.00	0.00	2.35	2.36
Closed-cone pine–cypress	0.05	0.00	5.65	5.65	0.23	0.94	9.11
Douglas-fir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mixed chaparral	3.36	0.00	3.95	3.95	1.70	9.63	22.77
Montane hardwood	19.73	0.00	20.89	20.89	0.24	0.13	62.63
Montane hardwood–conifer	24.69	0.00	19.27	19.27	2.61	6.62	86.66

Table 13-19. Impacts on Suitable Habitat for Special-Status Terrestrial Mollusks in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Relocation Areas: Church's sideband, Oregon Shoulderband, Shasta Chaparral (contd.)							
Montane riparian	0.08	0.00	0.33	0.33	0.04	0.02	0.72
Ponderosa pine	79.56	0.00	96.78	96.79	16.04	0.77	240.74
Total Habitat	127.48	0.00	146.88	146.88	20.86	20.46	424.98
Relocation Areas: Shasta Hesperian							
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Total Habitat	0.08	0.00	0.33	0.25	0.04	0.02	0.72

Note:
[1] Acreage values are approximate.

Impact Wild-13 (CP1): Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat The western bumblebee is designated USFS sensitive. Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a permanent loss of habitat. In addition, inundation caused by the raising of Shasta Dam would result in the permanent loss of habitat. This would be a potentially significant impact.

These general habitats also represent potential western bumble bee habitat. Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a permanent loss of habitat containing flowering shrubs and forbs, which serve as potential Western bumble bee nectar sources and potential underground burrow locations. In addition, inundation caused by the raising of Shasta Dam would result in the permanent loss of habitat. This would be a potentially significant impact.

Dam construction, vegetation removal and construction in the relocation areas, and inundation resulting from a 6.5-foot dam raise would result in a loss of 1,227 acres of general wildlife and western bumble bee habitat in the impoundment area and 698 acres of general wildlife and western bumble bee habitat in the relocation areas. Impacts on general wildlife and western bumble bee habitat by CWHR type in the impoundment area and relocation areas are summarized in Tables 13-20 and 13-21.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-20. Impacts on CWHR Habitats and Western Bumble Bee Habitat in the Impoundment Area (6.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Annual grassland	0.07	0.00	0.96	0.37	0.00	0.37	1.78
Barren	1.02	0.00	4.04	0.85	0.00	0.59	6.50
Blue oak–foothill pine	4.96	0.00	0.00	0.00	1.40	16.35	22.71
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	2.21	2.21
Closed-cone pine–cypress	17.75	0.00	6.30	10.78	23.95	36.71	95.49
Douglas-fir	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	5.51	5.51
Mixed chaparral	14.83	6.83	80.01	7.32	5.43	5.65	120.07
Montane hardwood	39.08	18.13	86.75	34.61	9.44	39.49	227.49
Montane hardwood–conifer	34.65	0.50	69.23	66.31	55.70	89.81	316.21
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Ponderosa pine	108.93	15.36	84.75	81.20	25.06	61.89	377.19
Riverine	0.00	0.35	2.30	3.81	0.59	0.00	7.05
Urban	10.95	0.00	1.37	4.74	0.00	0.26	17.33
Total	233.79	43.65	351.64	214.60	122.14	261.46	1227.27

Note:
[1] Acreage values are approximate.
Key:
CWHR = California Wildlife Habitat Relationships

Table 13-21. Impacts on CWHR Habitats and Western Bumble Bee Habitat in the Relocation Areas

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Annual grassland	0.40	0.00	4.95	0.53	0.70	0.01	6.59
Barren	12.46	0.00	11.97	5.38	0.00	2.96	32.76
Blue oak–foothill pine	0.01	0.00	0.00	0.00	0.00	2.35	2.36
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Closed-cone pine–cypress	0.05	0.00	5.65	2.23	0.23	0.94	9.11
Douglas-fir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mixed chaparral	3.36	0.00	3.95	4.11	1.70	9.63	22.77
Montane hardwood	19.73	0.00	20.89	21.64	0.24	0.13	62.63
Montane hardwood–conifer	24.69	0.00	19.27	33.48	2.61	6.62	86.66
Montane riparian	0.08	0.00	0.33	0.25	0.04	0.02	0.72
Ponderosa pine	79.56	0.00	96.78	47.58	16.04	0.77	240.74

Table 13-21. Impacts on CWHR Habitats and Western Bumble Bee Habitat in the Relocation Areas (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Riverine	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban	15.64	0.00	217.29	0.27	0.00	0.57	233.76
Total	155.98	0.00	381.09	115.47	21.56	23.99	698.10

Note:
[1] Acreage values are approximate.
Key:
CWHR = California Wildlife Habitat Relationships

Impact Wild-14 (CP1): Impacts on Other Birds of Prey (e.g., red-tailed hawk and red-shouldered hawk) and Migratory Bird Species (e.g., American robin, Anna's hummingbird) and their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of other birds of prey and migratory bird species. In addition, inundation caused by the raising of Shasta Dam could result in the loss of active nests and habitat for these species. This impact would be potentially significant.

Approximately 36 percent of the impoundment area would be subject to either complete (15 percent) or overstory (21 percent) vegetation removal. If vegetation removal were to occur before or after the breeding season, there would be no impact on migratory birds or raptors. When inundation of the impoundment area occurs, nest trees within the impoundment area would die. Because peak inundation generally occurs between late April and early June, nest trees would be flooded toward the end of the nesting season. If raptors were nesting in these trees, it is likely the young would fledge before the nest tree died from the effects of inundation. However, approximately 84 percent of understory vegetation inundated could have ground or shrub nesting birds that would be impacted by inundation. Impacts on ground or understory nesters would be potentially significant.

Maximum inundation would occur in late April through early June during the breeding season and many nests could be established before and while lake levels are rising. In the portions of the impoundment area where vegetation removal is not implemented, active bird nests would flood, resulting in mortality of young still dependent on the nest. This would be a potentially significant impact.

Additionally, removal of structures providing for raptor nests (e.g., power poles) in the relocation areas could result in mortality of young. This would be a potentially significant impact.

Vegetation in relocation areas would be completely removed. If vegetation removal occurred during the breeding season, there would a potentially significant impact on migratory birds or raptors.

Impacts on these species could occur over multiple years during project implementation if construction activities were conducted in or adjacent to reproductive habitat. This impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-15 (CP1): Loss of Critical Deer Winter and Fawning Range
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of critical deer winter and fawning range. In addition, inundation caused by the raising of Shasta Dam would result in the loss of critical deer range. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas under a 6.5-foot raise of Shasta Dam would result in the loss of approximately 3,962 acres of critical deer winter and/or fawning range. This impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-16 (CP1): Take and Loss of the California Red-Legged Frog
Reclamation completed California red-legged frog habitat assessments in coordination with the USFWS in the applicable impoundment and relocation areas, and the potential downstream Sacramento River restoration sites. The assessment results will enable Reclamation and the USFWS to determine if habitat for the species occurs, if impacts are anticipated, and if additional surveys are needed. Impacts on the California red-legged frog will be assessed if surveys are conducted and the California red-legged frog is found. Impacts for each alternative will not be assessed until USFWS has determined whether suitable habitat is present and whether surveys would be required. Mitigation for this impact is discussed in Section 13.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-17 (CP1): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Implementing CP1 would increase available water storage in Shasta Reservoir and result in a modified flow regime, which would modify the flow and stages of the upper Sacramento River. Monthly flow results were used to simulate mean daily flows. On average, in each month, changes in mean monthly flow would be reductions or increases of several percent, and often less

than 2 percent. Changes of 2 percent or less are considered essentially equivalent to baseline operations and therefore do not represent a substantial change. Generally, these effects diminish with distance downstream because of the influence of inflows from tributaries and of diversions and flood bypasses.

Implementing CP1 would reduce the frequency, duration, and magnitude of intermediate to large flows downstream from Shasta Dam during winter (December through February) in some water years, especially wet and above-normal years, because of the increase in storage space that could be filled in some years, usually after dry or critical water years. Conversely, CP1 would increase flow volumes in fall of most years (September through November) because more water would be available for delivery in the driest months. During spring and summer (generally March through August), changes in mean monthly flows would be small reductions or increases (generally less than 2 percent) and typically would be transitional between small reductions in winter flows and small increases in summer flows.

These changes in surface and subsurface hydrology could affect habitats adjacent to the river channel and reduce the formation of off-channel habitats in the long term, which would adversely affect the habitat of western pond turtle.

The portion of riparian vegetation in early successional stages would be reduced, although the total amount of riparian vegetation would not decline substantially. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species, particularly western yellow-billed cuckoos. Because CP1 would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

The operation of Shasta Dam has substantially modified the natural flow regime in the primary study area. As discussed previously, dam construction and operation has limited the frequency and magnitude of intermediate to large flows downstream from the dam in winter and spring, and has increased flow volumes during the active growing season (primarily March through October). Implementation of CP1 would be expected to amplify these effects (Table 13-22) because CP1 would increase available storage. These changes are most noticeable in the modeling data for wet and above-normal water years. Reducing the magnitude, frequency, and duration of intermediate to large flows could alter the dynamics and structure of wetland and riparian habitats that support special-status wildlife species along the Sacramento River, downstream from Shasta Dam, throughout the primary study area. (See Chapter 12, “Botanical Resources and Wetlands,” for more information.)

The effects of modified flow regimes would be somewhat attenuated downstream because of the cumulative tributary flow adding to the Sacramento River. However, many of these tributaries are also part of the CVP and SWP

and would likely be operated differently should CP1 be implemented. CP1 would increase the volume of flows in summer and fall of most years, most dramatically in September and October. This change is also a result of increased storage, which allows more water to be available for delivery in the driest months of the year. Although the relative contribution of CP1 to overall changes downstream from Keswick Dam would attenuate, it appears based on the modeling that in September of dry and critical water years, the effect of CP1 would be a substantial increase in flows all the way down to Freeport (Table 13-22).

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

- **Invertebrates** – Blue elderberry shrubs, the host plants 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 not commonly found growing immediately next to the river's edge, but are often found on floodplain terraces or higher up the bank. Most of the effect of CP1 on flow regime, including inundation during the growing season, would be concentrated in a narrow strip along the river channel that is already subjected to seasonal inundation. Elderberry shrubs growing in these areas already experience periodic seasonal inundation. CP1 would alter flows substantially (beyond the ±2 percent threshold), but the change in river stage is predicted by CalSim-II to generally be less than about 4 inches. Because of this relatively small vertical change in water surface elevation, implementing CP1 is not likely to prevent establishment or substantially reduce the vigor of existing elderberry shrubs in the primary study area. Therefore, the impact of CP1 on invertebrate species would be less than significant.

Table 13-22. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP1

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Keswick Dam												
Wet	1.6%	0.8%	-6.0%	-2.9%	-0.5%	0.4%	0.3%	0.1%	0.2%	0.3%	0.3%	0.4%
Above Normal	5.1%	-1.5%	-1.4%	-2.2%	-5.2%	-2.2%	0.0%	-3.0%	-1.4%	0.1%	0.9%	5.9%
Below Normal	0.9%	-0.7%	0.1%	-0.9%	-0.7%	-1.1%	0.2%	-2.6%	1.1%	0.2%	0.0%	1.3%
Dry	2.4%	4.1%	-2.0%	-2.0%	-1.0%	0.0%	0.7%	1.4%	2.3%	1.5%	2.3%	3.9%
Critical	2.3%	4.8%	1.0%	-0.6%	1.7%	0.8%	1.0%	1.8%	0.6%	0.7%	-0.2%	5.6%
Bend Bridge												
Wet	1.4%	1.4%	-3.1%	-1.2%	-0.3%	0.3%	0.2%	0.1%	0.2%	0.3%	0.3%	0.4%
Above Normal	4.0%	-1.1%	-0.6%	-1.2%	-2.8%	-1.3%	0.0%	-2.1%	-1.0%	0.0%	0.8%	5.5%
Below Normal	0.8%	-0.1%	0.0%	-0.5%	-0.4%	-0.8%	0.1%	-1.6%	1.0%	0.2%	-0.1%	1.2%
Dry	2.1%	3.1%	-1.0%	-1.0%	-0.5%	0.0%	0.5%	1.1%	2.1%	1.5%	2.3%	3.6%
Critical	1.6%	3.9%	0.8%	-0.4%	1.5%	0.6%	0.8%	1.6%	0.5%	0.6%	-0.2%	5.2%
Butte City												
Wet	1.6%	2.0%	-2.3%	-0.7%	-0.2%	0.3%	0.1%	-0.1%	0.0%	0.2%	0.2%	0.4%
Above Normal	4.3%	-0.8%	-0.4%	-0.9%	-1.9%	-0.8%	0.2%	-2.4%	-1.2%	-0.3%	0.8%	5.8%
Below Normal	1.2%	0.2%	0.3%	-0.6%	-0.3%	-0.7%	-0.3%	-1.5%	1.4%	0.3%	0.0%	1.0%
Dry	2.4%	3.2%	-0.7%	-0.5%	-0.2%	0.0%	0.8%	1.0%	3.2%	2.3%	3.2%	3.8%
Critical	1.4%	4.3%	0.8%	-0.5%	1.4%	0.5%	1.1%	2.2%	0.6%	0.9%	-0.2%	4.8%
Wilkins Slough												
Wet	1.6%	2.2%	-1.6%	-0.2%	0.0%	0.3%	0.1%	-0.1%	0.0%	0.2%	0.2%	0.4%
Above Normal	4.3%	-0.8%	-0.4%	-0.6%	-1.1%	-0.4%	0.2%	-2.4%	-1.2%	-0.3%	0.8%	5.8%
Below Normal	1.2%	0.2%	0.3%	-0.6%	0.0%	-0.7%	-0.3%	-1.5%	1.4%	0.3%	0.0%	1.0%
Dry	2.4%	3.2%	-0.7%	-0.4%	-0.2%	0.0%	0.8%	1.0%	3.2%	2.3%	3.2%	3.8%
Critical	1.4%	4.3%	0.8%	-0.5%	1.4%	0.5%	1.1%	2.2%	0.6%	0.9%	-0.2%	4.8%
Verona												
Wet	1.5%	1.7%	-1.3%	-0.2%	0.0%	0.2%	0.1%	-0.2%	0.0%	0.1%	-0.1%	0.2%
Above Normal	3.2%	-0.1%	-0.3%	-0.4%	-1.3%	-0.2%	0.1%	-1.0%	-0.8%	-0.2%	0.4%	2.3%
Below Normal	0.6%	0.1%	-0.1%	0.0%	0.1%	-0.5%	-0.2%	-0.4%	1.4%	0.1%	-0.1%	-0.3%
Dry	1.3%	2.5%	-0.8%	-0.2%	-0.2%	0.0%	0.5%	0.7%	-1.0%	1.1%	1.8%	5.7%
Critical	0.5%	3.6%	0.8%	-0.2%	1.1%	0.4%	0.7%	2.0%	0.5%	0.8%	-1.5%	3.1%

Table 13-22. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP1 (contd.)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Freeport												
Wet	0.7%	0.5%	-0.3%	-0.2%	0.1%	0.1%	0.0%	-0.2%	0.0%	0.0%	0.0%	0.0%
Above Normal	1.2%	-0.5%	0.0%	0.0%	-0.5%	-0.1%	0.1%	-0.8%	-0.6%	-0.1%	0.0%	0.5%
Below Normal	-0.1%	-0.6%	0.5%	0.5%	0.3%	-0.3%	0.1%	-0.5%	0.3%	-0.1%	-0.4%	0.0%
Dry	1.2%	1.4%	-0.5%	-0.1%	-0.1%	-0.1%	0.2%	0.5%	-0.2%	0.7%	1.7%	4.3%
Critical	0.1%	1.8%	0.8%	-0.2%	0.9%	-0.1%	0.4%	0.9%	0.0%	1.4%	0.5%	2.4%

- **Reptiles and Amphibians** – The presence of western pond turtle within the Sacramento River has been documented, and suitable habitat for the species is provided in the primary study area, including tributaries. Although they will use low-velocity areas of the main channels, western pond turtles also rely on habitat types (e.g., oxbow lakes) that have relatively slow rates of formation. Creation of new off-channel water bodies requires periodic intermediate to large fall and winter flow events that drive the processes of meander migration and channel cutoff. Similarly, off-channel water bodies gradually become terrestrial habitats as they fill with sediment and organic detritus and are colonized by riparian vegetation. Consequently, activities that prevent the long-term formation of off-channel water bodies (e.g., constructing levees and installing bank armor) reduce the extent of this important type of habitat for pond turtles. The increase in mean stage elevation resulting from implementation of CP1 could provide additional aquatic habitat for the species during some months of some years. A key potentially limiting factor for the western pond turtle is the relationship between water level and flow in off-channel water bodies during the summer incubation season (Stillwater Sciences 2007). The Sacramento River stage and flows would not be substantially changed during summer; however, less aquatic habitat for western pond turtle could be available during winter, spring, and drought periods. Modifying the flow regime by capturing channel-forming flows could also reduce the formation of off-channel water bodies in the long term. These changes in habitat availability could reduce the size of the western pond turtle population along the Sacramento River in the long term by reducing turtle survival and reproductive success. Therefore, the impact of CP1 on the western pond turtle and its habitat would be potentially significant.

- **Birds** – The riparian and wetland habitats along the Sacramento River floodway provide potential nesting and foraging habitat for western yellow-billed cuckoo, California yellow warbler, and yellow-breasted chat, all of which are special-status birds that nest in riparian vegetation. In addition, northern harrier and short-eared owl may nest in marshes in or adjacent to the stream channel. Other raptors (e.g., 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 a smaller amount of acreage recently disturbed by erosion or scouring after intermediate to large flows (see Chapter 12, "Botanical Resources and Wetlands.") These long-term changes to the structure of riparian vegetation are expected to change habitat values, causing the loss of,

and in some cases expanding, nesting territories or affecting the reproductive success of some riparian foraging and nesting birds. The birds most adversely affected by this alteration would be those that make the most extensive use of willow thickets and cottonwood- and willow-dominated riparian forests, such as yellow-billed cuckoo and yellow-breasted chat. This loss of nesting habitat would eventually lead to a reduction in local populations of sensitive bird species as habitat became unsuitable for nesting. Although some species, such as raptors that nest in later successional riparian habitats, could benefit from the long-term changes, the impact of CP1 on special-status bird species that nest in early successional riparian vegetation would be potentially 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. The amount of potential foraging habitat would not decrease under CP1, and available roosting areas in riparian habitats–even if modified by the new flow regime downstream from Shasta Dam–would not be subject to a substantial reduction. Therefore, the impact of CP1 on special-status bats would be less than significant. Potential changes in riparian vegetation along the river channel in the primary study area would not substantially reduce habitat for ringtail because this species is known to use a variety of habitats and forage on a wide array of items that would not be substantially altered (Belluomini 1980). Therefore, the impact of CP1 on special-status mammals would be less than significant.

Implementing CP1 would result in substantial long-term effects on the habitat of western pond turtle and some riparian-nesting special-status bird species. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-18 (CP1): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Bank swallows generally benefit from bank erosion caused by high winter stream flow (which renews nesting habitat while they are in overwintering habitats to the south); high spring and summer flows, however, have the potential to adversely affect bank swallow colonies by destroying active nests (Stillwater Sciences 2007). Implementing CP1 would increase available water storage in Shasta Reservoir and result in a modified flow regime, which would modify the flow and stages of the upper Sacramento River. Monthly flow results were used to simulate mean daily flows; on average, in each month, changes in mean monthly flow would be reductions or increases of several percent, and often less than 2 percent. Changes of 2 percent or less are considered essentially equivalent to baseline operations and therefore do not represent a substantial change.

Generally, these effects diminish with distance downstream because of the influence of inflows from tributaries and of diversions and flood bypasses.

Implementing CP1 would reduce the frequency, duration, and magnitude of intermediate to large flows downstream from Shasta Dam during winter (December through February) in some water years, especially wet and above-normal years, because of the increase in storage space that could be filled in some years, usually after dry or critical water years. Conversely, CP1 would increase flow volumes in fall of most years (September through November) because more water would be available for delivery in the driest months. During spring and summer (generally March through August), changes in mean monthly flows would be small reductions or increases (generally less than 2 percent) and typically would be transitional between small reductions in winter flows and small increases in summer flows.

The rates of geomorphic processes, such as bank erosion and the average rate of meander migration, are strongly related to flow regime and the cumulative portion of flow exceeding a threshold volume. On portions of the Sacramento River, this threshold may be around 30,000 cubic feet per second (cfs) (Larsen et al. 2006; Stillwater Sciences 2007), which is well below the bankfull discharge but well above flows during spring and summer. However, other important thresholds for bank erosion and channel avulsion along the Sacramento River have been estimated within the range of 10,000–80,000 cfs (Stillwater Sciences 2007). For additional discussion of the relationship of geomorphic processes to flow along the Sacramento River, see the *Fisheries and Aquatic Ecosystem Technical Report*.

CalSim-II results temporally downscaled to mean daily values also indicate the relative magnitude of changes to the flow regime. The simulated change in mean daily discharges greater than 30,000 cfs below the Red Bluff Pumping Plant and Hamilton City is summarized in Figure 12-4 in Chapter 12, “Botanical Resources and Wetlands.” Flows of this magnitude strongly affect bank erosion and meander migration. Overall, these modeling results suggest only a very small change in flows greater than 30,000 cfs along the uppermost portion of the lower Sacramento River. This change is not likely sufficient to cause significant effects on bank swallow.

Any effects would likely occur along the upper Sacramento River throughout the primary study area. In the primary study area, changes in the number of mean daily flows within the magnitude of intermediate and large flows (i.e., greater than 30,000 cfs), which affect bank erosion and meander migration, would be small. Downstream from Keswick Dam and the Red Bluff Pumping Plant, the number of days with mean flows greater than 30,000 cfs would be reduced by approximately 9 and 2 percent, respectively.

Therefore, although there would be a slight alteration of the river’s geomorphic processes in some years and the rate of bank erosion would be reduced, the

length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. High flows during the nesting season that may cause localized nest failure would not increase. The impact on habitat for bank swallow nesting colonies, and therefore bank swallows themselves, would be less than significant.

There are seven known colonies of bank swallow along the Sacramento River in the primary study area (CNDDB 2012). The bank swallow forms nesting colonies in steep-cut, eroding river banks. Generally installed to protect upland land uses, bank revetment has been preferentially applied to actively migrating bends that otherwise would be among the most suitable sites for bank swallow nests. The reduction in intermediate to large flows by CP1 would cause a small reduction in the rate of erosion at the cut banks that remain unprotected by revetment. This alteration would not reduce the amount of bank swallow nesting habitat in the short or long term. As modeled, spring flows at Keswick Dam and Bend Bridge would be substantially reduced under some water year conditions (e.g., February and March of above-normal years, May of above-normal and below-normal years), but generally would remain within the ±2 percent threshold that is considered essentially equivalent to existing conditions (Table 13-22). Therefore, the potential for spring flows to cause localized bank swallow nest failure would remain comparable to existing and no-action conditions.

The rate of bank failure is not expected to change substantially, and nest failure caused by spring flows may be reduced under certain conditions. Therefore, the impact of CP1 on bank swallow would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-19 (CP1): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime Vernal pools are present in upland areas near the Sacramento River and its tributaries in the primary study area. These pools provide habitat for numerous special-status species, such as 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). However, vernal pools are generally not present within the active floodplain of the upper Sacramento River in the primary study area; thus, vernal pools are not anticipated to be affected by changes in flows that could result from implementation of CP1. Changes in flow regime in the primary study area likely would not affect vernal pool special-status species. Because CP1 would not affect vernal pool habitat or the species that occur within the habitat, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-20 (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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant.

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. Examples of these include the RHJV, Sacramento River Advisory Council Forum, Sacramento River Conservation Area Program, and SRNWR comprehensive conservation plan and environmental assessment (See Section 13.2, "Regulatory Setting.")

Because CP1 may have a potentially significant impact on riparian vegetation in 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. This impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-21 (CP1): Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program Gravel augmentation is not included as part of CP1. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-22 (CP1): Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration Projects CP1 would not include any specific restoration components. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

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 effects on flow and stages of the middle Sacramento River would be smaller than those for the upper Sacramento River; changes in flows and stages would diminish downstream from Red Bluff because of the effects of inflows from tributaries, and the effects of diversions and flood bypasses.

Impact Wild-23 (CP1): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Implementing CP1 would modify the flow regime and would reduce the frequency, duration, and magnitude of

intermediate to large flows in the lower Sacramento River during winter and spring in some years. It also would increase flow volumes in fall of most years. This change in surface and subsurface hydrology would be of a smaller magnitude than in the upper Sacramento River, but could affect habitats adjacent to the river channel and the long-term formation of off-channel habitats along the lower Sacramento River, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species. Because CP1 would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

This impact would be similar to Impact Wild-17 (CP1) for the upper Sacramento River. However, the effect of CP1 on flow in the Sacramento River would generally attenuate downstream from Red Bluff Pumping Plant because of the inflows from tributaries, and because of other diversions and flood bypasses. CalSim-II modeling indicates that in most months and under most types of water years, changes in flows from Bend Bridge downstream would be within the ±2 percent to be considered essentially equivalent to existing conditions (Table 13-22). The exceptions to this are in September of dry and critical water years, for which the model predicts substantial flow increases. Nonetheless, along the middle Sacramento River, flow alterations could be sufficient to substantially affect habitat of western pond turtle and riparian-nesting birds as described for the upper Sacramento River (Impact Wild-17 (CP1)). This impact would be potentially significant.

Flow alterations may not be sufficient to measurably affect special-status wildlife in the bypasses, along the Sacramento River downstream from Colusa, or in the Delta, for several reasons:

- Flow alterations are more attenuated downstream by tributaries, diversions, and bypasses, and the results of CalSim-II modeling indicate little change in the frequency and duration of bypass inundation.

- Downstream from Colusa, the river is confined to a narrow channel closely bordered by levees lined with riprap; thus, geomorphic processes and riparian habitats are relatively unresponsive to small changes in river flows.

The effects of flow alterations are 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 CVP and SWP are managed to maintain standards for Delta inflow. CVP and SWP operations are constrained by USFWS's 2008 Formal ESA Consultation on the Proposed Coordinated

Operations of the CVP and SWP (2008 USFWS BO) and NMFS's 2009 BO and Conference Opinion on the Long-Term Operations of the CVP and SWP (2009 NMFS BO).

Thus, implementation of CP1 is not anticipated to cause an alteration in Sacramento River flow to the Delta sufficient to alter habitat for special-status wildlife species in the lower Sacramento River and Delta portion of the extended study area. However, because of the potential for substantial effects on western pond turtle and riparian-nesting birds in the lower Sacramento River (i.e., Red Bluff Pumping Plant to Colusa), this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-24 (CP1): Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Implementing CP1 would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the lower Sacramento River. This reduction also would alter the river's geomorphic processes. The rate of bank erosion would be reduced, but the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. High flows during the nesting season that may cause localized bank and nest failure would not increase. The impact on habitat for bank swallow nesting colonies, and therefore bank swallows themselves, would be less than significant.

There are more than 100 presumed extant colonies of bank swallow in Butte, Glenn, Colusa, Yuba, Yolo, Sutter, and Sacramento counties (CNDDB 2012). The effect of CP1 on bank swallow along the lower Sacramento River would be similar to that described for the upper Sacramento River. There would be a small reduction in the rate of bank erosion, but not a substantial change in the amount of bank swallow nesting habitat, or increases in spring flows that may cause a substantial increase in localized nest failure. However, the effect of altered flow regimes on bank swallow nesting habitat along the lower Sacramento River would be smaller than the effect along the upper Sacramento River (described in Impact Wild-18 (CP1)). Flow alterations in the Sacramento River downstream from Red Bluff Pumping Plant would be attenuated by tributary inflow, and by other diversions and flood bypasses that would also alter instream flows. For these reasons, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-25 (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 Vernal pools are present in upland areas near the Sacramento River and its tributaries in 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). However, vernal pools are generally not present within the active floodplain of regulated rivers along the lower Sacramento River and in the Delta. The largest increase in water surface elevation predicted to occur under CP1 for locations in the lower river is about 4 inches at Verona in September of dry water years. This increase would not result in river inundation of vernal pool habitat. Because all of the other predicted increases in water surface elevation are less than this, vernal pool special-status species would not likely be affected by changes in flow regime in the extended study area. Because CP1 would not affect vernal pool habitat or the species that occur within the habitat, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-26 (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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant.

This impact is similar to Impact Wild-20 (CP1) for the upper Sacramento River. For the same reasons as described for the upper Sacramento River, this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

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 EIRs 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 deliveries relative to the entire CVP/SWP service areas would be small, however. Assuming that this increased deliveries could be provided to any number of geographic areas within the CVP and SWP service areas, the project's impact on growth that could affect wildlife habitat for sensitive species would be minor. Similarly, projects potentially affecting sensitive habitats and listed species would require permits from CDFW, USACE, 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 Section 26.4, "Growth-Inducing Impacts," in Chapter 26, "Other Required Disclosures."

Impact Wild-27 (CP1): 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 and SWP service areas, CP1 would change flow regimes in several downstream waterways. Modified flow regimes would reduce the frequency, duration, and magnitude of intermediate to large flows along 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 and SWP service areas outside of the primary study area. Therefore, this impact would be less than significant.

Several riparian-associated or aquatic special-status wildlife species may be present in the CVP and SWP service areas, such as least Bell's vireo and arroyo toad. As discussed for the upper Sacramento River and the lower Sacramento River and Delta under Impact Wild-17 (CP1) and Impact Wild-21 (CP1), respectively, construction and operation of Shasta Dam has limited the frequency and magnitude of intermediate to large flows in winter and spring, and has increased flow volumes during the active growing season (primarily March–October). Implementation of CP1 would be expected to amplify these effects.

However, the effect of project-related alteration of flow regimes would attenuate somewhat in the Sacramento River downstream from Red Bluff Pumping Plant because of the inflows from tributaries, and because of other diversions and flood bypasses. Effects of flow alterations from Shasta Dam are also unlikely to extend to the CVP and SWP service areas because the reservoirs and diversions are managed as a single integrated system (consisting of the CVP and SWP). The CVP and SWP are managed to maintain standards for Delta inflow. CVP and SWP operations are constrained by the 2008 USFWS BO and NMFS's 2009 BO. Thus, this project is not anticipated to sufficiently alter 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. Mitigation for this impact is not needed, and thus not proposed.

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

Like CP1, this comprehensive plan focuses on enlarging Shasta Dam and Shasta Lake consistent with the goals of the 2000 CALFED Programmatic 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 involves raising Shasta Dam 12.5 feet, an elevation change that would raise the full pool by 14.5 feet (6 feet higher than under CP1) and would enlarge the total storage space in the reservoir by 443,000 acre-feet.

With respect to wildlife impacts, dam construction activities for CP1 through CP5 would be so similar that they are considered to be identical for purposes of this analysis. Because CP2 would result in higher lake levels than CP1, CP2 would also require more relocation of utilities, public service facilities, and recreational facilities than CP1, including a loss of up to 35 acres of limestone habitat and 2,870 acres of nonlimestone habitat. Because CP2 would result in higher lake levels than CP1, CP2 would also result in a larger (and deeper) area of inundation than CP1, in turn requiring more vegetation clearing within the inundation area than CP1.

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, USFS sensitive species, S&M species, MSCS-covered species, and BLM sensitive species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the Shasta salamander. This impact would be significant.

Inundation resulting from a 12.5-foot dam raise would result in a loss of approximately 10 acres of limestone habitat and 1,668 acres of nonlimestone habitat. Impacts to limestone and nonlimestone habitats in the impoundment area are summarized in Table 13-23

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-23. Impacts on Suitable Habitat for the Shasta Salamander in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Limestone	0.00	1.14	0.00	7.64	0.00	2.06	10.83
Nonlimestone	309.64	59.64	485.89	282.19	170.34	360.68	1668.38
Total	309.64	60.78	485.89	289.83	170.34	362.74	1679.21

Note:
[1] Acreage values are approximate.

Impact Wild-2 (CP2): Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat Ground-disturbing activities associated with construction could result in direct take (e.g., because of operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, a California species of special concern, a USFS sensitive species, an MSCS-covered species, and a BLM sensitive species, and of the tailed frog, a California species of special concern. 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.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the foothill yellow-legged and tailed frogs. This impact would be potentially significant.

Implementation of a 12.5-foot raise of the dam would result in inundation of approximately 47 acres of habitat for the foothill yellow-legged frog and tailed frog. A summary of suitable habitat loss by arm is presented in Table 13-24.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-24. Impacts on Suitable Habitat for the Foothill Yellow-Legged and Tailed Frog in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Riverine	0.00	0.42	4.02	4.51	0.84	0.00	9.80
Total	2.72	3.65	24.59	10.63	1.84	3.62	47.05

Note:
[1] Acreage values are approximate.

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

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the northwestern pond turtle. This impact would be potentially significant.

Implementation of a 12.5-foot raise of the dam would result in conversion of approximately 37 acres of montane riparian and approximately 10 acres of riverine habitat to lacustrine habitat. Because there are equally valuable components lost or gained in either habitat, the quality of the habitat would not be compromised. However, maximum lake inundation would be infrequent (at most 1 month per year) and would not benefit the species throughout the remainder of the year. Thus, the conversion to lacustrine remains an impact on northwestern pond turtle habitat. A summary of suitable habitat loss by arm is presented in Table 13-25.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-25. Impacts on Suitable Habitat for the Northwestern Pond Turtle in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Riverine	0.00	0.42	4.02	4.51	0.84	0.00	9.80
Total	2.72	3.65	24.59	10.63	1.84	3.62	47.05

Note:
[1] Acreage values are approximate.

Impact Wild-4 (CP2): Impact on the American Peregrine Falcon Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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 fully protected species and MSCS-covered species. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the American peregrine falcon.

Similar to CP1, overstory and complete vegetation removal is expected to occur within the impoundment area in suitable cliff habitat. Thus, overstory vegetation removal occurring in or near suitable cliff habitat during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests. Additionally, because of the steep terrain, trees would be yarded by helicopter. Noise generated by chainsaws and helicopter yarding could cause the abandonment of nests, resulting in the incidental loss of fertile eggs or nestlings. This impact would be potentially significant.

No known eyries would be inundated with a 12.5-foot raise in lake elevation; however, 12.5 vertical feet (full pool) of cliff habitat would be inundated. The impacts on this amount of cliff habitat suitable for nesting would be less than significant. The conversion of uplands to lacustrine habitat would not adversely affect foraging habitat for the species because they frequently forage over water. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-5 (CP2): Take and Loss of Habitat for the Bald Eagle
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas in addition to inundation caused by the raising of Shasta Dam during the nesting season would result in the loss of nest and perch trees used by the bald eagle, a State-listed species, fully protected species, and USFS sensitive species, an MSCS-covered species, and a BLM sensitive species. This impact would be significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the bald eagle. This impact would be potentially significant.

Six known bald eagle nest trees would be affected by a 12.5-foot dam raise due to inundation. When inundation occurs, nest trees within the impoundment area would die. Because peak inundation generally occurs in late April or early June, nest trees would be flooded toward the end of the nesting season. If eagles were nesting in these trees, it would be likely that young would fledge before the nest tree died from the effects of inundation. Because of inundation timing, it is not likely that individuals would be affected. Because bald eagles generally use the same nest for multiple years, the loss of nest trees would be a significant impact.

Inundation could also affect erosion and bank stability, which could affect nest trees that are in close proximity to the impoundment area. This would be a potentially significant impact.

Inundation resulting from a 12.5-foot dam raise would result in a loss of approximately 1,376 acres of bald eagle nesting and roosting habitat. Impacts on suitable bald eagle habitat by CWHR type in the impoundment area are summarized in Table 13-26.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-26. Impacts on Suitable Habitat for the Bald Eagle in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	3.03	3.03
Blue oak–foothill pine	7.05	0.00	0.00	0.00	2.46	22.80	32.31
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	7.66	7.66
Montane hardwood	53.30	25.75	120.47	48.59	13.31	55.23	316.66
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.77	447.06
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Ponderosa pine	152.04	21.54	123.71	114.71	35.08	85.84	532.91
Total	263.88	51.21	363.82	263.88	130.26	303.95	1376.97

Note:
[1] Acreage values are approximate.

Impact Wild-6 (CP2): Loss of Dispersal Habitat for the Northern Spotted Owl
Construction activities and vegetation removal associated with the dam raise, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in the loss of northern spotted owl dispersal habitat, a Federally listed as threatened species, and MSCS-covered species. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of dispersal habitat for the northern spotted owl. This impact would be potentially significant.

Inundation resulting from a 12.5-foot dam raise would result in a loss of approximately 643 acres of dispersal habitat for the northern spotted owl. Impacts on suitable habitat for the spotted owl by CWHR type in the impoundment area are summarized in Table 13-27.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-27. Impacts on Suitable Habitat for the Northern Spotted Owl in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Dispersal	96.85	10.29	155.97	157.79	77.74	144.87	643.51
Foraging	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nesting/roosting	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	96.85	10.29	155.97	157.79	77.74	144.87	643.51

Note:
[1] Acreage values are approximate.

Impact Wild-7 (CP2): Impact on the Purple Martin and Its Nesting Habitat
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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, inundation caused by the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. Also similar to CP1, nest trees occurring in the lake could be adversely affected by inundation and related vegetation removal. These impacts would be potentially significant.

Impact Wild-8 (CP2): Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the willow flycatcher, which is State-listed as endangered, a USFS sensitive species, and an MSCS-covered species; the Vaux's swift, a California species of special concern; and the yellow warbler and yellow-breasted chat, 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.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Inundation resulting from a 12.5-foot dam raise would result in a loss of approximately 1,341 acres of Vaux's swift nesting and foraging habitat in the

impoundment area. Additionally, approximately 37 acres of willow flycatcher, yellow warbler, and yellow-breasted chat habitat would be lost in the impoundment area.

Impacts on suitable habitats for the willow flycatcher, Vaux's swift, yellow warbler, and yellow-breasted chat habitat by CWHR type in the impoundment area is summarized in Table 13-28.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-28. Impacts on Suitable Habitat for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Vaux's Swift							
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	7.66	7.66
Montane hardwood	53.30	25.75	120.48	48.59	13.31	55.23	316.66
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.77	447.07
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Ponderosa pine	152.04	21.54	123.71	114.71	35.08	85.84	532.91
Total Vaux's Swift Habitat	256.83	51.22	363.82	263.85	127.80	278.12	1,341.63
Willow Flycatcher, Yellow Warbler, and Yellow-Breasted Chat							
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Total Habitat	2.72	3.23	20.57	6.12	1.00	3.62	37.26

Note:
[1] Acreage values are approximate.

Impact Wild-9 (CP2): Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the long-eared owl, a California species of special concern and an MSCS-covered species; the northern goshawk, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; Cooper's hawk, an MSCS-covered species; great blue heron, an MSCS-covered species; and osprey, an MSCS-covered species. In addition, the raising of Shasta Dam would result in the loss of foraging and nesting habitat for these species. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Inundation resulting from a 12.5-foot dam raise would result in a loss of approximately 987 acres of nesting and foraging habitat for long-eared owl and northern goshawk, approximately 1,505 acres of nesting and foraging habitat for the Cooper's hawk, and approximately 1,505 acres of nesting habitat for the great blue heron. Foraging habitat would increase for osprey and great blue heron. No impact to foraging habitat for these species would occur.

Impacts on suitable habitat by CWHR type in the impoundment area are summarized in Table 13-29.

Impacts to osprey would be the same as described for CP1. There are 54 osprey nests within the perimeter of Shasta Lake. Six nest trees would be affected by a 12.5-foot dam raise and 11 nests are located in relocation areas. Removal of nest trees would be a potentially significant impact. Because osprey generally use the same nest for multiple years, the loss of 17 nest trees (31 percent of the total in the Shasta Lake and vicinity) between the impoundment area and relocation areas would be a potentially significant impact.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-29. Impacts on Suitable Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Long-Eared Owl and Northern Goshawk							
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	7.66	7.66
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.77	447.07
Ponderosa pine	152.04	21.54	123.71	114.71	35.08	85.84	532.91
Total Habitat	200.81	22.23	222.77	209.13	113.49	219.27	987.70

Table 13-29. Impacts on Suitable Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron in the Impoundment Area (12.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Cooper's Hawk and Great Blue Heron							
Blue oak–foothill pine	7.05	0.00	0.00	0.00	2.46	22.80	32.31
Closed-cone pine-cypress	24.40	0.00	8.95	14.95	32.72	50.54	131.58
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	7.66	7.66
Montane hardwood	53.30	25.75	120.48	48.59	13.31	55.23	316.66
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.77	447.07
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Ponderosa pine	152.04	21.54	123.71	114.71	35.08	85.84	532.91
Total Habitat	288.28	51.22	372.77	278.81	162.98	351.45	1505.51

Note:
[1] Acreage values are approximate.

Impact Wild-10 (CP2): Take and Loss of Habitat for the Pacific Fisher
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the Pacific fisher, a Federal candidate for listing, a California species of special concern, a USFS sensitive species, and a BLM sensitive species. Furthermore, take (including mortality of individuals because of destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Inundation resulting from a 12.5-foot dam raise would result in a loss of approximately 1,057 acres of Pacific fisher habitat.

Impacts on suitable habitat by CWHR type in the impoundment area are summarized in Table 13-30.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-30. Impacts on Suitable Habitat for the Pacific Fisher in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Blue oak-foothill pine	7.05	0.00	0.00	0.00	2.46	22.80	32.31
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	7.66	7.66
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.77	447.06
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Ponderosa pine	152.04	21.54	123.71	114.71	35.08	85.84	532.91
Total Habitat	203.53	25.47	243.34	215.23	114.49	245.68	1057.27

Note:
[1] Acreage values are approximate.

Impact Wild-11 (CP2): Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, Yuma Myotis, and Fringed Myotis), the American Marten, and Ringtail and Their Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the pallid bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the western red bat, a USFS sensitive species; the western mastiff bat, a California species of special concern, an MSCS-covered species, and a BLM sensitive species; the Townsend's big-eared bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the long-eared myotis, a BLM sensitive species; the Yuma myotis, a BLM sensitive species; the fringed myotis, a USFS sensitive species; the American marten, a USFS sensitive species; and the ringtail, a State fully protected and MSCS-covered species. Furthermore, take (including mortality of individuals because of destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Dam construction, vegetation removal, and construction in the relocation areas, and inundation resulting from a 12.5-foot dam raise would result in the loss of approximately 45 acres of reproductive and roosting habitat for the pallid bat, spotted bat, western mastiff bat, Townsend's big-eared bat, Yuma myotis, and fringed myotis in the impoundment area. Additionally, one limestone cave

located on the Big Backbone Arm that is a known Townsend's big-eared bat roost would be affected by flooding. A 12.5-foot dam raise would result in the loss of approximately 1,687 acres of reproductive and roosting habitat for the western red bat and long-eared myotis. These impacts would be potentially significant.

Dam construction, vegetation removal, and inundation resulting from a 12.5-foot dam raise would result in the loss of approximately 1,687 acres of ringtail habitat. A 12.5-foot dam raise would result in the loss of approximately 1,022 acres of American marten habitat in the impoundment area. These impacts would be potentially significant.

Impacts on suitable habitat by CWHR type in the impoundment area are summarized in Table 13-31.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-31. Impacts on Suitable Habitat for Special-Status Bats, American Marten, and Ringtail in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Pallid Bat, Spotted Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Yuma Myotis, and Fringed Myotis							
Barren	1.40	0.89[1]	5.58	1.86	0.00	0.97	9.81
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	3.03	3.03
Blue oak–foothill pine	7.05	0.00	0.00	0.00	2.46	22.80	32.31
Total	8.45	0.00	5.58	1.86	2.46	26.80	45.15
Western Red Bat, Long-Eared Myotis, and Ringtail							
Barren	1.40	0.00	5.58	1.86	0.00	0.96	9.81
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	3.03	3.03
Blue oak–foothill pine	7.05	0.00	0.00	0.00	2.46	22.80	32.31
Closed-cone pine-cypress	24.40	0.00	8.95	14.95	32.72	50.53	131.58
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	7.66	7.66
Mixed chaparral	20.58	9.56	112.76	11.02	7.35	8.26	169.54
Montane hardwood	53.30	25.75	120.48	48.54	13.31	55.23	316.66

Table 13-31. Impacts on Suitable Habitat for Special-Status Bats, American Marten, and Ringtail in the Impoundment Area (12.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.76	447.06
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Ponderosa pine	152.04	21.54	123.71	114.78	35.08	85.84	532.91
Total Habitat	310.27	60.78	491.12	291.69	170.34	363.71	1687.70
American Marten							
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	4.70	4.70
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.77	447.06
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Ponderosa pine	152.03	21.54	123.71	114.71	35.08	85.84	532.91
Total Habitat	203.53	25.46	243.34	215.26	114.49	219.92	1022.00

Note:
[1] Acreage values are approximate.

Impact Wild-12 (CP2): Impacts on Special-Status Terrestrial Mollusks (Church's sideband, Shasta Sideband, Wintu Sideband, Oregon shoulderband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat All of these species are designated USFS sensitive and/or S&M species, and the Shasta sideband is also an MSCS-covered species. The Shasta sideband, Wintu sideband, Shasta chaparral, and Shasta hesperian are also petitioned for Federal listing. Ground-disturbing activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas could result in direct take and/or loss of suitable habitat for special-status terrestrial mollusks. In addition, the raising of Shasta Dam would result in the inundation of suitable habitat and direct take of these species. This impact would be significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Inundation resulting from a 12.5-foot dam raise would result in the loss of approximately 1,679 acres of Church's sideband, Oregon shoulderband, and Shasta chaparral habitat; and 37 acres of Shasta hesperian habitat in the impoundment area. Approximately 7 acres of Shasta sideband habitat and 2 acres of Wintu sideband would be lost. These impacts would be potentially significant.

Impacts on suitable habitat by CWHR type in the impoundment area are summarized in Table 13-32.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-32. Impacts on Suitable Habitat for Special-Status Terrestrial Mollusks in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area: Shasta Sideband							
Limestone	0.00	0.00	0.00	7.64	0.00	0.00	7.64
Impoundment Area: Wintu Sideband							
Limestone	0.00	0.00	0.00	0.00	0.00	2.06	2.06
Impoundment Area: Church's sideband, Oregon shoulderband, Shasta Chaparral							
Barren	0.77	0.00	0.36	0.00	0.00	0.00	1.13
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	3.03	3.03
Blue oak–foothill pine	7.05	0.00	0.00	0.00	2.46	22.80	32.31
Closed-cone pine–cypress	24.40	0.00	8.95	14.96	32.72	50.54	131.58
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	7.66	7.66
Mixed chaparral	20.58	9.56	112.76	11.02	7.35	8.26	169.54
Montane hardwood	53.30	25.75	120.47	48.59	13.31	55.23	316.66
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.77	447.07
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Ponderosa pine	152.04	21.54	123.71	114.71	35.08	85.84	532.91
Total Habitat	310.00	60.78	485.89	289.83	170.34	362.74	1679.21
Impoundment Area: Shasta Hesperian							
Montane riparian	1.54	2.48	15.92	4.60	0.58	2.59	27.71
Total Habitat	1.54	2.48	15.92	4.60	0.58	2.59	27.71

Note:
[1] Acres are approximate.

Impact Wild-13 (CP2): Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a permanent loss of habitat. In addition, inundation caused by the raising of Shasta Dam would result in the permanent loss of habitat. This would be a potentially significant impact.

These general habitats also represent potential Western bumble bee habitat. Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a permanent loss of

habitat containing flowering shrubs and forbs, which serve as potential Western bumble bee nectar sources, and potential underground burrow locations. In addition, inundation caused by the raising of Shasta Dam would result in the permanent loss of habitat. This would be a potentially significant impact.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in a greater loss of general wildlife habitat and Western bumble bee habitat. This impact would be potentially significant.

Inundation resulting from a 12.5-foot dam raise would result in a loss of approximately 1,725 acres of general wildlife habitat and Western bumble bee habitat in the impoundment area. Impacts on general wildlife habitat and Western bumble bee habitat by CWHR type in the impoundment area are summarized in Table 13-33.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-33. Impacts on CWHR Habitats and Western Bumble Bee Habitat in the Impoundment Area (12.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Annual grassland	0.36	0.00	1.53	0.53	0.00	0.38	2.79
Barren	1.40	0.00	5.58	1.86	0.00	0.97	9.81
Blue oak–foothill pine	7.05	0.00	0.00	0.00	2.46	22.79	32.31
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	3.03	3.03
Closed-cone pine–cypress	24.40	0.00	8.95	14.96	32.72	50.54	131.58
Douglas-fir	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	7.66	7.66
Mixed chaparral	20.58	9.56	112.76	11.02	7.35	8.26	169.54
Montane hardwood	53.30	25.75	120.48	48.59	13.31	55.23	316.66
Montane hardwood–conifer	48.77	0.70	99.06	94.36	78.41	125.77	447.06
Montane riparian	2.72	3.23	20.57	6.12	1.00	3.62	37.26
Ponderosa pine	152.04	21.54	123.71	114.71	35.08	85.84	532.91
Riverine	0.00	0.42	4.02	4.51	0.84	0.00	9.79

Table 13-33. Impacts on CWHR Habitats and Western Bumble Bee Habitat in the Impoundment Area (12.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Urban	16.65	0.00	1.63	6.42	0.00	0.66	25.37
Total	327.28	61.20	498.30	303.14	171.18	364.75	1725.85

Note:
[1]Acreage values are approximate.

Impact Wild-14 (CP2): Impacts on Other Birds of Prey (e.g., red-tailed hawk and red-shouldered hawk) and Migratory Bird Species (e.g., American robin, Anna's hummingbird) and their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of other birds of prey and migratory bird species. In addition, inundation caused by the raising of Shasta Dam could result in the loss of active nests and habitat for these species. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in greater impacts on nesting migratory birds and raptors. This impact would be potentially significant.

Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-15 (CP2): Loss of Critical Deer Winter and Fawning Range Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of critical deer winter and fawning range. In addition, inundation caused by the raising of Shasta Dam would result in the loss of critical deer range. This would be a potentially significant impact.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by a 12.5-foot raise of Shasta Dam would result in the loss of approximately 4,446 acres of critical deer winter and/or fawning range. This impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-16 (CP2): Take and Loss of the California Red-Legged Frog Reclamation completed California red-legged frog habitat assessments in coordination with the USFWS in the applicable impoundment and relocation areas, and the potential downstream Sacramento River restoration sites. The assessment results will enable Reclamation and the USFWS to determine if

habitat for the species occurs, if impacts are anticipated, and if additional surveys are needed. Impacts on the California red-legged frog will be assessed if surveys are conducted and the California red-legged frog is found. Impacts for each alternative will not be assessed until USFWS has determined whether suitable habitat is present and whether surveys would be required. Mitigation for this impact is discussed in Section 13.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-17 (CP2): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Implementing CP2 would increase available water storage in Shasta Reservoir and result in a modified flow regime. This modification would reduce the frequency, duration, and magnitude of intermediate to large flows downstream from Shasta Dam from December through January in most types of water years, extending through March in above-normal water years. Conversely, CP2 would increase the volume of flows from summer through fall of most years, especially in dry and critical water years. One of the goals of CP2 is to improve water supply during the driest of years, so this increase is not unexpected. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel and reduce the long-term formation of off-channel habitats, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species. Because CP2 would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

This impact would be similar to Impact Wild-17 (CP1). CP2 would affect habitat for sensitive species through the same pathways (alteration of off-channel habitat for western pond turtles, changes to successional patterns of vegetation) as discussed for CP1. The only difference between the two is the extent of the impact. Under CP2, the reductions in winter flows would be both more frequent and of larger magnitude than modeled to occur under CP1. In all water year types (except below-normal years and December of critical years), flows would be reduced by CP2 in December and January by on average about 2.2 and 8.0 percent. In above-normal years, this extends through February (-6.3 percent) and March (-5.2 percent) (Table 13-34). This impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-18 (CP2): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Implementing CP2 would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the Sacramento River in the primary study area. This reduction also would alter the river's geomorphic processes, including the rate of bank erosion. However, the length of eroding banks would not be

substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. High flows during the nesting season that may cause localized nest failure would not increase substantially (generally less than an average of a 3-inch increase in water surface elevation in the worst case). For these reasons, the impact on habitat for bank swallow nesting colonies would be less than significant.

This impact would be similar to Impact Wild-18 (CP1). The extent of the impact could be greater under CP2 than under CP1 because reductions in channel-forming flows could be more extensive than under CP1. Nonetheless, for the same reasons as discussed for CP1, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-19 (CP2): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime As mentioned in Impact Wild-19 (CP1), vernal pools are generally not present within the active floodplain of the upper Sacramento River in the primary study area; vernal pools are found in upland locations outside of the main river channel and the floodplain. Thus, vernal pools are not anticipated to be affected by changes in flows that could result from implementation of CP2. Because CP2 would not affect vernal pool habitat or the species that occur within the habitat, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Table 13-34. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP2

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Keswick												
Wet	1.2%	2.0%	-8.0%	-4.7%	-1.3%	0.4%	0.3%	0.4%	0.5%	0.5%	0.7%	0.9%
Above Normal	3.6%	0.0%	-2.5%	-2.2%	-6.3%	-5.2%	0.1%	-3.0%	-3.2%	0.3%	0.9%	8.6%
Below Normal	2.7%	-0.6%	-0.8%	-1.6%	-1.2%	-1.8%	0.5%	-4.0%	1.3%	0.1%	0.3%	1.3%
Dry	5.8%	5.3%	-2.8%	-3.3%	-0.6%	0.0%	1.8%	2.2%	3.9%	2.5%	4.9%	7.3%
Critical	3.6%	6.5%	1.5%	2.4%	1.6%	0.9%	0.9%	1.3%	0.8%	3.6%	-0.2%	9.4%
Bend Bridge												
Wet	1.1%	2.3%	-4.2%	-2.0%	-0.8%	0.3%	0.2%	0.4%	0.5%	0.4%	0.6%	0.8%
Above Normal	2.8%	-0.4%	-0.9%	-1.2%	-3.5%	-2.9%	0.1%	-2.0%	-2.4%	0.3%	0.8%	8.2%
Below Normal	2.4%	0.0%	-0.5%	-0.9%	-0.7%	-1.3%	0.4%	-2.6%	1.2%	0.1%	0.2%	1.2%
Dry	4.8%	4.6%	-1.5%	-1.6%	-0.3%	0.0%	1.4%	1.8%	3.7%	2.5%	4.8%	6.7%
Critical	2.7%	5.3%	1.3%	2.1%	1.4%	0.7%	0.8%	1.2%	0.7%	3.5%	-0.2%	8.6%
Butte City												
Wet	1.2%	3.0%	-3.2%	-1.2%	-0.5%	0.2%	0.2%	0.1%	0.3%	0.3%	0.6%	0.7%
Above Normal	3.3%	0.0%	-0.6%	-0.9%	-2.6%	-1.9%	0.2%	-2.6%	-2.8%	0.0%	0.7%	8.8%
Below Normal	2.5%	0.3%	-0.3%	-1.1%	-0.4%	-1.1%	-0.2%	-2.5%	1.6%	-0.1%	0.1%	0.9%
Dry	5.3%	5.0%	-1.1%	-1.0%	0.1%	-0.1%	2.2%	1.9%	5.3%	3.4%	6.6%	6.8%
Critical	2.5%	5.8%	1.3%	1.7%	1.3%	0.6%	1.1%	1.7%	1.0%	5.4%	-0.1%	8.6%
Wilkins Slough												
Wet	1.2%	3.2%	-2.0%	-0.5%	-0.1%	0.3%	0.2%	0.1%	0.3%	0.3%	0.6%	0.7%
Above Normal	3.3%	0.0%	-0.6%	-0.7%	-1.3%	-0.9%	0.2%	-2.6%	-2.8%	0.0%	0.7%	8.8%
Below Normal	2.5%	0.3%	0.0%	-1.1%	0.1%	-1.1%	-0.2%	-2.5%	1.6%	-0.1%	0.1%	0.9%
Dry	5.3%	5.0%	-1.1%	-0.9%	0.0%	-0.1%	2.2%	1.9%	5.3%	3.4%	6.6%	6.8%
Critical	2.5%	5.8%	1.3%	1.7%	1.3%	0.6%	1.1%	1.7%	1.0%	5.4%	-0.1%	8.6%
Verona												
Wet	0.4%	2.4%	-1.8%	-0.4%	-0.1%	0.2%	0.1%	0.0%	0.2%	0.0%	0.0%	0.4%
Above Normal	2.2%	0.7%	-0.5%	-0.4%	-1.7%	-0.5%	0.1%	-1.1%	-1.6%	0.0%	0.4%	3.5%
Below Normal	1.4%	1.0%	-0.5%	-0.4%	0.1%	-0.7%	-0.1%	-1.0%	1.6%	-0.1%	0.1%	-0.3%
Dry	3.2%	3.7%	-1.1%	-0.5%	-0.1%	0.0%	1.3%	1.0%	-1.5%	2.6%	3.4%	10.1%
Critical	0.7%	4.1%	0.8%	1.3%	0.8%	0.3%	0.7%	2.0%	1.2%	6.2%	-1.4%	5.4%

Table 13-34. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP2 (contd.)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Freeport												
Wet	0.4%	0.7%	-0.3%	-0.4%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Above Normal	1.9%	-0.4%	-0.1%	0.2%	-0.4%	-0.4%	0.1%	-0.9%	-1.3%	-0.1%	0.1%	0.6%
Below Normal	0.4%	0.2%	0.3%	0.5%	0.2%	-0.5%	0.2%	-1.1%	0.4%	-0.3%	-0.4%	0.2%
Dry	2.3%	2.8%	-0.7%	-0.3%	0.1%	0.1%	1.0%	0.7%	-0.5%	1.7%	2.8%	8.0%
Critical	-0.1%	2.8%	1.0%	1.5%	0.7%	0.0%	0.7%	0.9%	0.0%	2.1%	0.6%	3.6%

Impact Wild-20 (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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant.

This impact would be similar to Impact Wild-20 (CP1). The extent of the impact could be greater under CP2 than under CP1. This impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-21 (CP2): Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program Gravel augmentation is not included as part of CP2. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-22 (CP2): Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration Projects CP2 would not include any specific restoration components. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact Wild-23 (CP2): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Implementing CP2 would modify the flow regime and would reduce the frequency, duration, and magnitude of intermediate to large flows in the lower Sacramento River during winter in some years. It also would increase the flow volumes in late summer and fall of most years. Although this change in surface and subsurface hydrology would be of a smaller magnitude than in the upper Sacramento River, it could affect habitats adjacent to the river channel and the formation of off-channel habitats along the lower Sacramento River, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species. Because CP2 would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

This impact would be similar to Impact Wild-23 (CP1). Because CP2 could substantially reduce available habitat for special-status wildlife, this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-24 (CP2): Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Implementing CP2 would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the lower Sacramento River. This reduction also would alter the river's geomorphic processes. The rate of bank erosion would be reduced, but the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. High flows during the nesting season that may cause localized bank and nest failure would not increase substantially. The impact on habitat for bank swallow nesting colonies, and therefore bank swallows themselves, would be less than significant.

This impact would be similar to Impact Wild-24 (CP1). The effect of CP2 on bank swallow habitat along the lower Sacramento River would be similar to the effect along the upper Sacramento River, but smaller because the effect of CP2 on river flows would attenuate with distance downstream. Because the extent of bank erosion and flooding of nesting sites is not expected to substantially change under CP2, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-25 (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 Vernal pools are present in upland areas near the Sacramento River and its tributaries in 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). However, vernal pools are generally not present within the active floodplain of regulated rivers along the lower Sacramento River and in the Delta. Because the sensitive habitat and species are located outside of the area affected by the changes in flows, CP2 would not alter this habitat. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-26 (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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant.

This impact would be similar to Impact Wild-26 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

CVP/SWP Service Areas

Impact Wild-27 (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 and SWP service areas, CP2 would change flow regimes in several downstream waterways. Modified flow regimes would reduce the frequency, duration, and magnitude of intermediate to large flows along 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 and SWP service areas outside of the primary study area. Therefore, this impact would be less than significant.

This impact would be similar to Impact Wild-27 (CP1). The CVP and SWP are operated as an integrated system with the same downstream management targets and goals. CVP and SWP operations are constrained by the 2008 USFWS BO and the 2009 NMFS BO. Thus, implementation of CP2 is not anticipated to sufficiently alter flow to the CVP/SWP service areas to have a substantial effect on the riparian habitat upon which special-status wildlife species depend. For these reasons, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

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

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 Programmatic 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 involves raising Shasta Dam 18.5 feet, an elevation change that would increase the full 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.

With respect to wildlife impacts, dam construction activities for CP1 through CP5 would be so similar that they are considered to be identical for purposes of this analysis. Because CP3 would result in higher lake levels than CP2, CP3 would also require more relocation of utilities, public service facilities, and recreational facilities than CP2, including a loss of up to 35 acres of limestone habitat and 2,870 acres of nonlimestone habitat. Because CP3 would result in higher lake levels than CP2, CP3 would also result in a larger (and deeper) area of inundation than CP2, in turn requiring more vegetation clearing within the inundation area than CP2.

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, USFS sensitive species, S&M species, MSCS-covered species, and BLM sensitive species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the Shasta salamander. This impact would be significant.

Inundation resulting from an 18.5-foot dam raise would result in a loss of approximately 16 acres of limestone habitat and 2,399 acres of nonlimestone habitat. Impacts on limestone and nonlimestone habitats in the impoundment area are summarized in Table 13-35.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-35. Impacts on Suitable Habitat for the Shasta Salamander in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Limestone	0.00	1.63	0.00	11.09	0.00	2.85	15.57
Nonlimestone	436.74	89.15	710.35	407.76	241.51	511.00	2399.56
Total	436.74	90.78	710.35	418.85	241.51	513.85	2415.13

Note:
[1] Acreage values are approximate.

Impact Wild-2 (CP3): Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat Ground-disturbing activities associated with construction could result in direct take (e.g., because of operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, a California species of special concern, a USFS sensitive species, an MSCS-covered species, and a BLM sensitive species, and of the tailed frog, a California species of special concern. 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.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the foothill yellow-legged and tailed frogs. This impact would be potentially significant.

Implementation of an 18.5-foot raise of the dam would result in inundation of approximately 80 acres of foothill yellow-legged frog and tailed frog habitat. A summary of suitable habitat loss by arm is presented in Table 13-36.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-36. Impacts on Suitable Habitat for the Foothill Yellow-Legged and Tailed Frog in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Riverine	0.00	0.88	5.24	15.43	1.41	0.00	22.96
Total	4.16	7.55	31.40	29.34	2.94	5.52	80.90

Note:
[1] Acreage values are approximate.

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

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the northwestern pond turtle. This impact would be potentially significant.

Implementation of an 18.5-foot raise of the dam would result in the conversion of approximately 58 acres of montane riparian and 23 acres of riverine habitat to lacustrine habitat. Because equally valuable components are lost or gained in either habitat, the quality of the habitat would not be compromised. However, maximum lake inundation would be infrequent (at most 1 month per year) and would not benefit the species throughout the remainder of the year. Thus, the conversion to lacustrine habitat would remain an impact on northwestern pond turtle habitat. A summary of suitable habitat loss by arm is presented in Table 13-37.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-37. Impacts on Suitable Habitat for the Northwestern Pond Turtle in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Riverine	0.00	0.88	5.24	15.43	1.41	0.00	22.96
Total	4.16	7.55	31.40	29.34	2.94	5.52	80.90

Note:
[1] Acreage values are approximate.

Impact Wild-4 (CP3): Impact on the American Peregrine Falcon Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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 fully protected species and MSCS-covered species. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the American peregrine falcon.

Similar to CP1, overstory and complete vegetation removal is expected to occur within the impoundment area in suitable cliff habitat. Thus, overstory vegetation removal occurring in or near suitable cliff habitat during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests. Additionally, because of the steep terrain, trees would be yarded by helicopter. Noise generated by chainsaws and helicopter yarding could cause the abandonment of nests, resulting in the incidental loss of fertile eggs or nestlings. This impact would be potentially significant.

No known eyries would be inundated with an 18.5-foot raise in lake elevation; however, 18.5 (full pool) vertical feet of cliff habitat would be inundated. The impacts on this amount of cliff habitat suitable for nesting would be less than significant. The conversion of uplands to lacustrine habitat would not adversely affect foraging habitat for the species because they frequently forage over water. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-5 (CP3): Take and Loss of Habitat for the Bald Eagle
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas in addition to inundation caused by the raising of Shasta Dam during the nesting season would result in the loss of nest and perch trees used by the bald eagle, a State-listed species, fully protected

species, and USFS sensitive species, an MSCS-covered species, and a BLM sensitive species. This impact would be significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the bald eagle. This impact would be potentially significant.

Six known bald eagle nest trees would be affected by an 18.5-foot dam raise due to inundation. When inundation occurs, nest trees within the impoundment area would die. Because peak inundation generally occurs in late April or early June, nest trees would be flooded toward the end of the nesting season. If eagles were nesting in these trees, it would be likely that young would fledge before the nest tree died from the effects of inundation. Because of inundation timing, it is not likely that individuals would be affected. Because bald eagles generally use the same nest for multiple years, the loss of nest trees would be a significant impact.

Inundation could also affect erosion and bank stability, which could affect nest trees that are in close proximity to the impoundment area. This would be a potentially significant impact.

Inundation resulting from an 18.5-foot dam raise would result in a loss of approximately 1,989 acres of bald eagle nesting and roosting habitat. Impacts on suitable bald eagle habitat by CWHR type in the impoundment area are summarized in Table 13-38.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-38. Impacts on Suitable Habitat for the Bald Eagle in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	4.18	4.18
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	32.33	46.98
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	10.96	10.96
Montane hardwood	73.49	38.76	171.02	70.36	19.43	78.84	451.91
Montane hardwood–conifer	70.68	0.99	150.43	136.53	111.63	179.48	649.76

Table 13-38. Impacts on Suitable Habitat for the Bald Eagle in the Impoundment Area (18.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.21	161.64	49.56	122.07	767.30
Total	373.80	77.15	535.81	382.82	186.44	433.38	1989.40

Note:
[1] Acreage values are approximate.

Impact Wild-6 (CP3): Loss of Dispersal Habitat for the Northern Spotted Owl
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the northern spotted owl, a species that is Federally listed as threatened species and an MSCS-covered species. In addition, inundation caused by the raising of Shasta Dam would result in the loss of habitat for this species. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for the northern spotted owl. This impact would be potentially significant.

Inundation resulting from an 18.5-foot dam raise would result in a loss of approximately 976 acres of northern spotted owl dispersal habitat. Impacts on suitable spotted owl habitat by CWHR type in the impoundment area are summarized in Table 13-39.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-39. Impacts on Suitable Habitat for the Northern Spotted Owl in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Dispersal	145.16	17.49	243.53	239.73	114.12	216.06	976.09
Foraging	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nesting/Roosting	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	145.16	17.49	243.53	239.73	114.12	216.06	976.09

Note:
[1] Acreage values are approximate.

Impact Wild-7 (CP3): Impact on the Purple Martin and Its Nesting Habitat
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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, inundation caused by the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. Also similar to CP1, nest trees occurring in the lake could be adversely affected by inundation and related vegetation removal. These impacts would be potentially significant.

Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-8 (CP3): Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the willow flycatcher, a species State listed as endangered, a USFS sensitive species, and an MSCS-covered species; the Vaux's swift, a California species of special concern; and the yellow warbler and yellow-breasted chat, 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.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Inundation resulting from an 18.5-foot dam raise would result in a loss of approximately 1,938 acres of Vaux's swift nesting and foraging habitat in the impoundment area. Additionally, approximately 58 acres of willow flycatcher, yellow warbler, and yellow-breasted chat habitat would be lost in the impoundment area.

Impacts on suitable habitats for the willow flycatcher, Vaux's swift, yellow warbler, and yellow-breasted chat by CWHR type in the impoundment area are summarized in Table 13-40.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-40. Impacts on Suitable Habitat for the Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area							
Vaux's Swift							
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	10.96	10.96
Montane hardwood	73.49	38.76	171.01	70.36	19.43	78.84	451.91
Montane hardwood–conifer	70.68	0.99	150.43	136.54	111.63	179.48	649.76
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.20	161.64	49.56	122.07	767.30
Total Vaux's Swift Habitat	363.44	77.14	535.81	382.82	182.15	396.86	1938.24
Willow Flycatcher, Yellow Warbler, and Yellow-Breasted Chat							
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Total Habitat	4.16	6.67	26.16	13.91	1.53	5.52	57.94

Note:
[1] Acreage values are approximate.

Impact Wild-9 (CP3): Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the long-eared owl, a California species of special concern and an MSCS-covered species; the northern goshawk, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the Cooper's hawk, an MSCS-covered species; the great blue heron, an MSCS-covered species; and the osprey, an MSCS-covered species. In addition, the raising of Shasta Dam would result in the loss of foraging and habitat for these species. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Inundation resulting from an 18.5-foot dam raise would result in a loss of approximately 1,428 acres of nesting and foraging habitat for the long-eared owl and northern goshawk, approximately 2,167 acres of nesting and foraging habitat for the Cooper's hawk, and approximately 2,167 acres of nesting habitat

for the great blue heron. Foraging habitat would increase for osprey and the great blue heron. No impact to foraging habitat for these species would occur.

Impacts on suitable habitat by CWHR type in the impoundment area are summarized in Table 13-41.

Table 13-41. Impacts on Suitable Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Long-Eared Owl and Northern Goshawk							
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	10.96	10.96
Montane hardwood–conifer	70.68	0.99	150.43	136.54	111.63	179.48	649.76
Ponderosa pine	215.11	30.72	188.21	161.64	49.56	122.07	767.30
Total Habitat	285.80	31.72	338.61	298.36	161.19	312.51	1428.39
Cooper's Hawk and Great Blue Heron							
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	32.33	46.98
Closed-cone pine-cypress	32.68	0.00	12.95	20.89	44.72	70.52	181.77
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	10.96	10.96
Montane hardwood	73.49	38.76	171.02	70.55	19.43	78.84	451.91
Montane hardwood–conifer	70.68	0.99	150.43	136.54	111.63	179.48	649.76
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.21	161.63	49.56	122.06	767.30
Total Habitat	406.48	77.15	548.77	403.70	231.16	499.73	2167.00

Note:
[1] Acreage values are approximate.

Impacts to osprey would be similar to those described for CP1. There are 54 osprey nests within the perimeter of Shasta Lake. Seven nest trees would be affected by a 12.5-foot dam raise, and 11 nests are located in relocation areas. Removal of nest trees would be a potentially significant impact. Because osprey generally use the same nest for multiple years, the loss of 18 nest trees (33 percent of the total in the Shasta Lake and vicinity) between the impoundment area and relocation areas would be a potentially significant impact.

Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-10 (CP3): Take and Loss of Habitat for the Pacific Fisher
Construction activities and vegetation removal associated with raising the dam,

construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the Pacific fisher, a Federal candidate for listing, a California species of special concern, a USFS sensitive species, and a BLM sensitive species. Furthermore, take (including mortality of individuals because of destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Inundation resulting from an 18.5-foot dam raise would result in a loss of approximately 1,533 acres of Pacific fisher habitat.

Impacts on suitable habitat by CWHR type in the impoundment area are summarized in Table 13-42.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-42. Impacts on Suitable Habitat for the Pacific Fisher in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Blue oak-foothill pine	10.36	0.00	0.00	0.00	4.29	32.33	46.98
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	10.96	10.96
Montane hardwood–conifer	70.68	0.99	150.43	136.53	111.63	179.48	649.76
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.21	161.64	49.56	122.07	767.30
Total Habitat	300.32	38.39	364.80	312.45	167.00	350.36	1533.31

Note:
[1] Acreage values are approximate.

Impact Wild-11 (CP3): Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, Yuma Myotis, and Fringed Myotis), the American Marten, and Ringtail and Their Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the pallid bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the western red bat, a USFS sensitive species; the western mastiff bat, a California species of special concern, an MSCS-covered species, and a BLM sensitive species; the

Townsend's big-eared bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the long-eared myotis, a BLM sensitive species; the Yuma myotis, a BLM sensitive species; the fronged myotis, a USFS sensitive species; the American marten, a USFS sensitive species; and the ringtail, a State fully protected and MSCS-covered species. Furthermore, take (including mortality of individuals because of destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Dam construction, vegetation removal, and inundation resulting from an 18.5-foot dam raise would result in the loss of approximately 69 acres of reproductive and roosting habitat for the pallid bat, spotted bat, western mastiff bat, Townsend's big-eared bat, Yuma myotis, and fringed myotis in the impoundment area. Additionally, one limestone cave located on the Big Backbone Arm that is a known Townsend's big-eared bat roost would be affected by flooding. An 18.5-foot dam raise would result in the loss of approximately 2,431 acres of reproductive and roosting habitat for the western red bat and long-eared myotis. These impacts would be potentially significant.

Dam construction, vegetation removal, and inundation resulting from an 18.5-foot dam raise would result in the loss of approximately 2,431 acres of ringtail habitat. An 18.5-foot dam raise would result in the loss of approximately 1,482 acres of American marten habitat in the impoundment area. These impacts would be potentially significant.

Impacts on suitable habitat by CWHR type in the impoundment area are summarized in Table 13-43.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-43. Impacts on Suitable Habitat for Special-Status Bats, American Marten, and Ringtail in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Pallid Bat, Spotted Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Yuma Myotis, and Fringed Myotis							
Barren	2.30	1.28[2]	10.60	3.56	0.00	1.35	17.81
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	4.18	4.18
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	32.33	46.98
Total	12.66	0.00	10.60	3.56	4.29	37.86	68.98
Western Red Bat, Long-Eared Myotis, and Ringtail							
Barren	2.30	0.00	10.60	3.56	0.00	1.35	17.81
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	4.18	4.18
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	32.33	46.98
Closed-cone pine-cypress	32.68	0.00	12.95	20.89	44.72	70.52	181.77
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	10.96	10.96
Mixed chaparral	29.19	13.64	161.04	15.14	10.35	12.99	242.36
Montane hardwood	73.49	38.76	171.02	70.37	19.43	78.84	451.91
Montane hardwood–conifer	70.68	0.99	150.43	136.54	111.63	179.48	649.76
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.21	161.64	49.56	122.07	767.30
Total Habitat	437.98	90.78	720.42	422.41	241.51	518.25	2431.35
American Marten							
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	6.73	6.73
Montane hardwood–conifer	70.68	0.99	150.43	136.54	111.63	179.48	649.76
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.21	161.64	49.56	122.07	767.30
Total Habitat	289.95	38.38	364.79	312.45	162.72	313.80	1482.09

Note:
[1] Acreage values are approximate.
[2] Represents the amount of the limestone outcrop impacted at the Big Backbone Arm cave location.

Impact Wild-12 (CP3): Impacts on Special-Status Terrestrial Mollusks (Church's sideband, Shasta Sideband, Wintu Sideband, Oregon shoulderband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat All of these species are designated USFS sensitive and/or S&M species, and the Shasta sideband is also an MSCS-covered species. The Shasta Sideband, Wintu Sideband, Shasta Chaparral, and Shasta Hesperian are also petitioned for Federal listing. Ground-disturbing activities and vegetation removal associated

with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas could result in direct take and/or loss of suitable habitat for special-status terrestrial mollusks. In addition, the raising of Shasta Dam would result in the inundation of suitable habitat and direct take of these species. This impact would be significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of suitable habitat for these species. This impact would be potentially significant.

Inundation resulting from an 18.5-foot dam raise would result in the loss of approximately 2,415 acres of Church's sideband, Oregon shoulderband, and Shasta chaparral habitat; and 58 acres of Shasta hesperian habitat in the impoundment area. Approximately 11 acres of Shasta sideband habitat and 3 acres of Wintu sideband habitat would be lost. These impacts would be potentially significant.

Impacts on suitable habitat by CWHR type in the impoundment area are summarized in Table 13-44.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-44. Impacts on Suitable Habitat for Special-Status Terrestrial Mollusks in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Impoundment Area: Shasta Sideband							
Limestone	0.00	0.00	0.00	11.09	0.00	0.00	11.09
Impoundment Area: Wintu Sideband							
Limestone	0.00	0.00	0.00	0.00	0.00	2.85	2.85
Impoundment Area: Church's sideband, Oregon shoulderband, Shasta Chaparral							
Barren	1.06	0.00	0.55	0.00	0.00	0.00	1.61
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	4.18	4.18
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	32.33	46.98
Closed-cone pine-cypress	32.68	0.00	12.95	20.89	44.72	70.52	181.77
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Klamath mixed conifer	0.00	0.00	0.00	0.00	0.00	10.96	10.96
Mixed chaparral	29.19	13.64	161.04	15.14	10.35	12.99	242.36
Montane hardwood	73.49	38.76	171.02	70.37	19.43	78.84	451.91
Montane hardwood–conifer	70.68	0.99	150.43	136.54	111.63	179.48	649.76

Table 13-44. Impacts on Suitable Habitat for Special-Status Terrestrial Mollusks in the Impoundment Area (18.5-Foot Dam Raise) (contd.)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.21	161.64	49.56	122.07	767.30
Total Habitat	436.74	90.78	710.36	418.85	241.51	516.90	2415.14
Impoundment Area: Shasta Hesperian							
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Total Habitat	4.16	6.67	26.16	13.91	1.53	5.52	57.94

Note:
[1] Acres are approximate.

Impact Wild-13 (CP3): Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a permanent loss of habitat. In addition, inundation caused by the raising of Shasta Dam would result in the permanent loss of habitat. This would be a potentially significant impact.

These general habitats also represent potential western bumble bee habitat. Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a permanent loss of habitat containing flowering shrubs and forbs, which serve as potential western bumble bee nectar sources, and potential underground burrow locations. In addition, inundation caused by the raising of Shasta Dam would result in the permanent loss of habitat. This would be a potentially significant impact.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP2. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in a greater loss of general wildlife habitat and western bumble bee habitat. This impact would be potentially significant.

Inundation resulting from an 18.5-foot dam raise would result in a loss of approximately 2,492 acres of general wildlife habitat and western bumble bee habitat in the impoundment area. Impacts on general wildlife habitat and western bumble bee habitat by CWHR type in the impoundment area are summarized in Table 13-45.

Mitigation for this impact is proposed in Section 13.3.5.

Table 13-45. Impacts on CWHR Habitats and Western Bumble Bee Habitat in the Impoundment Area (18.5-Foot Dam Raise)

Habitat	Area (Acres[1])						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Annual grassland	0.44	0.00	3.10	0.70	0.00	0.38	4.62
Barren	2.30	0.00	10.60	3.56	0.00	1.35	17.81
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	4.18	4.18
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	32.33	46.98
Closed-cone pine–cypress	32.68	0.00	12.95	20.89	44.72	70.52	181.77
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00	0.36
Mixed chaparral	29.19	13.64	161.04	15.14	10.35	13.00	242.36
Montane hardwood	73.49	38.76	171.01	70.55	19.43	78.84	451.91
Montane hardwood–conifer	70.68	0.99	150.42	136.36	111.63	179.48	649.76
Montane riparian	4.16	6.67	26.16	13.91	1.53	5.52	57.94
Ponderosa pine	215.11	30.72	188.19	161.64	49.56	122.07	767.30
Riverine	0.00	0.88	5.24	15.43	1.41	0.00	22.96
Urban	21.95	0.00	1.95	7.96	0.00	1.27	33.14
Total	460.37	91.67	730.72	446.49	242.92	519.90	2492.07

Note:
[1] Acreage values are approximate.

Impact Wild-14 (CP3): Impacts on Other Birds of Prey (e.g., red-tailed hawk and red-shouldered hawk) and Migratory Bird Species (e.g., American robin, Anna's hummingbird) and their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of other birds of prey and migratory bird species. In addition, inundation caused by the raising of Shasta Dam could result in the loss of active nests and habitat for these species. This impact would be potentially significant.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in greater impacts on nesting migratory birds and raptors. This impact would be potentially significant.

Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-15 (CP3): Loss of Critical Deer Winter and Fawning Range Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of critical deer winter and fawning range. In addition, inundation caused by the raising of

Shasta Dam would result in the loss of critical deer range. This would be a potentially significant impact.

Impacts caused by construction and vegetation clearing for the dam and relocation areas would be similar to CP1. However, inundation caused by an 18.5-foot raise of Shasta Dam would result in the loss of approximately 5,182 acres of critical deer winter and/or fawning range. This impact would be potentially significant.

Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-16 (CP3): Take and Loss of the California Red-Legged Frog Reclamation completed California red-legged frog habitat assessments in coordination with the USFWS in the applicable impoundment and relocation areas, and the potential downstream Sacramento River restoration sites. The assessment results will enable Reclamation and the USFWS to determine if habitat for the species occurs, if impacts are anticipated, and if additional surveys are needed. Impacts on the California red-legged frog will be assessed if surveys are conducted and the California red-legged frog is found. Impacts for each alternative will not be assessed until USFWS has determined whether suitable habitat is present and whether surveys would be required. Mitigation for this impact is discussed in Section 13.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-17 (CP3): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Implementing CP3 would increase available water storage in Shasta Reservoir and result in a modified flow regime. This modification would reduce the frequency, duration, and magnitude of intermediate to large flows downstream from Shasta Dam during winter and spring in some water years, and would increase the volume of flows from spring through fall of some water year types. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel and reduce the formation of off-channel habitats, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species. Because CP3 would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

This impact would be similar to Impact Wild-17 (CP1). The goal of CP3 is to increase agricultural water supply reliability, as is evident in the CalSim-II modeling results. As modeled, in dry and critical water years, flows are generally higher – substantially so in several months – for the entire growing season, extending into November (Table 13-46). This additional water is

available during the growing season because of the increase in reservoir storage. Similar to results for CP1 and CP2, flows are shown to be substantially lower in winter and early spring as the larger reservoir captures more runoff. As discussed in Impact Wild-17 (CP1), the increased storage capacity reduces the frequency of channel-forming flows that create habitat for sensitive species like western pond turtle. This reduction in flows would also lead to a long-term reduction in early successional stage riparian habitat used by many species of riparian-dependent sensitive species of birds. The change in flow regimes would substantially reduce habitat for sensitive species of riparian-dependent wildlife. For this reason, this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-18 (CP3): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Implementing CP3 would cause a reduction in the magnitude, duration, and frequency of intermediate to large flows in the Sacramento River in the primary study area. This reduction also would alter the river's geomorphic processes, including the rate of bank erosion. However, the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. High flows during the nesting season that may cause localized nest failure would not increase. The impact on habitat for bank swallow nesting colonies would be less than significant.

This impact would be similar to Impact Wild-18 (CP1). Generally installed to protect upland land uses, bank revetment has been preferentially applied to actively eroding and migrating bends that otherwise would be among the most suitable sites for bank swallow nests. The reduction in intermediate to large flows by CP3 would cause a small reduction in the rate of erosion at the cut banks that remain unprotected by revetment. This alteration would not reduce the amount of bank swallow nesting habitat in the short or long term. The increase in water surface elevation is modeled to average about 2 inches or less during the breeding season (April–July) in all water year types. Although the flow increase exceeds the ±2 percent threshold that is used to discriminate between conditions essentially equivalent to existing conditions, the actual increase in elevation is not likely to result in additional flooding of bank swallow colonies. Because CP3 would not result in a substantial reduction in available habitat or in nesting colonies, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Table 13-46. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP3

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Keswick												
Wet	1.0%	2.7%	-10.2%	-6.2%	-1.4%	0.3%	0.3%	0.6%	0.7%	0.7%	0.8%	2.7%
Above Normal	5.9%	1.1%	-4.3%	-3.5%	-6.8%	-8.0%	0.8%	-2.2%	-3.0%	0.4%	1.2%	10.4%
Below Normal	1.7%	-0.2%	-1.8%	-1.5%	0.5%	-2.1%	2.0%	-1.8%	1.2%	1.2%	1.9%	3.0%
Dry	6.6%	7.0%	-2.6%	-3.3%	-1.2%	-0.1%	2.6%	4.3%	3.4%	2.2%	6.3%	3.5%
Critical	1.1%	7.2%	2.8%	-1.8%	1.0%	0.3%	1.9%	2.0%	1.0%	0.8%	2.0%	6.2%
Bend Bridge												
Wet	0.9%	2.7%	-5.4%	-2.7%	-0.8%	0.2%	0.2%	0.5%	0.6%	0.7%	0.7%	2.4%
Above Normal	4.7%	0.1%	-2.0%	-2.0%	-3.8%	-4.5%	0.6%	-1.4%	-2.2%	0.3%	1.0%	9.9%
Below Normal	1.5%	0.3%	-1.2%	-0.8%	0.4%	-1.5%	1.4%	-0.9%	1.2%	1.1%	1.7%	2.6%
Dry	5.3%	6.1%	-1.4%	-1.6%	-0.6%	0.0%	2.0%	3.4%	3.1%	2.1%	6.1%	3.0%
Critical	0.7%	5.9%	2.4%	-1.4%	0.9%	0.2%	1.5%	1.7%	0.9%	0.8%	2.0%	5.6%
Butte City												
Wet	1.1%	3.4%	-4.1%	-1.6%	-0.6%	0.2%	0.3%	0.1%	0.2%	0.3%	0.5%	2.3%
Above Normal	5.1%	0.3%	-1.7%	-1.3%	-2.9%	-3.0%	0.8%	-2.1%	-2.9%	-0.4%	0.6%	10.7%
Below Normal	1.9%	0.6%	-0.9%	-1.0%	0.5%	-1.4%	1.5%	-0.9%	1.0%	0.7%	1.3%	2.1%
Dry	5.8%	6.7%	-1.0%	-1.0%	-0.2%	-0.1%	2.6%	3.1%	3.4%	1.6%	7.6%	2.4%
Critical	0.7%	6.5%	2.7%	-1.3%	1.0%	0.1%	1.9%	2.1%	1.0%	0.7%	2.3%	5.6%
Wilkins Slough												
Wet	1.1%	3.6%	-2.3%	-0.8%	-0.1%	0.3%	0.3%	0.1%	0.2%	0.3%	0.5%	2.3%
Above Normal	5.1%	0.3%	-1.4%	-0.8%	-1.4%	-1.5%	0.8%	-2.1%	-2.9%	-0.4%	0.6%	10.7%
Below Normal	1.9%	0.6%	-0.2%	-1.0%	0.7%	-1.4%	1.5%	-0.9%	1.0%	0.7%	1.3%	2.1%
Dry	5.8%	6.7%	-1.0%	-0.9%	-0.2%	-0.1%	2.6%	3.1%	3.4%	1.6%	7.6%	2.4%
Critical	0.7%	6.5%	2.7%	-1.3%	1.0%	0.1%	1.9%	2.1%	1.0%	0.7%	2.3%	5.6%
Verona												
Wet	0.9%	2.7%	-2.3%	-0.6%	-0.1%	0.1%	0.1%	-0.1%	0.2%	0.1%	-0.1%	0.9%
Above Normal	3.6%	1.3%	-1.1%	-0.5%	-1.9%	-1.0%	0.5%	-0.7%	-1.7%	-0.1%	0.4%	4.4%
Below Normal	1.7%	0.4%	0.9%	-0.3%	0.3%	-1.4%	0.9%	0.0%	1.2%	0.5%	0.5%	0.5%
Dry	3.7%	4.7%	-0.9%	-0.4%	-0.3%	-0.1%	1.7%	2.0%	2.8%	1.6%	2.3%	2.6%
Critical	0.1%	4.8%	2.1%	-0.8%	0.8%	0.0%	1.2%	0.3%	0.9%	2.4%	2.3%	3.9%

Table 13-46. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP3 (contd.)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Freeport												
Wet	0.5%	1.1%	-0.5%	-0.5%	0.1%	0.1%	0.1%	-0.1%	0.1%	0.0%	-0.1%	0.3%
Above Normal	1.9%	-0.6%	-0.4%	0.2%	-0.5%	-0.8%	0.4%	-0.5%	-1.4%	-0.2%	0.1%	0.8%
Below Normal	0.4%	-0.2%	1.5%	0.5%	0.4%	-1.2%	0.9%	-0.5%	0.1%	0.1%	0.2%	0.6%
Dry	2.2%	3.4%	-0.6%	-0.3%	0.1%	0.1%	1.5%	1.5%	-0.3%	0.7%	2.6%	2.0%
Critical	0.0%	3.1%	2.0%	-0.6%	0.9%	0.4%	0.9%	0.0%	-0.1%	1.7%	1.6%	1.5%

Impact Wild-19 (CP3): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime As mentioned in Impact Wild-19 (CP1), vernal pools are generally not present within the active floodplain of the upper Sacramento River in the primary study area; vernal pools are found in upland locations outside of the main river channel and the floodplain. Thus, vernal pools are not anticipated to be affected by changes in flows that could result from implementation of CP3. Because CP3 would not affect vernal pool habitat or the species that occur within the habitat, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-20 (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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant.

This impact would be similar to Impact Wild-20 (CP1). The alteration of flows resulting from CP3 would continue to adversely affect riparian habitat. This would make the achievement of restoration, preservation, and conservation goals under regional and local plans and policies more difficult to attain. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-21 (CP3): Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program Gravel augmentation is not included as part of CP3. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-22 (CP3): Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration Projects CP3 would not include any specific restoration components. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact Wild-23 (CP3): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Implementing CP3 would modify the flow regime and would reduce the frequency, duration, and magnitude of intermediate to large flows in the lower Sacramento River during winter and spring in some years, but generally not above the ±2 percent threshold that separates the alternative from existing conditions. Under CP3 there would be increases in lower Sacramento River flows during the growing season, especially in the drier water years, that would occur as water was delivered to agricultural diversions. Many of these increases would exceed the ±2 percent

threshold and therefore are considered substantial flow changes. Although this change in surface and subsurface hydrology would be of a smaller magnitude than in the upper Sacramento River, it could affect habitats adjacent to the river channel and the formation of off-channel habitats, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution and abundance of riparian-nesting special-status bird species. Because CP3 would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

This impact would be similar to Impact Wild-23 (CP1). Implementing CP3 would modify the flow regime and would reduce the frequency, duration, and magnitude of intermediate to large flows in the lower Sacramento River during winter and spring in some years, but generally not above the ±2 percent threshold that separates the alternative from existing conditions (except at Verona in December of wet water years). Because the focus of CP3 is the delivery of water for agricultural uses, under CP3 there would be increases in lower Sacramento River flows during the growing season, especially in the drier water years, that would occur as water was delivered to agricultural diversions. As modeled, many of these increases in lower Sacramento River flows exceed the ±2 percent threshold (Table 13-46) and therefore are considered substantial flow changes. Because CP3 could substantially reduce available habitat for special-status wildlife, this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-24 (CP3): Impacts on Bank Swallow along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Implementing CP3 would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the lower Sacramento River. This reduction also would alter the river's geomorphic processes. The rate of bank erosion could be different than the existing rate, but the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not be decline substantially. High flows during the nesting season that may cause localized bank and nest failure would not increase substantially. The impact on habitat for bank swallow nesting colonies, and therefore bank swallows themselves, would be less than significant.

This impact would be similar to Impact Wild-24 (CP1). The factors affecting bank erosion have been discussed previously. The effect of CP3 on bank swallow habitat along the lower Sacramento River would be similar to the effect along the upper Sacramento River, but smaller because the effect of CP3 on river flows would attenuate somewhat with distance downstream. The different operational goals of CP3 would actually increase average flows in the lower Sacramento River during November and December. Modeling shows only minor reductions in flows (less than 2 percent) during January and February.

The changes in flows predicted by CalSim-II are not expected to substantially alter the rate or extent of bank erosion. The maximum increase in average monthly water surface elevation predicted for the lower Sacramento River is generally less than 3 inches; this is not expected to result in a substantial increase in flooding of bank swallow nesting colonies. Because CP3 would not result in substantial changes in available habitat, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-25 (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 Vernal pools are present in upland areas near the Sacramento River and its tributaries in 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). However, vernal pools are generally not present within the active floodplain of regulated rivers along the lower Sacramento River and in the Delta. Because the sensitive habitat and species are located outside of the area affected by the changes in flows, CP3 would not alter this habitat. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-26 (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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant.

This impact would be similar to Impact Wild-26 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

CVP/SWP Service Areas

Impact Wild-27 (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 and SWP service areas, CP3 would change flow regimes in several downstream waterways. Most potential noticeable changes in flows and stages would diminish downstream from 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 and

SWP service areas outside of the primary study area. Therefore, this impact would be less than significant.

This impact would be similar to Impact Wild-27 (CP1). Modified flow regimes would change 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, outside of the primary study area, are expected to be less than effects on the Sacramento River. The CVP and SWP are operated as an integrated system with the same downstream management targets and goals. CVP and SWP operations are constrained by the 2008 USFWS BO and the 2009 NMFS BO. Thus, this alternative is not anticipated to sufficiently alter flow to the CVP/SWP service areas to have a substantial effect on the riparian habitat upon which special-status wildlife species depend. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

The primary function of CP4 and CP4A is to address survival of anadromous fish, while still improving water supply reliability. CP4 and CP4A focus 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 full pool by 20.5 feet and enlarge total reservoir storage space by 634,000 acre-feet.

CP4 and CP4A have similar reservoir operations in that they each dedicate a portion of the new storage in Shasta Lake for fisheries purposes, however, the portion of this dedicated storage varies. For CP4, about 378,000 acre-feet of the increased reservoir storage space would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. Operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as in CP1. For CP4A, about 191,000 acre-feet of the increased reservoir storage space would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4A, operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as in CP2.

In addition to the activities common to CP1–CP3, CP4 and CP4A include augmenting locations along the Upper Sacramento River segment of the study area with gravel to increase spawning habitat for anadromous fish. Gravel placement would occur at one or more sites per year over a 10-year period and would be accomplished by one of three methods; lateral berms, talus cone, direct placement in river; as appropriate depending on specific conditions, including geomorphology, of the augmentation site. To the extent available, existing river access points would be used to deliver gravel to the river; however, temporary new access roads would be needed in some cases, mostly adjacent to the river, and would be extended from existing dirt roads.

Furthermore, under CP4 and CP4A, riparian, floodplain, and side channel habitat restoration would be implemented at up to six potential sites on the upper Sacramento River to restore habitat for anadromous salmonids.

With respect to wildlife impacts, dam construction activities for CP1–CP5 would be so similar that they are considered to be identical for purposes of this analysis. Because CP4 or CP4A would result in lake levels identical to those under CP3, CP4 or CP4A would require the same relocation of utilities, public service facilities, and recreational facilities as CP3, including a loss of up to 35 acres of limestone habitat and 2,870 acres of nonlimestone habitat. Because CP4 or CP4A would result in identical lake levels as CP3, CP4 or CP4A would result the same area of inundation as CP3, in turn requiring identical vegetation clearing within the inundation area as CP3. CP4 or CP4A would also involve some vegetation clearing in the Upper Sacramento River portion of the study area to provide access for gravel augmentation.

Shasta Lake and Vicinity

Impact Wild-1 (CP4 and CP4A): 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, USFS sensitive species, S&M species, MSCS-covered species, and BLM sensitive species. In addition, the raising of Shasta Dam would result in the inundation of habitat for this species. This impact would be significant for CP4 or CP4A.

This impact would be similar to Impact Wild-1 (CP3) and would be significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-1 (CP3) and would be significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-2 (CP4 and CP4A): Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat Ground-disturbing activities associated with construction could result in direct take (e.g., because of operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, a California species of special concern, a USFS sensitive species, an MSCS-covered species, and a BLM sensitive species, and of the tailed frog, a California species of special concern. 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 for CP4 or CP4A.

This impact would be similar to Impact Wild-2 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-2 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-3 (CP4 and CP4A): Impact on the Northwestern Pond Turtle and Its Habitat Ground-disturbing activities associated with construction could result in direct take (e.g., because of operation of equipment in or adjacent to riverine or riparian habitat) of the northwestern pond turtle, an MSCS-covered species, a California species of special concern, and a USFS sensitive species. In addition, project implementation could result in the degradation of suitable aquatic habitat because of increased erosion and sedimentation. This impact would be potentially significant.

This impact would be similar to Impact Wild-3 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-3 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-4 (CP4 and CP4A): Impact on the American Peregrine Falcon Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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 fully protected species and MSCS-covered species. This impact would be potentially significant for CP4 or CP4A.

This impact would be similar to Impact Wild-4 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-4 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-5 (CP4 and CP4A): Take and Loss of Habitat for the Bald Eagle Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas in addition to inundation caused by the raising of Shasta Dam during the nesting season would result in the loss of nest and perch trees used by the bald eagle, a State-listed species, fully protected species, and USFS sensitive species, an MSCS-covered species, and a BLM sensitive species. This impact would be significant.

This impact would be similar to Impact Wild-5 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-5 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-6 (CP4 and CP4A): Loss of Dispersal Habitat for the Northern Spotted Owl Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of

various amounts of vegetation in the impoundment areas would result in the loss of northern spotted owl dispersal habitat, a species Federally listed as threatened and an MSCS-covered species. This impact would be potentially significant.

This impact would be similar to Impact Wild-6 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-6 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-7 (CP4 and CP4A): Impact on the Purple Martin and Its Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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, inundation caused by the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant for CP4 or CP4A.

This impact would be similar to Impact Wild-7 (CP3) and would be significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-7 (CP3) and would be significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-8 (CP4 and CP4A): Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the willow flycatcher, a species State listed as endangered, a USFS sensitive species, and MSCS-covered species; the Vaux's swift, a California species of special concern; and the yellow warbler and yellow-breasted chat, 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 for CP4 or CP4A.

This impact would be similar to Impact Wild-8 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-8 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-9 (CP4 and CP4A): Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging

and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the long-eared owl, a California species of special concern and an MSCS-covered species; the northern goshawk, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the Cooper's hawk, an MSCS-covered species; the great blue heron, an MSCS-covered species; and the osprey, an MSCS-covered species. In addition, the raising of Shasta Dam would result in the loss of foraging and nesting habitat for these species. This impact would be potentially significant for CP4 and CP4A.

This impact would be similar to Impact Wild-9 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-9 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-10 (CP4 and CP4A): Take and Loss of Habitat for the Pacific Fisher Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the Pacific fisher, a Federal candidate for listing, a California species of special concern, a USFS sensitive species, and a BLM sensitive species. Furthermore, take (including mortality of individuals because of destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant for CP4 or CP4A.

This impact would be similar to Impact Wild-10 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-10 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-11 (CP4 and CP4A): Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, Yuma Myotis, and Fringed Myotis), the American Marten, and Ringtail and Their Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the pallid bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the western red bat, a USFS sensitive species; the western mastiff bat, a California species of special concern, an MSCS-covered species, and a BLM sensitive species; the Townsend's big-eared bat, a California species of special concern, a USFS

sensitive species, and a BLM sensitive species; the long-eared myotis, a BLM sensitive species; the Yuma myotis, a BLM sensitive species; the fringed myotis, a USFS sensitive species; the American marten, a USFS sensitive species; and the ringtail, a State fully protected and MSCS-covered species. Furthermore, take (including mortality of individuals because of destruction or disturbance of active roost sites or dens) could result from construction activities and vegetation clearing. This impact would be potentially significant for CP4 and CP4A.

This impact would be similar to Impact Wild-11 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-11 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-12 (CP4 and CP4A): Impacts on Special-Status Terrestrial Mollusks (Church's sideband, Shasta Sideband, Wintu Sideband, Oregon shoulderband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat
All of these species are designated USFS sensitive and/or S&M species, and the Shasta sideband is also an MSCS-covered species. The Shasta Sideband, Wintu Sideband, Shasta Chaparral, and Shasta Hesperian are also petitioned for Federal listing. Ground-disturbing activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas could result in direct take and/or loss of suitable habitat for special-status terrestrial mollusks. In addition, the raising of Shasta Dam would result in the inundation of suitable habitat and direct take of these species. This would be a significant impact for CP4 or CP4A.

This impact would be similar to Impact Wild-12 (CP3) and would be significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-12 (CP3) and would be significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-13 (CP4 and CP4A): Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a permanent loss of habitat. In addition, inundation caused by the raising of Shasta Dam would result in a permanent loss of habitat. This would be a potentially significant impact for CP4 or CP4A.

This impact would be similar to Impact Wild-13 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-13 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-14 (CP4 and CP4A): Impacts on Other Birds of Prey (e.g., red-tailed hawk and red-shouldered hawk) and Migratory Bird Species (e.g., American robin, Anna's hummingbird) and their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of other birds of prey and migratory bird species. In addition, inundation caused by the raising of Shasta Dam could result in the loss of active nests and habitat for these species. This impact would be potentially significant for CP4 or CP4A.

This impact would be similar to Impact Wild-14 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be similar to Impact Wild-14 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-15 (CP4 and CP4A): Loss of Critical Deer Winter and Fawning Range Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of critical deer winter and fawning range. In addition, inundation caused by the raising of Shasta Dam would result in the loss of critical deer range. This would be a potentially significant impact for CP4 or CP4A.

This impact would be identical to Impact Wild-15 (CP3) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

This impact would be identical to Impact Wild-15 (CP3) and would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-16 (CP4 and CP4A): Take and Loss of the California Red-Legged Frog Reclamation completed California red-legged frog habitat assessments in coordination with the USFWS in the applicable impoundment and relocations areas, and the potential downstream Sacramento River restoration sites. The assessment results will enable Reclamation and the USFWS to determine if habitat for the species occurs, if impacts are anticipated, and if additional surveys are needed. Impacts on the California red-legged frog will be assessed if surveys are conducted and the California red-legged frog is found. Impacts for each alternative will not be assessed until USFWS has determined whether suitable habitat is present and whether surveys would be required. Mitigation for this impact is discussed in Section 13.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-17 (CP4 and CP4A): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Implementation of CP4 or CP4A would increase the available water storage in Shasta Reservoir and result in a modified flow regime. This modification would reduce the frequency, duration, and magnitude of intermediate to large flows downstream from Shasta Dam during winter and spring in some years, especially wet and above-normal water years. Conversely, CP4 or CP4A would increase flow volumes in summer and fall of most years, most dramatically in September and October, because more water would be available to enhance conditions for anadromous fish (the goal of both CP4 and CP4A) in the driest months. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel and reduce the formation of off-channel habitats, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species. Because CP4 or CP4A would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. Table 13-47 shows the changes in monthly flows that would occur under CP4. Therefore, this impact would be the same as Impact Wild-17 (CP1) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

For CP4A, this impact would be similar to Impact Wild-17 (CP1). CP4A would affect habitat for sensitive species through the same pathways (alteration of off-channel habitat for western pond turtles, changes to successional patterns of vegetation) as discussed for CP1. The only difference between the two is the extent of the impact. Operation of CP4A would be identical to CP2, and the reductions in winter flows would be both more frequent and of larger magnitude than modeled to occur under CP1. In all water year types (except below-normal years and the Decembers of critical years), flows would be reduced by CP4A in December and January on average about 2.2 and 8.0 percent, respectively. In above-normal years, this would extend through February (-6.3 percent) and March (-5.2 percent) (see CP2 in Table 13-34). This impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-18 (CP4 and CP4A): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes The implementation of CP4 or CP4A would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the Sacramento River in the primary study area. This reduction also would alter the

river's geomorphic processes, including the rate of bank erosion. However, the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not be substantially reduced. High flows during the nesting season that may cause localized nest failure would not be increased. The impact on habitat for bank swallow nesting colonies would be less than significant for CP4 or CP4A.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. Therefore, this impact would be the same as Impact Wild-18 (CP1) and would be less than significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

For CP4A, the impact would be similar to Impact Wild-18 (CP1), but greater as in Impact Wild-18 (CP2). The extent of the impact could be greater under CP4A than under CP1 because reductions in channel-forming flows could be more extensive than under CP1. Nonetheless, for the same reasons as discussed for CP1, this impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-19 (CP4 and CP4A): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Dam Construction and from Changes in Flow Regime As mentioned in Impact Wild-19 (CP1), vernal pools are generally not present within the active floodplain of the upper Sacramento River in the primary study area; vernal pools are found in upland locations outside of the main river channel and the floodplain. Thus, vernal pools are not anticipated to be affected by changes in flows that could result from implementation of CP4 or CP4A.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. Therefore, this impact would be the same as Impact Wild-19 (CP1). Because CP4 would not affect vernal pool habitat or the sensitive wildlife species that occur within the habitat, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

The operational rules that govern the management of reservoirs and delivery of water under CP4A are identical to those that guided the modeling for CP2. Therefore, this impact would be the same as Impact Wild-19 (CP2). Because CP4A would not affect vernal pool habitat or the sensitive wildlife species that occur within the habitat, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Table 13-47. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP4

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Keswick												
Wet	1.6%	0.8%	-6.0%	-2.9%	-0.5%	0.4%	0.3%	0.1%	0.2%	0.3%	0.3%	0.4%
Above Normal	5.1%	-1.5%	-1.4%	-2.2%	-5.2%	-2.2%	0.0%	-3.0%	-1.4%	0.1%	0.9%	5.9%
Below Normal	0.9%	-0.7%	0.1%	-0.9%	-0.7%	-1.1%	0.2%	-2.6%	1.1%	0.2%	0.0%	1.3%
Dry	2.4%	4.1%	-2.0%	-2.0%	-1.0%	0.0%	0.7%	1.4%	2.3%	1.5%	2.3%	3.9%
Critical	2.3%	4.8%	1.0%	-0.6%	1.7%	0.8%	1.0%	1.8%	0.6%	0.7%	-0.2%	5.6%
Bend Bridge												
Wet	1.4%	1.4%	-3.1%	-1.2%	-0.3%	0.3%	0.2%	0.1%	0.2%	0.3%	0.3%	0.4%
Above Normal	4.0%	-1.1%	-0.6%	-1.2%	-2.8%	-1.3%	0.0%	-2.1%	-1.0%	0.0%	0.8%	5.5%
Below Normal	0.8%	-0.1%	0.0%	-0.5%	-0.4%	-0.8%	0.1%	-1.6%	1.0%	0.2%	-0.1%	1.2%
Dry	2.1%	3.1%	-1.0%	-1.0%	-0.5%	0.0%	0.5%	1.1%	2.1%	1.5%	2.3%	3.6%
Critical	1.6%	3.9%	0.8%	-0.4%	1.5%	0.6%	0.8%	1.6%	0.5%	0.6%	-0.2%	5.2%
Butte City												
Wet	1.6%	2.0%	-2.3%	-0.7%	-0.2%	0.3%	0.1%	-0.1%	0.0%	0.2%	0.2%	0.4%
Above Normal	4.3%	-0.8%	-0.4%	-0.9%	-1.9%	-0.8%	0.2%	-2.4%	-1.2%	-0.3%	0.8%	5.8%
Below Normal	1.2%	0.2%	0.3%	-0.6%	-0.3%	-0.7%	-0.3%	-1.5%	1.4%	0.3%	0.0%	1.0%
Dry	2.4%	3.2%	-0.7%	-0.5%	-0.2%	0.0%	0.8%	1.0%	3.2%	2.3%	3.2%	3.8%
Critical	1.4%	4.3%	0.8%	-0.5%	1.4%	0.5%	1.1%	2.2%	0.6%	0.9%	-0.2%	4.8%
Wilkins Slough												
Wet	1.6%	2.2%	-1.6%	-0.2%	0.0%	0.3%	0.1%	-0.1%	0.0%	0.2%	0.2%	0.4%
Above Normal	4.3%	-0.8%	-0.4%	-0.6%	-1.1%	-0.4%	0.2%	-2.4%	-1.2%	-0.3%	0.8%	5.8%
Below Normal	1.2%	0.2%	0.3%	-0.6%	0.0%	-0.7%	-0.3%	-1.5%	1.4%	0.3%	0.0%	1.0%
Dry	2.4%	3.2%	-0.7%	-0.4%	-0.2%	0.0%	0.8%	1.0%	3.2%	2.3%	3.2%	3.8%
Critical	1.4%	4.3%	0.8%	-0.5%	1.4%	0.5%	1.1%	2.2%	0.6%	0.9%	-0.2%	4.8%
Verona												
Wet	1.5%	1.7%	-1.3%	-0.2%	0.0%	0.2%	0.1%	-0.2%	0.0%	0.1%	-0.1%	0.2%
Above Normal	3.2%	-0.1%	-0.3%	-0.4%	-1.3%	-0.2%	0.1%	-1.0%	-0.8%	-0.2%	0.4%	2.3%
Below Normal	0.6%	0.1%	-0.1%	0.0%	0.1%	-0.5%	-0.2%	-0.4%	1.4%	0.1%	-0.1%	-0.3%
Dry	1.3%	2.5%	-0.8%	-0.2%	-0.2%	0.0%	0.5%	0.7%	-1.0%	1.1%	1.8%	5.7%
Critical	0.5%	3.6%	0.8%	-0.2%	1.1%	0.4%	0.7%	2.0%	0.5%	0.8%	-1.5%	3.1%

Table 13-47. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP4 (contd.)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Freeport												
Wet	0.7%	0.5%	-0.3%	-0.2%	0.1%	0.1%	0.0%	-0.2%	0.0%	0.0%	0.0%	0.0%
Above Normal	1.2%	-0.5%	0.0%	0.0%	-0.5%	-0.1%	0.1%	-0.8%	-0.6%	-0.1%	0.0%	0.5%
Below Normal	-0.1%	-0.6%	0.5%	0.5%	0.3%	-0.3%	0.1%	-0.5%	0.3%	-0.1%	-0.4%	0.0%
Dry	1.2%	1.4%	-0.5%	-0.1%	-0.1%	-0.1%	0.2%	0.5%	-0.2%	0.7%	1.7%	4.3%
Critical	0.1%	1.8%	0.8%	-0.2%	0.9%	-0.1%	0.4%	0.9%	0.0%	1.4%	0.5%	2.4%

Impact Wild-20 (CP4 and CP4A): 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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant for CP4 or CP4A.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. Therefore, this impact would be the same as Impact Wild-20 (CP1) and would be potentially significant for CP4. Mitigation for this impact is proposed in Section 13.3.5.

The operational rules that govern the management of reservoirs and delivery of water under CP4A are identical to those that guided the modeling for CP2. This impact would be similar to Impact Wild-20 (CP2). This impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-21 (CP4 and CP4A): Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program CP4 and CP4A include a gravel augmentation program in the upper Sacramento River for fisheries benefit, as described in Chapter 2, “Alternatives.” Implementing the gravel augmentation program could result in temporary and short-term disturbance of riparian vegetation that has the potential to support special-status wildlife. There are no vernal pools or other seasonal wetland habitats at the augmentation sites. However, riparian-associated special-status wildlife species could be killed during removal of riparian vegetation. This impact would be potentially significant for CP4 or CP4A.

The implementation of a gravel augmentation program in the upper Sacramento River for fisheries benefit could result in temporary disturbance of habitat or removal of riparian vegetation that has the potential to support special-status wildlife. Gravel augmentation would occur at one to three sites per year over a 10-year period, so the area of impact in a given year would be relatively small. Although a total of 15 potential augmentation sites have been identified between Keswick Dam and Shea Island, the choice of specific sites would be made annually through an agency consultation process that would minimize impacts and maximize benefits of the deposited gravel.

Gravel placement itself is not expected to result in substantial adverse effects on any wildlife species because the gravel would all be placed within the active stream channel where there are no vernal pools or other seasonal wetland habitats. The main avenue of impact for riparian-dependent species would be

construction of access roads required to allow equipment to reach the river. This would be a short-term habitat loss that would not be sufficient to substantially affect any wildlife species. However, riparian-associated special-status wildlife species could be killed during riparian vegetation removal. Direct loss of riparian-associated special-status species during vegetation removal would be a potentially significant impact for CP4 or CP4A. Potential effects on special-status wildlife species are as follows:

- **Invertebrates** – Blue elderberry shrubs, the host plant for the valley elderberry longhorn beetle, are found throughout much of the Sacramento River's riparian corridor. Gravel augmentation activities have the potential to directly and indirectly affect blue elderberry shrubs, as well as valley elderberry longhorn beetles potentially present in the shrubs. Eleven individual elderberry shrubs and/or clumps are present within 100 feet of areas that would be disturbed during gravel augmentation; these shrubs are located 20 feet or more from the access trail. As currently designed, no elderberry shrub removal is required; the nearest project activity is restricted to use of the access trail. Should access routes need to be adjusted or elderberry shrubs become established in an access route between augmentation intervals, the resulting disturbance of elderberry shrubs would be a potentially significant impact.

- **Reptiles and Amphibians** – The western pond turtle has been documented within the Sacramento River and suitable habitat for the species is provided in the primary study area. Riparian vegetation that would be removed along the river corridor provides potential cover and foraging habitat for western pond turtle. Augmentation activities would take place during the western pond turtle's breeding season; thus, the potential also exists to affect nests, eggs, nesting females, or juvenile turtles during vegetation clearing, grading, and gravel placement. Therefore, loss of habitat for the western pond turtle would be a potentially significant impact.

- **Birds** – The riparian and wetland habitats along the Sacramento River floodway provide potential nesting and foraging habitat for western yellow-billed cuckoo, California yellow warbler, and yellow-breasted chat, all of which are special-status birds that nest in riparian vegetation. In addition, northern harrier and short-eared owl may nest in marshes in or adjacent to the stream channel. Other raptors (Cooper's hawk, Swainson's hawk, white-tailed kite, bald eagle, and osprey) may nest in trees in the riparian habitat in the study area. Gravel augmentation activities would be limited to a 1-month window from late August to September each year. Therefore, gravel augmentation would generally be conducted outside of the nesting season of most of these species. However, there would still be some potential for active nests to be present in gravel augmentation and

vegetation removal areas until mid-September. For example, the nesting season for Swainson's hawk, white-tailed kite, and other raptors is from March 1 to September 15 and the nesting season of many other species extends through August 31. Therefore, vegetation removal or disturbance of active nests could result in direct mortality or loss or abandonment of active nests. This would be a potentially significant impact.

- **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 while they may roost there, these species are not typically dependent on riparian habitats. The amount of potential foraging and roosting habitat would not substantially decrease, so impacts on special-status bats would be less than significant. Removal of small amounts of riparian vegetation along the river channel in the study area to create access routes for gravel augmentation would not substantially reduce habitat for ringtail. Therefore, impacts on special-status mammals would be less than significant.

Because creation and maintenance of access routes to gravel augmentation sites has the potential to affect valley elderberry longhorn beetle, western pond turtle, and riparian-associated special-status birds, the impact would be potentially significant for CP4 or CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-22 (CP4 and CP4A): Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration Projects CP4 and CP4A include riparian, floodplain, and side-channel habitat restoration at one or a combination of potential locations along the upper Sacramento River for fisheries benefit. Restoration actions could require removing vegetation, site grading and excavation, and planting of riparian species. This could require the construction of access routes, the use of heavy equipment to excavate side channels and restore floodplains, and the installation of native riparian plant species when earth-moving is complete. Disturbances as a result of these restoration actions would generally be related to construction-related activities, and could potentially take years for the installed plants to recover to the degree that the new community would function as high-quality riparian habitat. Overall, restoration work could result in disturbance and short-term removal of riparian vegetation that support riparian-associated special-status wildlife species that could be killed during riparian vegetation removal. This impact would be potentially significant for CP4 or CP4A.

CP4 and CP4A include restoration actions at up to six proposed sites. Potential effects of these actions on special-status wildlife species are as follows:

- **Invertebrates** – Blue elderberry shrubs, the host plant for the valley elderberry longhorn beetle, are found throughout much of the Sacramento River's riparian corridor. Elderberry shrubs may be present at any of the six proposed sites but have been documented near the Henderson Open Space, Anderson Island, and Reading Island sites. Construction activities have the potential to directly and indirectly affect blue elderberry shrubs, as well as valley elderberry longhorn beetles potentially present in the shrubs. Disturbance of elderberry shrubs would be a potentially significant impact for CP4 or CP4A.

- **Reptiles and Amphibians** – The western pond turtle has been documented within the Sacramento River, and suitable habitat for the species is provided within the primary study area. Riparian vegetation that would be removed along the river corridor provides potential cover and foraging habitat for western pond turtle. Pond turtles may use the historic and partially or intermittently connected side channels found at most of the restoration sites. Enhancement of these channels to provide spawning habitat for Chinook salmon could alter the channels to the extent that they are unsuitable for western pond turtles. This would primarily occur through an increase in water velocities required for spawning salmon and removal of complex cover and basking sites that turtles require. Habitat restoration activities would take place during the western pond turtle's breeding season; thus, the potential also exists to affect nests, eggs, juveniles, nesting females, and non-nesting adults during vegetation clearing, grading, and gravel placement. Therefore, loss of habitat for the western pond turtle or direct impacts on turtles themselves would be a potentially significant impact for CP4 or CP4A.

- **Birds** – The riparian habitat along the Sacramento River provides potential nesting and foraging habitat for western yellow-billed cuckoo, California yellow warbler, and yellow-breasted chat, all of which are special-status birds that nest in riparian vegetation. In addition, northern harrier and short-eared owl may nest in marshes in or adjacent to the stream channel. Other raptors (e.g., Cooper's hawk, Swainson's hawk, white-tailed kite, bald eagle, and osprey) may nest in trees in the riparian habitat along these waterways. Bald eagles have been documented nesting at Reading Island and Kapusta Island. The streambanks at Tobiasson Island and Reading Island provide nesting habitat for bank swallows. The proposed restoration activities all would require removing existing riparian vegetation to allow access to the work areas, staging equipment, removing soil, and site grading. Although riparian vegetation would be replanted after site work is complete, the removal or disturbance of active nests could result in direct mortality or loss or abandonment of active nests. This would be a potentially significant impact for CP4 or CP4A.

- **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. The amount of potential foraging habitat would not decrease appreciably during restoration activities. Available riparian habitats would still be sufficient for roosting habitat, so impacts on special-status bats would be less than significant. Vegetation removal would occur at any of the sites proposed for restoration. Although ringtail are not reported in the CNDDB (2012) from any of these locations, this species is known to occur in riparian habitat. The amount of vegetation to be removed would not substantially reduce available habitat for ringtail in the vicinity of these sites. Removal of small amounts of riparian vegetation along the river corridor would not substantially reduce habitat for ringtail. Therefore, impacts on special-status mammals would be less than significant for CP4 or CP4A.

The majority of the impacts associated with special-status wildlife species in upper Sacramento River riparian areas would be for short durations during r construction, temporary impacts lasting for several years after restoration is complete. Eventually conditions at the restoration sites would likely be the same as, or higher quality than what currently exists at the sites. Because of the potential to affect valley elderberry longhorn beetle, western pond turtle, and riparian-associated special-status birds, this impact would be potentially significant for CP4 or CP4A. Mitigation for this impact is proposed in Section 13.3.5.

Lower Sacramento River and Delta

Impact Wild-23 (CP4 and CP4A): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta The implementation of CP4 or CP4A would modify the flow regime and would reduce the frequency, duration, and magnitude of intermediate to large flows in the lower Sacramento River during winter and spring in some years. It also would increase the volume of flows in fall of most years. Although this change in surface and subsurface hydrology would be of a smaller magnitude than in the upper Sacramento River, it could affect habitats adjacent to the river channel and the formation of off-channel habitats along the lower Sacramento River, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species. Because CP4 or CP4A would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant for CP4 or CP4A.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. Therefore, this impact would be the same as Impact Wild-23 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

The operational rules that govern the management of reservoirs and delivery of water under CP4A are identical to those that guided the modeling for CP2. For CP4A, this impact would be the same as Impact Wild-23 (CP2). Because CP4A could substantially reduce available habitat for special-status wildlife, this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-24 (CP4 and CP4A): Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes
Implementation of CP4 or CP4A would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the lower Sacramento River. This reduction also would alter the river's geomorphic processes. The rate of bank erosion would be reduced, but the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. High flows during the nesting season that may cause localized bank and nest failure would not increase. The impact on habitat for bank swallow nesting colonies, and therefore bank swallows themselves, would be less than significant for CP4 or CP4A.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. The effect of CP4 on bank swallow habitat along the lower Sacramento River would be similar to the effect along the upper Sacramento River, but smaller because the effect of CP4 on river flows would attenuate with distance downstream. Therefore, this impact would be the same as Impact Wild-24 (CP1), and would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

The operational rules that govern the management of reservoirs and delivery of water under CP4A are identical to those that guided the modeling for CP2. This impact would be the same as Impact Wild-24 (CP2). The effect of CP4A on bank swallow habitat along the lower Sacramento River would be similar to the effect along the upper Sacramento River, but smaller because the effect of CP4A on river flows would attenuate with distance downstream. Because the extent of bank erosion and flooding of nesting sites is not expected to substantially change under CP4A, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-25 (CP4 and CP4A): 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 Vernal pools are present in upland areas near the Sacramento River and its tributaries in 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). However, vernal pools are generally not present within the active floodplain of regulated rivers along the lower Sacramento River and in the Delta.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. Because CP4 would not affect this habitat or these species, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

The operational rules that govern the management of reservoirs and delivery of water under CP4A are identical to those that guided the modeling for CP2. Because the sensitive habitat and species are located outside of the area affected by the changes in flows, CP4A would not alter this habitat. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-26 (CP4 and CP4A): 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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant for CP4 or CP4A.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. Therefore, this impact would be the same as Impact Wild-26 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

The operational rules that govern the management of reservoirs and delivery of water under CP4A are identical to those that guided the modeling for CP2. Therefore, this impact would be the same as Impact Wild-26 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

CVP/SWP Service Areas

Impact Wild-27 (CP4 and CP4A): 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 and SWP service areas, CP4 or CP4A would change flow regimes in several downstream waterways. Modified flow regimes would reduce the frequency, duration, and magnitude of intermediate to large flows along 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 and SWP service areas outside of the primary study area. Therefore, this impact would be less than significant for CP4 or CP4A.

The operational rules that govern the management of reservoirs and delivery of water under CP4 are identical to those that guided the modeling for CP1. Therefore, this impact would be the same as Impact Wild-27 (CP1) and would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

For CP4A, this impact would be similar to Impact Wild-27 (CP2). The CVP and SWP are operated as an integrated system with the same downstream management targets and goals. CVP and SWP operations are constrained by the 2008 USFWS BO and the 2009 NMFS BO. Thus, implementation of CP4A is not anticipated to sufficiently alter flow to the CVP/SWP service areas to have a substantial effect on the riparian habitat upon which special-status wildlife species depend. For these reasons, this impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

CP5 would address both the primary and secondary planning objectives. It involves enlarging Shasta Dam by 18.5 feet, which is consistent with the objectives of the 2000 CALFED Programmatic ROD, and also includes the common features described above. Affected wildlife acreages for CP5 are the same as described for CP4 and CP4A. 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 included in the Feasibility Report.

CP5 would also include implementing the same gravel augmentation program and the same riparian, floodplain, and side channel habitat restoration at up to six locations along the upper Sacramento River as described for CP4 and CP4A.

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, USFS sensitive species, S&M species, MSCS-covered species, and BLM sensitive 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 similar to Impact Wild-1 (CP3) and would be significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-2 (CP5): Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat Ground-disturbing activities associated with construction could result in direct take (e.g., because of operation of equipment in or adjacent to riverine or riparian habitat) of the foothill yellow-legged frog, a California species of special concern, a USFS sensitive species, an MSCS-covered species, and a BLM sensitive species, and of the tailed frog, a California species of special concern. 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 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-3 (CP5): Impact on the Northwestern Pond Turtle and Its Habitat Ground-disturbing activities associated with construction could result in direct take (e.g., because of operation of equipment in or adjacent to riverine or riparian habitat) of the northwestern pond turtle, an MSCS-covered species, a California species of special concern, and a USFS sensitive species. In addition, project implementation could result in the degradation of suitable aquatic habitat because of increased erosion and sedimentation. This impact would be potentially significant.

This impact would be similar to Impact Wild-3 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-4 (CP5): Impact on the American Peregrine Falcon Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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 fully protected species and MSCS-covered species. This impact would be potentially significant.

This impact would be similar to Impact Wild-4 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-5 (CP5): Take and Loss of Habitat for the Bald Eagle Construction activities and vegetation removal associated with raising the dam,

construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas in addition to inundation caused by the raising of Shasta Dam during the nesting season would result in the loss of nest and perch trees used by the bald eagle, a State-listed species, fully protected species, and USFS sensitive species, an MSCS-covered species, and a BLM sensitive species. This impact would be significant.

This impact would be similar to Impact Wild-5 (CP3) and would be significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-6 (CP5): Take and Loss of Dispersal Habitat for the Northern Spotted Owl Construction activities and vegetation removal associated with the dam construction activities, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in the loss of northern spotted owl dispersal habitat, a species Federally listed as threatened and an MSCS-covered species. This impact would be potentially significant.

This impact would be similar to Impact Wild-6 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-7 (CP5): Impact on the Purple Martin and Its Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season 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, inundation caused by the raising of Shasta Dam would result in the loss of nest trees. This impact would be significant.

This impact would be similar to Impact Wild-7 (CP3) and would be significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-8 (CP5): Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the willow flycatcher, a species State listed as endangered, USFS sensitive species, and MSCS-covered species; the Vaux's swift, a California species of special concern; and the yellow warbler and yellow-breasted chat, 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 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-9 (CP5): Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of the long-eared owl, a California species of special concern and an MSCS-covered species; the northern goshawk, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the Cooper's hawk, an MSCS-covered species; the great blue heron, an MSCS-covered species; and the osprey, an MSCS-covered species. In addition, the raising of Shasta Dam would result in the loss of foraging and nesting habitat for these species. This impact would be potentially significant.

This impact would be similar to Impact Wild-9 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-10 (CP5): Take and Loss of Habitat for the Pacific Fisher Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the Pacific fisher, a Federal candidate for listing, a California species of special concern, a USFS sensitive species, and a BLM sensitive species. Furthermore, take (including mortality of individuals because of 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-10 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-11 (CP5): Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, Yuma Myotis, and Fringed Myotis), the American Marten, and Ringtail and Their Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of habitat for the pallid bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the western red bat, a USFS sensitive species; the western mastiff bat, a California species of special concern, an MSCS-covered species, and a BLM sensitive species; the Townsend's big-eared bat, a California species of special concern, a USFS sensitive species, and a BLM sensitive species; the long-eared myotis, a BLM sensitive species; the Yuma myotis, a BLM sensitive species; the fringed myotis, a USFS sensitive species; the American marten, a USFS sensitive

species; and the ringtail, a State fully protected and MSCS-covered species. Furthermore, take (including mortality of individuals because of 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 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-12 (CP5): Impacts on Special-Status Terrestrial Mollusks (Church's Sideband, Shasta Sideband, Wintu Sideband, Oregon Shoulderband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat All of these species are designated USFS sensitive and/or S&M species, and the Shasta sideband is also an MSCS-covered species. The Shasta Sideband, Wintu Sideband, Shasta Chaparral, and Shasta Hesperian are also petitioned for Federal listing. Ground-disturbing activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas could result in direct take and/or loss of suitable habitat for special-status terrestrial mollusks. In addition, the raising of Shasta Dam would result in the inundation of suitable habitat and direct take of these species. This would be a significant impact.

This impact would be similar to Impact Wild-12 (CP3) and would be a significant impact. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-13 (CP5): Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a permanent loss of habitat. In addition, inundation caused by the raising of Shasta Dam would result in a permanent loss of habitat. This would be a potentially significant impact.

This impact would be similar to Impact Wild-13 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-14 (CP5): Impacts on Other Birds of Prey (e.g., red-tailed hawk and red-shouldered hawk) and Migratory Bird Species (e.g., American robin, Anna's hummingbird) and their Foraging and Nesting Habitat Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas during the nesting season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to the abandonment of nests of other birds of prey and migratory bird species. In addition, inundation caused by the raising of Shasta Dam could result in the loss of active nests and habitat for these species. This impact would be potentially significant.

This impact would be similar to Impact Wild-14 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-15 (CP5): Loss of Critical Deer Winter and Fawning Range
Construction activities and vegetation removal associated with raising the dam, construction activities in the relocation areas, and removal of various amounts of vegetation in the impoundment areas would result in a loss of critical deer winter and fawning range. In addition, inundation caused by the raising of Shasta Dam would result in the loss of critical deer range. This would be a potentially significant impact.

This impact would be similar to Impact Wild-15 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-16 (CP5): Take and Loss of the California Red-Legged Frog
Reclamation completed California red-legged frog habitat assessments in coordination with the USFWS in the applicable impoundment and relocations areas, and the potential downstream Sacramento River restoration sites. The assessment results will enable Reclamation and the USFWS to determine if habitat for the species occurs, if impacts are anticipated, and if additional surveys are needed. Impacts on the California red-legged frog will be assessed if surveys are conducted and the California red-legged frog is found. Impacts for each alternative will not be assessed until USFWS has determined whether suitable habitat is present and whether surveys would be required. Mitigation for this impact is discussed in Section 13.3.5.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Wild-17 (CP5): Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area Implementing CP5 would increase available water storage in Shasta Reservoir and result in a modified flow regime. This modification would reduce the frequency, duration, and magnitude of intermediate to large flows downstream from Shasta Dam during winter and spring in some water years, and would increase the volume of flows in fall of most years. This change in surface and subsurface hydrology could affect habitats adjacent to the river channel and reduce the formation of off-channel habitats, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species. Because CP5 would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

This impact would be similar to Impact Wild-17 (CP1). The pathways by which sensitive species would be affected under CP5 are similar to those for CP1. The

differences are in the magnitude of changes. For example, implementing CP5 would result in a reduction in average monthly flow downstream from Keswick Dam of between 2 and 10 percent in December of dry through wet water year types; similar although smaller reductions extend through March (Table 13-48). Because one of the goals of CP5 is increased water supply reliability, average monthly flows in critical water years are generally increased under CP5. As modeled, average monthly flows are substantially higher in April through August of dry water years and in September and October under most types of water years. Sensitive species could be affected by these changes through flow-caused alteration of riparian habitat and altered flow regimes. Because the changes would be substantial, they could result in increased mortality or reductions in reproductive success. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-18 (CP5): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Implementing CP5 would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the Sacramento River in the primary study area. This reduction also would alter the river's geomorphic processes, including the rate of bank erosion. However, the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. Therefore, the impact on habitat for bank swallow nesting colonies and the colonies themselves would be less than significant.

This impact would be the same as Impact Wild-18 (CP3). Modeling for CP5 predicts that increases in water surface elevation during the bank swallow nesting season would be at most an average of about 5–6 inches. These increases are not high enough that they would be expected to substantially increase the rate of localized nest failure. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-19 (CP5): Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Dam Construction and from Changes in Flow Regime As mentioned in Impact Wild-19 (CP1), vernal pools are generally not present within the active floodplain of the upper Sacramento River in the primary study area; vernal pools are found in upland locations outside of the main river channel and the floodplain. Thus, vernal pools are not anticipated to be affected by changes in flows that could result from implementation of CP5. Because CP5 would not affect vernal pool habitat or the species that occur within the habitat, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Table 13-48. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP5

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Keswick												
Wet	1.6%	1.7%	-9.9%	-6.4%	-2.0%	0.3%	0.3%	0.5%	0.7%	0.3%	0.5%	2.8%
Above Normal	5.8%	1.0%	-3.7%	-3.2%	-7.0%	-8.0%	0.2%	-2.3%	-3.1%	0.3%	0.9%	10.2%
Below Normal	1.8%	-1.1%	-2.1%	-1.5%	-1.4%	-2.3%	1.1%	-3.3%	-0.6%	0.8%	0.8%	1.9%
Dry	6.4%	6.1%	-2.7%	-3.3%	-1.8%	0.0%	2.5%	3.9%	6.0%	3.7%	8.0%	8.8%
Critical	5.1%	7.1%	2.8%	2.8%	1.4%	1.0%	0.8%	1.1%	0.9%	4.6%	-1.5%	14.1%
Bend Bridge												
Wet	1.5%	2.0%	-5.2%	-2.8%	-1.2%	0.3%	0.2%	0.4%	0.6%	0.3%	0.5%	2.4%
Above Normal	4.7%	0.0%	-1.5%	-1.8%	-4.0%	-4.5%	0.1%	-1.5%	-2.3%	0.2%	0.8%	9.7%
Below Normal	1.5%	-0.5%	-1.3%	-0.8%	-0.8%	-1.7%	0.9%	-2.1%	-0.3%	0.7%	0.7%	1.6%
Dry	5.3%	5.3%	-1.4%	-1.6%	-1.0%	0.0%	2.0%	3.2%	5.6%	3.6%	7.8%	8.1%
Critical	3.9%	5.7%	2.4%	2.4%	1.2%	0.7%	0.6%	1.0%	0.9%	4.5%	-1.5%	12.9%
Butte City												
Wet	1.8%	2.7%	-3.9%	-1.7%	-0.8%	0.2%	0.2%	0.0%	0.2%	-0.2%	0.2%	2.3%
Above Normal	5.2%	0.3%	-1.2%	-1.2%	-3.1%	-2.9%	0.2%	-2.1%	-2.9%	-0.3%	0.6%	10.5%
Below Normal	1.7%	-0.3%	-1.1%	-1.0%	-0.5%	-1.5%	0.7%	-2.2%	-0.9%	0.5%	0.0%	1.1%
Dry	5.9%	5.8%	-1.0%	-1.0%	-0.4%	-0.1%	2.7%	2.9%	7.6%	4.3%	10.4%	7.9%
Critical	3.9%	6.2%	2.7%	2.0%	1.2%	0.6%	0.8%	1.5%	1.2%	6.8%	-1.7%	12.8%
Wilkins Slough												
Wet	1.8%	2.9%	-2.3%	-0.8%	-0.2%	0.3%	0.2%	0.0%	0.2%	-0.2%	0.2%	2.3%
Above Normal	5.2%	0.3%	-1.2%	-0.8%	-1.5%	-1.5%	0.2%	-2.1%	-2.9%	-0.3%	0.6%	10.5%
Below Normal	1.7%	-0.3%	-0.4%	-1.0%	0.0%	-1.5%	0.7%	-2.2%	-0.9%	0.5%	0.0%	1.1%
Dry	5.9%	5.8%	-1.0%	-0.9%	-0.4%	-0.1%	2.7%	2.9%	7.6%	4.3%	10.4%	7.9%
Critical	3.9%	6.2%	2.7%	2.0%	1.2%	0.6%	0.8%	1.5%	1.2%	6.8%	-1.7%	12.8%
Verona												
Wet	0.5%	2.2%	-2.3%	-0.6%	-0.1%	0.2%	0.1%	-0.1%	0.2%	-0.3%	-0.3%	1.0%
Above Normal	3.5%	1.1%	-1.0%	-0.5%	-2.1%	-0.9%	0.1%	-0.7%	-1.7%	-0.1%	0.3%	4.2%
Below Normal	1.9%	0.8%	-0.3%	-0.3%	-0.1%	-1.0%	0.5%	-0.8%	-0.1%	0.3%	0.0%	0.2%
Dry	3.9%	4.4%	-1.0%	-0.5%	-0.5%	-0.1%	1.6%	1.8%	-1.2%	3.4%	6.2%	9.2%
Critical	0.9%	5.5%	2.2%	2.0%	0.7%	0.3%	0.5%	1.8%	1.5%	8.2%	-4.7%	7.9%

Table 13-48. Percent Change in Average Monthly Flows at Keswick Dam and Downstream Under CP5 (contd.)

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Freeport												
Wet	0.8%	0.5%	-0.5%	-0.6%	0.0%	0.1%	0.0%	-0.1%	0.1%	-0.2%	-0.2%	0.4%
Above Normal	2.2%	-0.8%	-0.4%	0.2%	-0.7%	-0.7%	0.1%	-0.5%	-1.4%	-0.2%	0.1%	0.6%
Below Normal	0.8%	0.0%	0.5%	0.5%	0.1%	-0.9%	0.6%	-1.0%	-0.8%	-0.1%	-0.4%	0.7%
Dry	2.6%	3.1%	-0.7%	-0.3%	-0.2%	0.1%	1.4%	1.5%	-0.6%	2.4%	5.2%	7.5%
Critical	-0.3%	3.1%	2.1%	1.8%	0.5%	-0.1%	0.3%	0.4%	0.0%	3.9%	-0.4%	5.9%

Impact Wild-20 (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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant.

This impact would be the same as Impact Wild-20 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-21 (CP5): Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program CP5 includes the gravel augmentation program. Implementing the gravel augmentation program could result in temporary and short-term disturbance or removal of riparian vegetation that has the potential to support special-status wildlife. Gravel augmentation would occur at one to three sites per year over a 10-year period (distributed at up to 15 different sites overall), so the area of impact in a given year would be very small. Thus, gravel placement is not expected to result in any substantial short- or long-term adverse effects on any wildlife species. However, riparian-associated special-status wildlife species could be killed during disturbance or removal of riparian vegetation. This impact would be potentially significant.

This impact would be the same as Impact Wild-21 (CP4 and CP4A) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-22 (CP5): Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration Projects Under CP5, riparian, floodplain, and side-channel habitat restoration would occur at one or a combination of potential locations along the upper Sacramento River. Restoration measures for the six potential restoration sites would generally involve riparian, floodplain, and side-channel restoration. Restoration actions could require removing vegetation, site grading and excavation, and planting riparian species. This could require the construction of access routes, use of heavy equipment to excavate side channels and restore floodplains, and installation of native riparian plant species when earth-moving is complete, Disturbances would generally be related to construction-related activities, but it would take years for the installed plants to recover to the degree that the new community would function as high-quality riparian habitat. Overall, restoration work could result in disturbance and short-term removal of riparian vegetation that support riparian-associated special-status wildlife species that could be killed during riparian vegetation removal. This impact would be potentially significant.

This impact would be the same as Impact Wild-22 (CP4 and CP4A) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Lower Sacramento River and Delta

Impact Wild-23 (CP5): Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta Implementing CP5 would modify the flow regime and would reduce the frequency, duration, and magnitude of intermediate to large flows in the lower Sacramento River during winter and spring in some years. It also would increase the volume of flows in fall of most years. Although this change in surface and subsurface hydrology would be of smaller magnitude than in the upper Sacramento River, it could affect habitats adjacent to the river channel and the formation of off-channel habitats along the lower Sacramento River, which would adversely affect the habitat of western pond turtle. Although the total amount of riparian vegetation would not decline substantially, the portion in early successional stages would be reduced. These early successional stages provide habitat for some special-status wildlife species. These changes could result in substantial effects on the distribution or abundance of riparian-nesting special-status bird species. Because CP5 would substantially alter habitat for a variety of riparian-dependent special-status species, this impact would be potentially significant.

This impact would be the same as Impact Wild-23 (CP1). The pathways of the impact under CP5 would be the same as those under CP1. Because flows would be substantially altered under CP5, impacts on sensitive riparian-dependent species would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

Impact Wild-24 (CP5): Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes Implementing CP5 would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the lower Sacramento River. This reduction also would alter the river's geomorphic processes. The rate of bank erosion would be reduced, but the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. High flows during the nesting season that may cause localized bank and nest failure would not increase. The impact on habitat for bank swallow nesting colonies, and therefore bank swallows themselves, would be less than significant.

This impact would be the same as Impact Wild-24 (CP1). The pathways of the impact under CP5 would be the same as those under CP1. The effect of CP5 on bank swallow habitat along the lower Sacramento River would be similar to the effect along the upper Sacramento River, but smaller because the effect of CP5 on river flows would attenuate somewhat with distance downstream. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-25 (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 Vernal pools are present in upland areas near the Sacramento River and its tributaries in 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). However, vernal pools are generally not present within the active floodplain of regulated rivers along the lower Sacramento River and in the Delta. Because the sensitive habitat and species are located outside of the area affected by the changes in flows, CP5 would not alter this habitat. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Wild-26 (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 with goals of promoting riparian habitat along the Sacramento River. Because flow regimes and riverine geomorphic processes could be altered with project implementation, riparian habitat could be affected in such a manner that the goals of the local and regional plans would be more difficult to attain. Therefore, this impact would be potentially significant.

This impact would be the same as Impact Wild-26 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 13.3.5.

CVP/SWP Service Areas

Impact Wild-27 (CP5): 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 and SWP service areas, CP5 would change flow regimes in several downstream waterways. 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 and SWP service areas outside of the primary study area. Therefore, this impact would be less than significant.

This impact is similar to Impact Wild-27 (CP1). Modified flow regimes under CP5 would reduce the frequency, duration, and magnitude of intermediate to large flows along the Sacramento River. Most potential noticeable changes in flows and stages would diminish downstream from Red Bluff, but substantial changes are predicted in the Sacramento River downstream as far as Freeport in some water years (Table 13-48). The CVP and SWP are operated as an

integrated system with the same downstream management targets and goals. CVP and SWP operations are constrained by the 2008 USFWS BO and the 2009 NMFS BO. Thus, this alternative is not anticipated to sufficiently alter 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. Mitigation for this impact is not needed, and thus not proposed.

13.3.5 Mitigation Measures

Table 13-49 presents a summary of mitigation measures for wildlife resources.

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-18 (CP1), Wild-19 (CP1), Wild-21 (CP1), Wild-22 (CP1), Wild-24 (CP1), Wild-25 (CP1), and Wild-27 (CP1). Mitigation is provided below for the remaining impacts of CP1 on wildlife species.

Table 13-49. Summary of Mitigation Measures for Wildlife Resources

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Wild-1: Take and Loss of Habitat for the Shasta Salamander	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Wild-1: Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-2: Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-2: Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-3: Impact on the Northwestern Pond Turtle and Its Habitat	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-3: Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-4: Impact on the American Peregrine Falcon	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-4: Conduct Preconstruction Surveys for the American Peregrine Falcon and Establish Buffers.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 13-49. Summary of Mitigation Measures for Wildlife Resources (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Wild-5: Take and Loss of Habitat for the Bald Eagle	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Wild-5: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-6: Loss of Dispersal Habitat for the Northern Spotted Owl	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-6: Acquire and Preserve Mitigation Lands, Habitat Enhancement.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Wild-7: Impact on the Purple Martin and Its Habitat	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Wild-7: Conduct a Preconstruction Survey for the Purple Martin and Establish Buffers.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-8: Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-8: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU

Table 13-49. Summary of Mitigation Measures for Wildlife Resources (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Wild-9: Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure						
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-10: Take and Loss of Habitat for the Pacific Fisher	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-10: Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-11: Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, and Yuma Myotis), the American Marten, and Ringtails and Their Habitat	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-11: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for Special-Status Bats, American Marten, and Ringtails and Establish Buffers.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-12: Impacts on Special-Status Terrestrial Mollusks (Shasta Sideband, Wintu Sideband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Wild-12: Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU

Table 13-49. Summary of Mitigation Measures for Wildlife Resources (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Wild-13: Permanent Loss of General Wildlife Habitat	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-13: Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-14: Impacts on Other Birds of Prey (i.e., Red-Tailed Hawk and Red-Shouldered Hawk) and Migratory Bird Species (i.e., American Robin, Anna's Hummingbird) and Their Foraging and Nesting Habitat	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-14: Acquire and Preserve Mitigation Lands and Conduct Preconstruction Surveys for Other Nesting Raptors and Migratory Birds and Establish Buffers.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-15: Loss of Critical Deer Winter and Fawning Range	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-15: Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Wild-16: Take and Loss of the California Red-Legged Frog	LOS before Mitigation	NI	TBD	TBD	TBD	TBD	TBD
	Mitigation Measure	None required.	TBD				
	LOS after Mitigation	NI	TBD	TBD	TBD	TBD	TBD

Table 13-49. Summary of Mitigation Measures for Wildlife Resources (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Wild-17: Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area	LOS before Mitigation	LTS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-17: Implement Mitigation Measure Bot-7: 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.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Wild-18: Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Wild-19: Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact Wild-20: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-20: Implement Mitigation Measure Bot-7: 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.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 13-49. Summary of Mitigation Measures for Wildlife Resources (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Wild-21: Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program	LOS before Mitigation	NI	NI	NI	NI	PS	PS
	Mitigation Measure	None required.	None needed; thus, none proposed.			Mitigation Measure Wild-21: Conduct Preconstruction Surveys for Elderberry Shrubs, Northwestern Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds. Avoid Removal or Degradation of Elderberry Shrubs and Avoid Vegetation Removal near Active Nest Sites.	
	LOS after Mitigation	NI	NI	NI	NI	LTS	LTS
Impact Wild-22: Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration at Reading Island	LOS before Mitigation	NI	NI	NI	NI	PS	PS
	Mitigation Measure	None required.	None needed; thus, none proposed.			Mitigation Measure Wild-22: Implement Mitigation Measure Wild-21: Conduct Preconstruction Surveys for Elderberry Shrubs, Northwestern Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds. Avoid Removal or Degradation of Elderberry Shrubs and Avoid Vegetation Removal near Active Nest Sites.	
	LOS after Mitigation	NI	NI	NI	NI	LTS	LTS
Impact Wild-23: Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta	LOS before Mitigation	LTS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-23: Implement Mitigation Measure Bot-7: 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.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS

Table 13-49. Summary of Mitigation Measures for Wildlife Resources (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Wild-24: Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Wild-25: 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	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact Wild-26: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Wild-26: Implement Mitigation Measure Bot-7: 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.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 13-49. Summary of Mitigation Measures for Wildlife Resources (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Wild-27: Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS

Key:
CP = Comprehensive Plan
LOS = level of significance
LTS = less than significant
NI = no impact
PS = potentially significant
S = significant
SU = significant and unavoidable
TBD = to be determined

Mitigation Measure Wild-1 (CP1): Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander As described in the Preliminary Environmental Commitments and Mitigation Plan Appendix, Reclamation convened an interagency working group to enhance mitigation measures presented in the DEIS. This working group had the benefit of additional information from recent investigations of nearby private lands available for mitigation and refined analyses of potential project impacts. Using this updated information the working group developed and refined mitigation measures for wildlife resources, including land acquisition, habitat management and enhancement, and other measures.

Mitigation measure Wild-1 consists of a program to acquire nearby private lands with similar habitat attributes and species composition as those impacted by the SLWRI project. Reclamation has identified several willing private landowners and specific parcels for purchase in the SLWRI project area vicinity. Preliminary investigations of these lands have shown they contain similar and/or additional habitats and special-status species as those impacted by SLWRI. Special-status wildlife species known to occur on the lands subject to these preliminary investigations include Church's sideband, Klamath shoulderband, Shasta chaparral, Shasta sideband, Shasta hesperian, Shasta salamander, foothill yellow-legged frog, bald eagle, and Pacific fisher. Additionally, the interagency working group identified other private parcels with similar biological resources in the vicinity of the SLWRI project area, some of which have owners willing to discuss purchase agreements.

As discussed during the interagency working group meetings, mitigation measure Wild-3 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. The interagency working group also agreed that additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Inundation Area It is unfeasible to quantify the number of individual Shasta salamanders that would be lost in the impoundment area. Direct loss of individuals and of limestone habitat from inundation cannot be mitigated. As described above, mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-1 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-1 will mitigate for the loss of 1,195 acres of Shasta salamander habitat in the inundation area and 425 acres in the relocation areas by acquiring a minimum of 4,860 acres of mitigation lands containing comparable habitats. Potential mitigation lands containing comparable Shasta salamander habitat have been identified adjacent to the project. Shasta salamander has been found in both limestone and nonlimestone habitat in this site.

Vegetation Removal and Construction Activities

- To minimize impacts on individuals, preconstruction surveys, in consultation with CDFW and USFS, will be conducted by a qualified biologist before construction activities during the wet season. Individuals will be relocated to suitable limestone habitat in the vicinity of detection.

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities. However, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-1 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-2 (CP1): Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog To avoid or minimize impacts on the foothill yellow-legged frog and tailed frog, the following measures will be implemented.

Inundation Area Individual foothill yellow-legged frog and tailed frogs will not be affected by the inundation caused by the raise of the dam. Animals will be able to swim upstream to suitable habitat.

This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-2 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-2 will mitigate for the loss of 35 acres of foothill yellow-legged frog and tailed frog habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 108 acres of mitigation lands containing comparable habitats.

Vegetation Removal and Construction Activities

- To the extent feasible, projects planned in relocation areas will be designed to avoid construction in perennial streams and their associated riparian zones.

- When instream construction activities must occur, a preconstruction survey of the foothill yellow-legged frog and tailed frog adults, larvae, and eggs will be conducted by a qualified biologist before ground-disturbing activities begin in perennial stream and riparian habitat. This survey will be conducted within the construction boundary no more than 1 week before instream or adjacent riparian construction activities begin. If foothill yellow-legged frog or tailed frog adults, larvae, or eggs are detected, the biologist in coordination with CDFW and USFS will relocate them to a suitable stream habitat outside the construction boundary. If frogs are absent, no further surveys will be required.

- If adults are found to use the stream where construction activities are intended to take place, a qualified biologist will relocate all individuals to suitable habitat outside the construction zone daily before instream activities resume.

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities. However, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-2 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-3 (CP1): Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle To avoid or minimize impacts on the northwestern pond turtle, the following measures will be implemented.

Inundation Area Individual northwestern pond turtles will not be impacted by the inundation caused by the raise of the dam. Lacustrine is suitable habitat for the northwestern pond turtle. The loss of northwestern pond turtle nests in the inundation zone if inundated while eggs are in the nest is unavoidable.

This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-3 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value

habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-3 will mitigate for the loss of 35 acres of northwestern pond turtle habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 108 acres of mitigation lands containing comparable habitats.

Vegetation Removal and Construction Activities

- To the extent feasible, projects planned in relocation areas will be designed to avoid all suitable aquatic habitat and its associated riparian zone.

- When construction activities are to occur within suitable northwestern pond turtle habitat as defined in Impact Wild-3 (CP1), a qualified biologist will conduct a minimum of one preconstruction survey for northwestern pond turtles and their nests. The survey will be conducted no more than 1 week before construction. If a pond turtle nest is found, the biologist will flag the site and determine whether construction activities can avoid impacting the nest. If the nest cannot be avoided, CDFW and the USFS will be contacted for further direction and construction activities in that location will be halted.

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

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities. However, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-3 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-4 (CP1): Conduct Preconstruction Surveys for the American Peregrine Falcon and Establish Buffers To avoid or minimize impacts on nesting American peregrine falcons, the following measures will be implemented.

Inundation Area Individual American peregrine falcons will not be impacted by the inundation caused by the raise of the dam.

Vegetation Removal and Construction Activities

- To the extent feasible, projects planned in relocation areas will be designed to avoid suitable cliff habitat.

- If vegetation removal or construction occurs outside of the breeding season (August 1 through March 31), no further mitigation will be necessary. If the breeding season cannot be completely avoided, the following measure will be implemented.

- For proposed construction activities during the breeding season (February 1 and July 31) within 0.5 mile of a known American peregrine falcon eyrie or suitable habitat identified in Impact Wild-4 (CP1), a qualified biologist will conduct a protocol-level survey. The survey will be conducted no more than 2 weeks before construction begins. If an active nest is found, a qualified biologist, in consultation with CDFW, will determine the construction-free buffer zone to be established around the nest until the young have fledged. In consultation with CDFW, a plan will be developed to monitor whether construction activity is disturbing the nesting process and to determine when the young have fledged.

Implementation of this mitigation measure would reduce Impact Wild-4 (CP1) to a less-than-significant level.

Mitigation Measure Wild-5 (CP1): Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers To avoid or minimize impacts on nesting bald eagles, the following measures will be implemented.

Inundation Area This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-5 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations. For bald eagles, emphasis will also be placed on the location of these mitigation lands relative to large water body features to ensure these lands provide potential bald eagle habitat.

Under CP1, Wild-5 will mitigate for the loss of 979 acres of bald eagle habitat in the inundation area and 393 acres in the relocation areas by acquiring a minimum of 4,116 acres of mitigation lands containing comparable habitats. Additional mitigation will be provided by implementing fuels reduction projects within and adjacent to existing bald eagle nest stands at Shasta Lake to help protect those sites from wildfire.

Vegetation Removal and Construction Activities

- For each year of vegetation removal or construction activity, all active bald eagle nests will be located and mapped using the National Bald Eagle Management Guidelines (USFWS 2007).

- If vegetation removal or construction occurs outside of the breeding season (August 2 through December 31), no further mitigation will be necessary. If the breeding season cannot be completely avoided, the following measure will be implemented.

- If vegetation removal is to occur between January 1 and August 1, a 660-foot to 0.5-mile buffer will be established around active nests in consultation with CDFW and USFS. No vegetation removal or construction activity will occur within the established buffer during the limited operating period.

The avoidance and relocation measures for vegetation removal and construction activities and the nest protection measures within the inundation area would effectively mitigate impacts caused by those activities. However, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-5 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-6 (CP1): Acquire and Preserve Mitigation Lands for Northern Spotted Owl To avoid or minimize impacts on northern spotted owl dispersal habitat, the following measures will be implemented.

Inundation Area This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-6 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-6 will mitigate for the loss of 438 acres of northern spotted owl dispersal habitat in the inundation area and 341 acres in the relocation areas by acquiring a minimum of 2,337 acres of mitigation lands containing comparable habitats.

Providing compensatory mitigation by acquiring and conserving habitat mitigation lands for dispersal habitat will minimize this impact. Implementation

of this mitigation measure would reduce Impact Wild-6 (CP1) to a less-than-significant level.

Mitigation Measure Wild-7 (CP1): Conduct a Preconstruction Survey for the Purple Martin and Establish Buffers Purple martins at Shasta Lake nest in flooded snags within the existing reservoir and snags occurring in recently burned areas at nearby upland locations. To avoid or minimize impacts on nesting purple martins, implement the following mitigation measures:

- To the extent feasible, all snags in the Pit Arm will be retained. Vegetation will not be removed from the Pit Arm from Jones Valley north, with exception of Arbuckle Campground, which will provide snag recruitment from trees that will die from inundation.

- If vegetation removal or construction occurs outside of the breeding season (September 1 through March 31), no further mitigation will be necessary. If the breeding season cannot be completely avoided, the following measure will be implemented.

- If proposed vegetation removal and construction activities are to take place on the Pit Arm from April 1 through August 31, a qualified biologist will conduct a protocol-level survey to locate active nests. The survey will be conducted no more than 2 weeks before construction begins. If an active nest is found, a qualified biologist, in consultation with CDFW, will determine a construction-free buffer zone to be established around the nest until the young have fledged. In consultation with CDFW, a plan will be developed to monitor whether construction activity is disturbing the reproductive process and to determine when the young have fledged.

In addition these measures, Reclamation will develop a purple martin management plan that details additional specific actions to minimize impacts in the inundation zone and maintain purple martin habitat in adjacent uplands. At a minimum, the management plan will include the following actions:

- Determine key upland nesting locations and identify vegetation management prescriptions, including prescribed fire and manual/mechanized techniques, which maintain open habitats and snags to preserve purple martin habitat.

- Implement vegetation management that maintains open habitats and snags to preserve purple martin habitat in the key upland locations.

- A minimum of 3 years before project construction and initial (new) inundation, develop an experimental artificial nest box program in upland nesting locations, including monitoring and adaptive management.

Implementation of this mitigation measure will reduce impacts on individual purple martins nesting during the implementation of the project; however, these measures would not protect purple martins actively nesting within the impoundment area when the lake reaches maximum inundation and might not fully mitigate the loss of snags used for nesting. Therefore, Impact Wild-7 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-8 (CP1): Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers To avoid or minimize impacts on nesting willow flycatchers, Vaux's swifts, yellow warblers, and yellow-breasted chats, the following measures will be implemented.

Inundation Area Individuals actively nesting within the impoundment area could be flooded when the lake reaches maximum inundation. These potential losses cannot be mitigated.

This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-8 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-8 will mitigate for the loss of 954 acres of Vaux's swift habitat in the inundation area and 390 acres in the relocation areas by acquiring a minimum of 1,344 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-8 will mitigate for the loss of 28 acres of willow flycatcher, yellow warbler, and yellow-breasted chat habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 87 acres of mitigation lands containing comparable habitats.

Vegetation Removal and Construction Activities

- To the extent feasible, projects planned in relocation areas will be designed to avoid riparian habitat.

- To the extent feasible, construction activities will be avoided within riparian habitat and snags suitable for Vaux's swift nesting.

- If vegetation removal or construction occurs outside of the breeding season (September 1 through March 31), no further mitigation will be

necessary. If the breeding season cannot be completely avoided, the following measure will be implemented.

- If proposed vegetation removal and construction activities are to occur within 250 feet of suitable habitat for willow flycatchers, Vaux's swifts, yellow warblers, and yellow-breasted chats between April 1 and August 31, a qualified biologist will conduct a preconstruction survey no more than 2 weeks before construction activities begin. If an active nest is found, a qualified biologist, in consultation with CDFW, will determine a construction-free buffer zone to be established around the nest until the young have fledged. In consultation with CDFW, a plan will be developed to monitor whether construction activity is disturbing the reproductive process and to determine when the young have fledged.

- If willow flycatchers are detected during the preconstruction survey, protocol-level surveys using a current approved protocol will be conducted to locate and monitor active nests.

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities; however, these measures would not protect individuals actively nesting within the impoundment area when the lake reaches maximum inundation. Also, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-8 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-9 (CP1): Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Establish Buffers To avoid or minimize impacts to these species, the following measures will be implemented.

Inundation Area This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-9 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-9 will mitigate for the loss of 699 acres of long-eared owl and northern goshawk habitat in the inundation area and 327 acres in the relocation

areas by acquiring a minimum of 3,078 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-9 will mitigate for the loss of 1,072 acres of Cooper's hawk and great blue heron habitat in the inundation area and 402 acres in the relocation areas by acquiring a minimum of 4,422 acres of mitigation lands containing comparable habitats.

Vegetation Removal and Construction Activities

- To the extent feasible, construction activities will be avoided within riparian habitat.

- If vegetation removal or construction takes place outside of the breeding season (March 31 through September 1), no further mitigation will be necessary. If the breeding season cannot be completely avoided, the following measure will be implemented.

- If proposed vegetation removal and construction activities are to take place within 0.25 mile of suitable habitat for the long-eared owl, northern goshawk, Cooper's hawk, and great blue heron between February 1 and August 31, a qualified biologist will conduct a preconstruction survey no more than 2 weeks before construction activities begin. Protocol-level surveys will be conducted in suitable goshawk habitat.

- If vegetation removal is to occur between February 1 and August 31, a construction-free buffer will be established around active nests in consultation with CDFW and USFS. No vegetation removal or construction activity will occur within the established buffer during the limited operating period.

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities. However, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-9 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-10 (CP1): Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Pacific Fisher and Establish Buffers To avoid or minimize impacts on Pacific fisher natal dens, the following measures will be implemented.

Inundation Area Pacific fisher natal dens within the impoundment area could be flooded when the lake reaches maximum inundation. These potential losses cannot be mitigated. However, female fishers often move young to alternate natal dens if threatened or disturbed.

This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-10 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-10 will mitigate for the loss of 749 acres of Pacific fisher habitat in the inundation area and 330 acres in the relocation areas by acquiring a minimum of 3,237 acres of mitigation lands containing comparable habitats. Potential mitigation lands containing comparable habitat and where Pacific fishers are known to occur have been identified adjacent to the project.

Vegetation Removal and Construction Activities

- If vegetation removal or construction occurs outside of the breeding season (February 1 through May 1), no further mitigation will be necessary. If the breeding season cannot be completely avoided, the following measure will be implemented.

- If proposed vegetation removal and construction activities are to occur in suitable habitat for the Pacific fisher between February 1 and May 1, a qualified biologist will conduct a preconstruction survey for potential natal or maternity den trees no more than 2 weeks before construction activities begin. If an active den is found, a qualified biologist, in consultation with USFS, BLM (if on BLM land), and USFWS, will determine a construction-free buffer zone to be established around the den until the mother and young have dispersed. In consultation with USFWS, a plan will be developed to monitor whether construction activity is disturbing the reproductive success and to determine when the young have dispersed.

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities. However, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-10 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-11 (CP1): Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for Special-Status Bats, American Marten, and Ringtails and Establish Buffers To avoid or minimize impacts on bats, American martens, and ringtails, the following measures will be implemented.

Inundation Area Maternity colonies or natal dens within the impoundment area could be flooded when the lake reaches maximum inundation. These potential losses cannot be mitigated. However, female western red bats, American martens, and ringtails would be expected to move young to alternate locations if threatened or disturbed.

This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-11 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-11 will mitigate for the loss of 31 acres of pallid bat, spotted bat, western mastiff bat, Townsend's big-eared bat, Yuma myotis, and fringed myotis habitat in the inundation area and 35 acres in the relocation areas by acquiring a minimum of 198 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-11 will mitigate for the loss of 1,201 acres of western red bat and long-eared myotis habitat in the inundation area and 457 acres in the relocation areas by acquiring a minimum of 4,974 acres of mitigation lands containing comparable habitats.

Under CP1, Wild-11 will mitigate for the loss of 1,201 acres of ringtail habitat in the inundation area and 457 acres in the relocation areas by acquiring a minimum of 1,658 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-11 will mitigate for the loss of 724 acres of American marten habitat in the inundation area and 328 acres in the relocation areas by acquiring a minimum of 3,156 acres of mitigation lands containing comparable habitats.

Vegetation Removal and Construction Activities

- A preconstruction survey conducted by a qualified bat biologist for roosting bats will be conducted before the inundation or removal of any bridges, buildings, known caves, or trees 12 inches or larger in diameter at breast height. If no active roosts are found, then no further action will be warranted. If a maternity roost is present, in consultation with CDFW, a qualified bat biologist will determine the extent of construction-free zones around active nurseries. If either a maternity roost or a hibernacula is present, either of the following measures will be implemented.

To the extent feasible, the project will be redesigned to avoid the loss of the maternity or hibernacula roost.

- If the project cannot be redesigned, removal of the occupied tree or structure should begin before maternity colonies form (i.e., before March 1) or after young are volant (flying) (i.e., after July 31). The established disturbance-free buffer will be observed during the maternity roost season (March 1 through July 31).

- If a nonbreeding bat hibernacula is found in a structure or tree scheduled for removal, the individuals will be safely evicted, under the direction of a qualified bat biologist (as determined by a memorandum of understanding with CDFW), by opening the roosting area to allow air flow through the cavity. Removal of the tree or structure will follow not before the following day (i.e., there should be at least 1 night between initial disturbance for air flow and the demolition). This action will 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 before removal that same evening, to allow bats to escape at night.

- For the American marten and ringtail, if vegetation removal or construction occurs outside of the breeding season (May 2 through January 31), no further mitigation is necessary. If the breeding season cannot be completely avoided, the following measure will be implemented.

- If proposed vegetation removal and construction activities are to occur in suitable habitat for the American marten and ringtail between February 1 and May 1, a qualified biologist will conduct a preconstruction survey for potential natal or maternity den trees no more than 2 weeks before construction activities begin. If an active den is found, a qualified biologist, in consultation with CDFW and USFS, will determine a construction-free buffer zone to be established around the den until the mother and young have dispersed. In consultation with CDFW and USFS, a plan will be developed to monitor whether construction activity is disturbing the reproductive success and to determine when the young have dispersed.

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities. However, the loss of some individuals from inundation cannot be mitigated. Also, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-11 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-12 (CP1): Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks To avoid or minimize impacts on special-status terrestrial mollusks, the following measures will be implemented.

Inundated Area It is infeasible to quantify the loss of individuals in the impoundment area. The loss of individuals and loss of limestone habitat (for Shasta and Wintu sideband snails) cannot be mitigated.

This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). As described in Wild-1 (CP1), mitigation lands will be acquired to mitigate for the loss of habitat. Additionally, opportunities for restoration and enhancement of habitat will be explored and defined. Mitigation measure Wild-12 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. This ratio will be applied specific to each habitat type. Additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-12 will mitigate for the loss of 1,195 acres of Church's sideband, Oregon shoulderband, and Shasta chaparral habitat in the inundation area and 425 acres in the relocation areas by acquiring a minimum of 4,860 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-12 will mitigate for the loss of 28 acres of Shasta hesperian habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 87 acres of mitigation lands containing comparable habitats.

Under CP1, Wild-12 will mitigate for the loss of 5 acres of Shasta sideband habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 18 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-12 will mitigate for the loss of 1.5 acres of Wintu sideband habitat in the inundation area by acquiring a minimum of 4.5 acres of mitigation lands containing comparable habitats.

Vegetation Removal and Construction Activities

- When feasible, use of heavy equipment and excavation in limestone substrates and riparian or mesic habitats will be avoided.

- Guidelines provided in Management Recommendations for Survey and Manage Terrestrial Mollusks (Burke et al. 1999) will be applied.

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities. However, the loss of some individuals from inundation cannot be mitigated. Also, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be

accurately determined without additional details. Therefore, Impact Wild-12 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-13 (CP1): Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat Mitigation measure Wild-13 consists of a program to acquire nearby private lands with similar habitat attributes and species composition as those impacted by the SLWRI project. Reclamation has identified several willing private landowners and specific parcels for purchase in the SLWRI project area vicinity. Preliminary investigations of these lands have shown they contain similar and/or additional habitats and special-status species as those impacted by SLWRI. Additionally, the interagency working group identified other private parcels with similar biological resources in the vicinity of the SLWRI project area, some of which have owners willing to discuss purchase agreements.

As discussed during the interagency working group meetings, mitigation measure Wild-13 will begin with a 3:1 minimum replacement ratio of acquired lands to impacted lands. The interagency working group also agreed that additional considerations will be made for other replacement ratios (more or less), depending on habitat quality at a particular site. Emphasis will be placed on lands containing high-value habitats (e.g., riparian, wetland, limestone, blue oak woodlands) and/or special-status species populations.

Under CP1, Wild-13 will mitigate for the loss of 1,227 acres of overall habitats and western bumble bee habitat in the inundation area and 698 acres in the relocation areas by acquiring a minimum of 5,775 acres of mitigation lands containing comparable habitats.

The effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-13 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-14 (CP1): Acquire and Preserve Mitigation Lands and Conduct Preconstruction Surveys for Other Nesting Raptors and Migratory Birds and Establish Buffers To avoid or minimize impacts on nesting raptors and migratory birds, the following measures will be implemented.

Inundation Area Individuals actively nesting within the impoundment area could be flooded when the lake reaches maximum inundation. These potential losses cannot be mitigated.

Vegetation Removal and Construction Activities

- To the extent feasible, construction activities will be avoided within riparian habitat.

- If vegetation removal or construction occurs outside of the breeding season (March 31 through September 1), no further mitigation will be necessary. If the breeding season cannot be completely avoided, the following measure will be implemented.

- If project-related vegetation removal or construction will occur during the breeding season (February 1 through August 31), a qualified biologist will conduct a preconstruction survey for nesting birds. For migratory birds (non-raptors), preconstruction surveys will occur within the construction footprint and 250 feet beyond the construction footprint boundary. Surveys will be conducted no more than 2 weeks before construction. For raptors, preconstruction surveys will occur in suitable raptor nesting habitat within 0.25 mile of the construction footprint boundary. If an active nest is found, a qualified biologist, in consultation with CDFW, will determine a construction-free buffer zone to be established around the nest until the young have fledged. In consultation with CDFW, a plan will be developed to monitor whether construction activity is disturbing the reproductive process and to determine when the young have fledged.

The avoidance and relocation measures for vegetation removal and construction activities would effectively mitigate impacts caused by those activities. However, the loss of some individuals from inundation cannot be mitigated. Also, the effectiveness of providing compensatory mitigation by acquiring and conserving habitat mitigation lands to mitigate inundation impacts cannot be accurately determined without additional details. Therefore, Impact Wild-14 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-15 (CP1): Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range

Inundation Area Habitats providing deer wintering and fawning range within the impoundment area would be flooded when the lake reaches maximum inundation. These potential losses cannot be mitigated. Therefore, Impact Wild-15 (CP1) would remain significant and unavoidable.

Mitigation Measure Wild-16 (CP1) Potential impacts and applicable mitigation have yet to be determined for the California red-legged frog. Impacts for each alternative will not be assessed until USFWS has determined whether suitable habitat is present and whether surveys would be required. At that time, the need for mitigation would be determined and appropriate mitigation described, if necessary.

Mitigation Measure Wild-17 (CP1): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan Reclamation will implement Mitigation Measure Bot-7 (CP1), “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 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-17 (CP1) to a less-than-significant level.

Mitigation Measure Wild-20 (CP1): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan
Reclamation will implement Mitigation Measure Bot-7 (CP1), "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 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-20 (CP1) to a less-than-significant level.

Mitigation Measure Wild-23 (CP1): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan Reclamation will implement Mitigation Measure Bot-7 (CP1), "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 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-23 (CP1) to a less-than-significant level.

Mitigation Measure Wild-26 (CP1): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan Reclamation will implement Mitigation Measure Bot-7 (CP1), "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 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-26 (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-18 (CP2), Wild-19 (CP2), Wild-21 (CP2), Wild-22 (CP2), Wild-24 (CP2), Wild-25 (CP2), and Wild-27 (CP2). Mitigation is provided below for the remaining impacts of CP2 on wildlife species.

Mitigation Measure Wild-1 (CP2): Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Implementation of this mitigation measure will reduce impacts on the Shasta salamander; however, because impacts cannot be fully mitigated, Impact Wild-1 (CP2) is considered significant and unavoidable.

Under CP2, Wild-1 will mitigate for the loss of 1,678 acres of Shasta salamander habitat in the inundation area and 425 acres in the relocation areas by acquiring a minimum of 6,309 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-2 (CP2): Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog This mitigation measure is identical to Mitigation Measure Wild-2 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-2 (CP2) is considered significant and unavoidable.

Under CP2, Wild-2 will mitigate for the loss of 47 acres of foothill yellow-legged frog and tailed frog habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 144 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-3 (CP2): Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle This mitigation measure is identical to Mitigation Measure Wild-3 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-3 (CP2) is considered significant and unavoidable.

Under CP2, Wild-3 will mitigate for the loss of 47 acres of northwestern pond turtle habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 144 acres of mitigation lands containing comparable habitats.

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

Mitigation Measure Wild-5 (CP2): Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-5 (CP1). Implementation of this mitigation measure will reduce impacts on individual bald eagles nesting during the implementation of the project;

however, all nest trees in the inundation zone will be lost. Therefore, Impact Wild-5 (CP2) is considered significant and unavoidable.

Under CP2, Wild-5 will mitigate for the loss of 1,376 acres of bald eagle habitat in the inundation area and 393 acres in the relocation areas by acquiring a minimum of 5,307 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-6 (CP2): Acquire and Preserve Mitigation Lands for Northern Spotted Owl This mitigation measure is identical to Mitigation Measure Wild-6 (CP1). Implementation of this mitigation measure will reduce impacts to northern spotted owl dispersal habitat.

Under CP2, Wild-6 will mitigate for the loss of 643 acres of northern spotted owl dispersal habitat in the inundation area and 341 acres in the relocation areas by acquiring a minimum of 2,952 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-7 (CP2): Conduct a Preconstruction Survey for the Purple Martin and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-7 (CP1). Implementation of this mitigation measure will reduce impacts on individual purple martins nesting during the implementation of the project; however, these measures might not fully mitigate the loss of snags used for nesting. Therefore, Impact Wild-7 (CP2) is considered significant and unavoidable.

Mitigation Measure Wild-8 (CP2): Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-8 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-8 (CP2) is considered significant and unavoidable.

Under CP2, Wild-8 will mitigate for the loss of 1,341 acres of Vaux's swift habitat in the inundation area and 390 acres in the relocation areas by acquiring a minimum of 5,193 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-8 will mitigate for the loss of 37 acres of willow flycatcher, yellow warbler, and yellow-breasted chat habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 114 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-9 (CP2): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-9 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-9 (CP2) is considered significant and unavoidable.

Under CP2, Wild-9 will mitigate for the loss of 987 acres of long-eared owl and northern goshawk habitat in the inundation area and 327 acres in the relocation areas by acquiring a minimum of 3,942 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-9 will mitigate for the loss of 1,505 acres of Cooper's hawk and great blue heron habitat in the inundation area and 402 acres in the relocation areas by acquiring a minimum of 5,721 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-10 (CP2): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-10 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-10 (CP2) is considered significant and unavoidable.

Under CP2, Wild-10 will mitigate for the loss of 1,057 acres of Pacific fisher habitat in the inundation area and 330 acres in the relocation areas by acquiring a minimum of 4,161 acres of mitigation lands containing comparable habitats. Potential mitigation lands containing comparable habitat and where Pacific fishers are known to occur have been identified adjacent to the project.

Mitigation Measure Wild-11 (CP2): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for Special-Status Bats, American Marten, and Ringtails and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-11 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-11 (CP2) is considered significant and unavoidable.

Under CP2, Wild-11 will mitigate for the loss of 45 acres of pallid bat, spotted bat, western mastiff bat, Townsend's big-eared bat, Yuma myotis, and fringed myotis habitat in the inundation area and 35 acres in the relocation areas by acquiring a minimum of 240 acres of mitigation lands containing comparable habitats. Also under CP2, Wild-11 will mitigate for the loss of 1,687 acres of western red bat and long-eared myotis habitat in the inundation area and 457 acres in the relocation areas by acquiring a minimum of 6,432 acres of mitigation lands containing comparable habitats.

Under CP2, Wild-11 will mitigate for the loss of 1,687 acres of ringtail habitat in the inundation area and 457 acre in the relocation areas by acquiring a minimum of 6,432 acres of mitigation lands containing comparable habitats. Also under CP2, Wild-11 will mitigate for the loss of 1,022 acres of American marten habitat in the inundation area and 328 acres in the relocation areas by acquiring a minimum of 4,050 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-12 (CP2): Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks This mitigation measure is identical to Mitigation Measure Wild-12 (CP1). Implementation of this mitigation measure will reduce impacts on special-status terrestrial mollusks; however, because impacts cannot be fully mitigated, Impact Wild-12 (CP2) is considered significant and unavoidable.

Under CP2, Wild-12 will mitigate for the loss of 1,697 acres of Church's sideband, Oregon shoulderband, and Shasta chaparral habitat in the inundation area and 425 acres in the relocation areas by acquiring a minimum of 6,366 acres of mitigation lands containing comparable habitats. Also under CP2, Wild-12 will mitigate for the loss of 37 acres of Shasta hesperian habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 114 acres of mitigation lands containing comparable habitats.

Under CP2, Wild-12 will mitigate for the loss of 7 acres of Shasta sideband habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 24 acres of mitigation lands containing comparable habitats. Also under CP2, Wild-12 will mitigate for the loss of 2 acres of Wintu sideband habitat in the inundation area by acquiring a minimum of 6 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-13 (CP2): Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat This mitigation measure is identical to Mitigation Measure Wild-13 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-13 (CP2) is considered significant and unavoidable.

Under CP2, Wild-13 will mitigate for the loss of 1,725 acres of overall habitats and western bumble bee habitat in the inundation area and 698 acres in the relocation areas by acquiring a minimum of 7,269 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-14 (CP2): Acquire and Preserve Mitigation Lands and Conduct Preconstruction Survey for Other Nesting Raptors and Migratory Birds and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-14 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot

be fully mitigated, Impact Wild-14 (CP2) is considered significant and unavoidable.

This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Under CP2, Wild-14 will mitigate for the loss of 1,725 acres of overall habitats and western bumble bee habitat in the inundation area and 698 acres in the relocation areas by acquiring a minimum of 7,239 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-15 (CP2): Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range This mitigation measure is identical to Mitigation Measure Wild-15 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-15 (CP2) is considered significant and unavoidable.

This mitigation measure is identical to Mitigation Measure Wild-13 (CP1). Under CP2, Wild-15 will mitigate for the loss of 1,725 acres of overall habitats and western bumble bee habitat in the inundation area and 698 acres in the relocation areas by acquiring a minimum of 7,239 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-16 (CP2) Potential impacts and applicable mitigation has yet to be determined for the California red-legged frog. This impact is considered significant and unavoidable.

Mitigation Measure Wild-17 (CP2): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP2), described in Chapter 12, “Botanical Resources and Wetlands.” Implementation of this mitigation measure would reduce Impact Wild-17 (CP2) to a less-than-significant level.

Mitigation Measure Wild-20 (CP2): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP2), described in Chapter 12, “Botanical Resources and Wetlands.” Implementation of this mitigation measure would reduce Impact Wild-20 (CP2) to a less-than-significant level.

Mitigation Measure Wild-23 (CP2): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem

Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP2), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-23 (CP2) to a less-than-significant level.

Mitigation Measure Wild-26 (CP2): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP2), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-26 (CP2) to a less-than-significant level.

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

No mitigation is required for Impacts Wild-18 (CP3), Wild-19 (CP3), Wild-21 (CP3), Wild-22 (CP3), Wild-24 (CP3), Wild-25 (CP3), and Wild-27 (CP3). Mitigation is provided below for the remaining impacts of CP3 on wildlife species.

Mitigation Measure Wild-1 (CP3): Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Implementation of this mitigation measure will reduce impacts on the Shasta salamander; however, because impacts cannot be fully mitigated, Impact Wild-1 (CP3) is considered significant and unavoidable.

Under CP3, Wild-1 will mitigate for the loss of 2,415 acres of Shasta salamander habitat in the inundation area and 425 acres in the relocation areas by acquiring a minimum of 8,520 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-2 (CP3): Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog This mitigation measure is identical to Mitigation Measure Wild-2 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-2 (CP3) is considered significant and unavoidable.

Under CP3, Wild-2 will mitigate for the loss of 80 acres of foothill yellow-legged frog and tailed frog habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 243 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-3 (CP3): Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle This mitigation measure is

identical to Mitigation Measure Wild-3 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because the impacts cannot be fully mitigated, Impact Wild-3 (CP3) is considered significant and unavoidable.

Under CP3, Wild-2 will mitigate for the loss of 80 acres of northwestern pond turtle habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 243 acres of mitigation lands containing comparable habitats.

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

Mitigation Measure Wild-5 (CP3): Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-5 (CP1). Implementation of this mitigation measure will reduce impacts on individual bald eagles nesting during the implementation of the project; however, all nest trees in the inundation zone will be lost. Therefore, Impact Wild-5 (CP3) is considered significant and unavoidable.

Under CP3, Wild-5 will mitigate for the loss of 1,989 acres of bald eagle habitat in the inundation area and 393 acres in the relocation areas by acquiring a minimum of 7,146 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-6 (CP3): Acquire and Preserve Mitigation Lands for Northern Spotted Owl This mitigation measure is identical to Mitigation Measure Wild-6 (CP1). Implementation of this mitigation measure will reduce impacts on northern spotted owl dispersal habitat.

Under CP3, Wild-6 will mitigate for the loss of 976 acres of northern spotted owl dispersal habitat in the inundation area and 341 acres in the relocation areas by acquiring a minimum of 3,951 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-7 (CP3): Conduct a Preconstruction Survey for the Purple Martin and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-7 (CP1). Implementation of this mitigation measure will reduce impacts on individual purple martins nesting during the implementation of the project; however, these measures might not fully mitigate for the loss of snags used for nesting; therefore, Impact Wild-7 (CP3) is considered significant and unavoidable.

Mitigation Measure Wild-8 (CP3): Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher,

Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-8 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-8 (CP3) is considered significant and unavoidable.

Under CP3, Wild-8 will mitigate for the loss of 1,938 acres of Vaux's swift habitat in the inundation area and 390 acres in the relocation areas by acquiring a minimum of 6,984 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-8 will mitigate for the loss of 58 acres of willow flycatcher, yellow warbler, and yellow-breasted chat habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 177 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-9 (CP3): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-9 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-9 (CP3) is considered significant and unavoidable.

Under CP3, Wild-9 will mitigate for the loss of 1,428 acres of long-eared owl and northern goshawk habitat in the inundation area and 327 acres in the relocation areas by acquiring a minimum of 5,265 acres of mitigation lands containing comparable habitats. Also under CP1, Wild-9 will mitigate for the loss of 2,167 acres of Cooper's hawk and great blue heron habitat in the inundation area and 402 acres in the relocation areas by acquiring a minimum of 7,707 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-10 (CP3): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-10 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-10 (CP3) is considered significant and unavoidable.

Under CP2, Wild-10 will mitigate for the loss of 1,533 acres of Pacific fisher habitat in the inundation area and 330 acres in the relocation areas by acquiring a minimum of 5,589 acres of mitigation lands containing comparable habitats. Potential mitigation lands containing comparable habitat and where Pacific fishers are known to occur have been identified adjacent to the project.

Mitigation Measure Wild-11 (CP3): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for Special-Status Bats, American Marten, and Ringtails and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-11 (CP1). Implementation of

this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-11 (CP3) is considered significant and unavoidable.

Under CP3, Wild-11 will mitigate for the loss of 69 acres of pallid bat, spotted bat, western mastiff bat, Townsend's big-eared bat, Yuma myotis, and fringed myotis habitat in the inundation area and 35 acres in the relocation areas by acquiring a minimum of 312 acres of mitigation lands containing comparable habitats. Also under CP3, Wild-11 will mitigate for the loss of 2,431 acres of western red bat and long-eared myotis habitat in the inundation area and 457 acres in the relocation areas by acquiring a minimum of 8,664 acres of mitigation lands containing comparable habitats.

Under CP3, Wild-11 will mitigate for the loss of 2,431 acres of ringtail habitat in the inundation area and 457 acre in the relocation areas by acquiring a minimum of 8,664 acres of mitigation lands containing comparable habitats. Also under CP3, Wild-11 will mitigate for the loss of 1,482 acres of American marten habitat in the inundation area and 328 acres in the relocation areas by acquiring a minimum of 5,430 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-12 (CP3): Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks This mitigation measure is identical to Mitigation Measure Wild-12 (CP1). Implementation of this mitigation measure will reduce impacts on special-status terrestrial mollusks; however, because impacts cannot be fully mitigated, Impact Wild-12 (CP3) is considered significant and unavoidable.

Under CP2, Wild-12 will mitigate for the loss of 2,415 acres of Church's sideband, Oregon shoulderband, and Shasta chaparral habitat in the inundation area and 425 acres in the relocation areas by acquiring a minimum of 8,520 acres of mitigation lands containing comparable habitats. Also under CP2, Wild-12 will mitigate for the loss of 58 acres of Shasta hesperian habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 177 acres of mitigation lands containing comparable habitats.

Under CP2, Wild-12 will mitigate for the loss of 11 acres of Shasta sideband habitat in the inundation area and 1 acre in the relocation areas by acquiring a minimum of 36 acres of mitigation lands containing comparable habitats. Also under CP2, Wild-12 will mitigate for the loss of 3 acres of Wintu sideband habitat in the inundation area by acquiring a minimum of 9 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-13 (CP3): Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat This mitigation measure is identical to Mitigation Measure Wild-13 (CP1). Implementation of this mitigation measure will reduce

impacts on these species; however, because the impacts cannot be fully mitigated, Impact Wild-13 (CP3) is considered significant and unavoidable.

Under CP3, Wild-13 will mitigate for the loss of 2,492 acres of overall habitats and western bumble bee habitat in the inundation area and 698 acres in the relocation areas by acquiring a minimum of 9,570 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-14 (CP3): Acquire and Preserve Mitigation Lands and Conduct Preconstruction Survey for Other Nesting Raptors and Migratory Birds and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-14 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-14 (CP3) is considered significant and unavoidable.

This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Under CP3, Wild-14 will mitigate for the loss of 2,492 acres of overall habitats and western bumble bee habitat in the inundation area and 698 acres in the relocation areas by acquiring a minimum of 9,570 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-15 (CP3): Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range This mitigation measure is identical to Mitigation Measure Wild-15 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-15 (CP3) is considered significant and unavoidable.

This mitigation measure is identical to Mitigation Measure Wild-13 (CP1). Under CP3, Wild-15 will mitigate for the loss of 2,492 acres of overall habitats and western bumble bee habitat in the inundation area and 698 acres in the relocation areas by acquiring a minimum of 9,570 acres of mitigation lands containing comparable habitats.

Mitigation Measure Wild-16 (CP3): Potential impacts and applicable mitigation has yet to be determined for the California red-legged frog. This impact is considered significant and unavoidable.

Mitigation Measure Wild-17 (CP3): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP3), described in Chapter 12, “Botanical Resources and Wetlands.” Implementation of this mitigation measure would reduce Impact Wild-17 (CP3) to a less-than-significant level.

Mitigation Measure Wild-20 (CP3): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP3), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-20 (CP3) to a less-than-significant level.

Mitigation Measure Wild-23 (CP3): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP3), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-23 (CP3) to a less-than-significant level.

Mitigation Measure Wild-26 (CP3): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP3), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-26 (CP3) to a less-than-significant level.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation is needed for Impacts Wild-18 (CP4 and CP4A), Wild-19 (CP4 and CP4A), Wild-24 (CP4 and CP4A), Wild-25 (CP4 and CP4A), and Wild-27 (CP4 and CP4A). Mitigation is provided below for the remaining impacts of CP4 or CP4A on wildlife species.

Mitigation Measure Wild-1 (CP4 and CP4A): Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Implementation of this mitigation measure will reduce impacts on the Shasta salamander; however, because impacts cannot be fully mitigated, Impact Wild-1 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-2 (CP4 and CP4A): Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog This mitigation measure is identical to Mitigation Measure Wild-2 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-2 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-3 (CP4 and CP4A): Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle This mitigation measure is identical to Mitigation Measure Wild-3 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-3 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-4 (CP4 and CP4A): Conduct Preconstruction Surveys for the American Peregrine Falcon and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-4 (CP1). Implementation of this mitigation measure will reduce Impact Wild-4 (CP4 and CP4A) to a less-than- significant level.

Mitigation Measure Wild-5 (CP4 and CP4A): Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-5 (CP1). Implementation of this mitigation measure will reduce impacts on individual bald eagles nesting during the implementation of the project; however, all nest trees in the inundation zone will be lost. Therefore, Impact Wild-5 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-6 (CP4 and CP4A): Acquire and Preserve Mitigation Lands for Northern Spotted Owl This mitigation measure is identical to Mitigation Measure Wild-6 (CP1). Implementation of this mitigation measure will reduce impacts on northern spotted owl dispersal habitat.

Mitigation Measure Wild-7 (CP4 and CP4A): Conduct a Preconstruction Survey for the Purple Martin and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-7 (CP1). Implementation of this mitigation measure will reduce impacts on individual purple martins nesting during the implementation of the project; however, these measures might not fully mitigate the loss of snags used for nesting. Therefore, Impact Wild-7 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-8 (CP4 and CP4A): Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-8 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-8 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-9 (CP4 and CP4A): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Establish Buffers This mitigation measure is identical to Mitigation

Measure Wild-9 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-9 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-10 (CP4 and CP4A): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-10 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-10 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-11 (CP4 and CP4A): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for Special-Status Bats, American Marten, and Ringtails and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-11 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-11 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-12 (CP4 and CP4A): Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks This mitigation measure is identical to Mitigation Measure Wild-12 (CP1). Implementation of this mitigation measure will reduce impacts on special-status terrestrial mollusks; however, because impacts cannot be fully mitigated, Impact Wild-12 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-13 (CP4 and CP4A): Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat This mitigation measure is identical to Mitigation Measure Wild-13 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-13 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-14 (CP4 and CP4A): Acquire and Preserve Mitigation Lands and Conduct Preconstruction Survey for Other Nesting Raptors and Migratory Birds and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-14 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-14 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-15 (CP4 and CP4A): Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range This mitigation measure is identical to Mitigation Measure Wild-15 (CP1). Implementation of this mitigation measure will reduce impacts

on these species; however, because impacts cannot be fully mitigated, Impact Wild-15 (CP4 and CP4A) is considered significant and unavoidable.

Mitigation Measure Wild-16 (CP4 and CP4A): Potential impacts and applicable mitigation has yet to be determined for the California red-legged frog. This impact is considered significant and unavoidable.

Mitigation Measure Wild-17 (CP4 and CP4A): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP4 and CP4A), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-17 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Wild-20 (CP4 and CP4A): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP4 and CP4A), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-20 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Wild-21 (CP4 and CP4A): Conduct Preconstruction Surveys for Elderberry Shrubs, Western Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds; Avoid Removal or Degradation of Elderberry Shrubs; and Avoid Vegetation Removal Near Active Nest Sites To avoid impacts on valley elderberry longhorn beetle, western pond turtle, and nesting raptors, and other nesting birds, Reclamation will implement the following measures at gravel augmentation sites with the potential to affect these species:

Valley Elderberry Longhorn Beetle

- A worker awareness training program for construction personnel will be conducted by a qualified biologist/restoration ecologist before gravel augmentation activities begin. The program will inform all construction personnel about the life history and status of the beetle, the need to avoid damaging the elderberry plants, and the possible penalties for not complying with these requirements. Written documentation of the training will be submitted to USFWS within 30 days of the completion of training.

- Elderberry shrubs shall be protected through establishment of a fenced avoidance area. Fencing will be placed at least 20 feet from the dripline of the shrubs where they occur along any access routes. Signs will be

posted along the avoidance area. The signs will state: "This area is the habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." Signs will be readable from a distance of 20 feet. Fencing and signs will be maintained at gravel recruitment sites during construction activities.

- If removal of elderberry shrubs during construction of access routes is unavoidable, Reclamation will consult with USFWS as required under Section 7 of the ESA as appropriate. No project construction will proceed in areas potentially containing valley elderberry longhorn beetle until a BO has been issued by USFWS, and Reclamation has abided by all pertinent conditions in the BO relating to the proposed construction.

- Elderberry shrubs will be mitigated for according to the transplantation guidelines outlined in the Beetle Conservation Guidelines (USFWS 1999). These transplantation guidelines dictate the necessary timing and details of the transplanting. At the discretion of USFWS, shrubs that are unlikely to survive transplantation because of poor condition or location, or a plant that would be extremely difficult to move because of access problems, may be exempted from transplantation. In cases where transplantation is not possible, compensation ratios would be increased to offset the additional habitat loss.

- Relocation of existing elderberry shrubs and planting of new elderberry seedlings will be implemented on a no-net-loss basis. Compensatory mitigation for elderberry shrubs that would be removed from their current locations will be developed in consultation with USFWS during the Section 7 consultation process. Compensatory mitigation may include planting replacement elderberry seedlings or cuttings and associated native plants or purchasing credits at an approved mitigation bank, or a combination thereof. Relocated and replacement shrubs and associated native plantings will be placed in conservation areas providing a minimum of 1,800 square feet per transplanted shrub.

- No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant will be used within 100 feet of elderberry shrubs. Roadways and disturbed areas within 100 feet of elderberry shrubs will be watered at least twice a day and as needed to minimize dust emissions.

Western Pond Turtle

- When construction activities are to occur within suitable western pond turtle habitat as defined in Impact Wild-3 (CP1), a qualified biologist will conduct a minimum of one preconstruction survey for western

pond turtles and their nests. The survey will be conducted no more than 1 week before construction. If a pond turtle nest is found, the biologist will flag the site and determine whether construction activities can avoid impacting the nest. If the nest cannot be avoided, CDFW will be contacted for further direction and construction activities in that location will be halted.

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

- When feasible, work areas will be surrounded by exclusion fencing consisting of silt fence securely staked into the ground, with the bottom edge buried at least 6 inches to prevent turtles from accessing the work sites from upland locations.

Birds

- For each year of vegetation removal for gravel augmentation activity, all active bald eagle nests will be located and mapped using the National Bald Eagle Management Guidelines (USFWS 2007).

- In consultation with CDFW and USFS, a 660-foot to 0.5-mile buffer will be established around active nests. Vegetation will be retained and no construction activities will occur within this buffer.

- If proposed vegetation removal would occur between April 1 and August 31, a qualified biologist will conduct a preconstruction survey for nesting special-status birds no more than 2 weeks before construction activities begin. If an active nest is found, a qualified biologist, in consultation with CDFW, will determine a construction-free buffer zone to be established around the nest until the young have fledged. In consultation with CDFW, a plan will be developed to monitor whether construction activity is disturbing the reproductive process and to determine when the young have fledged.

Implementation of this mitigation measure would reduce Impact Wild-21 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Wild-22 (CP4 and CP4A): Implement Mitigation Measure Wild-21: Conduct Preconstruction Surveys for Elderberry Shrubs, Western Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds; Avoid Removal or Degradation of Elderberry Shrubs; and Avoid Vegetation Removal Near Active Nest Sites To avoid impacts on valley elderberry longhorn beetle, western pond turtle, nesting raptors, and other nesting birds, Reclamation will implement the following measures as part of the

gravel augmentation activities project at augmentation sites with the potential to affect these species:

Valley Elderberry Longhorn Beetle This mitigation measure is identical to Mitigation Measure Wild-21 (CP4 and CP4A) for valley elderberry longhorn beetle, except that the following additional measures will be implemented:

- Before implementation of any vegetation improvements or other activities associated with gravel augmentation, including constructing access routes, a survey will be conducted to identify and map all elderberry shrubs.
- New roads, trails, and staging areas will be constructed a minimum of 100 feet from elderberry shrubs.
- Removal and disturbance of elderberry shrubs will be avoided, to the extent feasible.

Western Pond Turtle This mitigation measure is identical to Mitigation Measure Wild-21 (CP4 and CP4A) for western pond turtles.

Birds This mitigation measure is identical to Mitigation Measure Wild-21 (CP4 and CP4A) for birds.

Implementation of this mitigation measure would reduce Impact Wild-22 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Wild-23 (CP4 and CP4A): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP4 and CP4A), described in Chapter 12, “Botanical Resources and Wetlands.” Implementation of this mitigation measure would reduce Impact Wild-23 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Wild-26 (CP4 and CP4A): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP4 and CP4A), described in Chapter 12, “Botanical Resources and Wetlands.” Implementation of this mitigation measure would reduce Impact Wild-26 (CP4 and CP4A) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is required for Impacts Wild-18 (CP5), Wild-19 (CP5), Wild-24 (CP5), Wild-25 (CP5), and Wild-27 (CP5). Mitigation is provided below for the remaining impacts of CP5 on wildlife species.

Mitigation Measure Wild-1 (CP5): Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander This mitigation measure is identical to Mitigation Measure Wild-1 (CP1). Implementation of this mitigation measure will reduce impacts on the Shasta salamander; however, because impacts cannot be fully mitigated, Impact Wild-1 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-2 (CP5): Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog This mitigation measure is identical to Mitigation Measure Wild-2 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-2 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-3 (CP5): Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle This mitigation measure is identical to Mitigation Measure Wild-3 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-3 (CP5) is considered significant and unavoidable.

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

Mitigation Measure Wild-5 (CP5): Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-5 (CP1). Implementation of this mitigation measure will reduce impacts on individual bald eagles nesting during the implementation of the project; however, all nest trees in the inundation zone will be lost. Therefore, Impact Wild-5 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-6 (CP5): Acquire and Preserve Mitigation Lands for Northern Spotted Owl This mitigation measure is identical to Mitigation Measure Wild-6 (CP1). Implementation of this mitigation measure will reduce impacts on northern spotted owl dispersal habitat.

Mitigation Measure Wild-7 (CP5): Conduct a Preconstruction Survey for the Purple Martin and Establish Buffers This mitigation measure is

identical to Mitigation Measure Wild-7 (CP1). Implementation of this mitigation measure will reduce impacts on individual purple martins nesting during the implementation of the project; however, these measures might not fully mitigate the loss of snags used for nesting. Therefore, Impact Wild-7 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-8 (CP5): Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-8 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-8 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-9 (CP5): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-9 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-9 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-10 (CP5): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-10 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-10 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-11 (CP5): Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for Special-Status Bats, American Marten, and Ringtails and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-11 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-11 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-12 (CP5): Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks This mitigation measure is identical to Mitigation Measure Wild-12 (CP1). Implementation of this mitigation measure will reduce impacts on special-status terrestrial mollusks; however, because impacts cannot be fully mitigated, Impact Wild-12 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-13 (CP5): Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat and Western Bumble Bee Habitat This mitigation measure is identical to Mitigation

Measure Wild-13 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-13 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-14 (CP5): Acquire and Preserve Mitigation Lands and Conduct Preconstruction Survey for Other Nesting Raptors and Migratory Birds and Establish Buffers This mitigation measure is identical to Mitigation Measure Wild-14 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-14 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-15 (CP5): Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range This mitigation measure is identical to Mitigation Measure Wild-15 (CP1). Implementation of this mitigation measure will reduce impacts on these species; however, because impacts cannot be fully mitigated, Impact Wild-15 (CP5) is considered significant and unavoidable.

Mitigation Measure Wild-16 (CP5) Potential impacts and applicable mitigation has yet to be determined for the California red-legged frog. This impact is considered significant and unavoidable.

Mitigation Measure Wild-17 (CP5): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP5), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-17 (CP5) to a less-than-significant level.

Mitigation Measure Wild-20 (CP5): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP5), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-20 (CP5) to a less-than-significant level.

Mitigation Measure Wild-21 (CP5): Conduct Preconstruction Surveys for Elderberry Shrubs, Western Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds; Avoid Removal or Degradation of Elderberry Shrubs; and Avoid Vegetation Removal Near Active Nest Sites This mitigation measure is identical to Mitigation Measure Wild-21 (CP4 and CP4A). Implementation of this mitigation measure would reduce Impact Wild-21 (CP5) to a less-than-significant level.

Mitigation Measure Wild-22 (CP5): Implement Mitigation Measure Wild-21: Conduct Preconstruction Surveys for Elderberry Shrubs, Western Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds; Avoid Removal or Degradation of Elderberry Shrubs; and Avoid Vegetation Removal Near Active Nest Sites This mitigation measure is identical to Mitigation Measure Wild-22 (CP4 and CP4A). Implementation of this mitigation measure would reduce Impact Wild-22 (CP5) to a less-than-significant level.

Mitigation Measure Wild-23 (CP5): To Reduce Impacts on Riparian-Associated and Aquatic Special-Status Wildlife along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP5), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-23 (CP5) to a less-than-significant level.

Mitigation Measure Wild-26 (CP5): To Promote Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta, Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan This mitigation measure is identical to Mitigation Measure Bot-7 (CP5), described in Chapter 12, "Botanical Resources and Wetlands." Implementation of this mitigation measure would reduce Impact Wild-26 (CP5) to a less-than-significant level.

13.3.6 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," discusses overall cumulative impacts methodology related to the action alternatives, including the relationship to the CALFED Bay-Delta Program Programmatic EIS/EIR cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the present and reasonably foreseeable future projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 under Quantitative Analysis would have impacts on wildlife resources in the primary study area, nor would they have overlapping cumulative effects on wildlife resources with any of the action alternatives. Therefore, the following analysis is based on the programs and projects listed in the Qualitative Analysis section of Table 3-1. Projects listed in Table 3-1 that may have cumulative effects in the primary and extended study area include, but are not limited to,

the CALFED Ecosystem Restoration Program, Bay-Delta Conservation Plan, Sacramento River Conservation Area Forum Program, Central Valley Flood Protection Plan, PG&E and DWR Hydropower Relicensing Programs, Antlers Bridge Replacement, Moody Flats Quarry, and the Mountain Gate at Shasta Mixed Use Area Plan.

A large number of past actions have occurred in the study area. These past actions have substantially degraded wildlife resources in the primary and extended study areas. This degradation is in part indicated by the number of species that have been listed as threatened or endangered under the CESA and ESA, or considered species of special concern by CDFW.

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 agricultural, road, dam, levee, or utility maintenance).

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 (or entirely eliminating) 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 Delta (Fremier 2003, TNC et al. 2008).

The effects of climate change on operations at Shasta Lake could potentially affect wildlife both at the lake and downstream. As described in the Climate Change Modeling Appendix, climate change could result in higher reservoir releases in the future because of an increase in winter and early-spring inflow into the lake from high-intensity storm events. The change in reservoir releases could be necessary to manage for flood events resulting from these potentially larger storms. The potential increase in releases from the reservoir could lead to long-term changes in flooding frequency, downstream habitat for wildlife, and water temperatures which could affect habitat along the Sacramento River and in the Delta. Climate change is also expected to result in changes to conditions for agricultural land and forest land, which are both habitat types. See Chapter 10, "Agriculture and Important Farmland," for a detailed discussion of effects on these habitat types.

Shasta Lake and Vicinity

The construction of Shasta Dam and the subsequent flooding of the area now known as Shasta Lake affected botanical and wildlife resources endemic to the

region. For example, based on population locations, Shasta snow-wreath populations may have connected at the confluence of the Pit River, Squaw Creek, McCloud River, and Sacramento River before inundation. The creation of Shasta Lake fragmented this species habitat and populations. As a result, these populations are more vulnerable to extirpation.

As described in Section 13.3, without mitigation, CP1 through CP5 could cause potentially significant effects on wildlife habitats and special-status wildlife species in the primary and extended study areas. These effects could be caused by project construction activities; increased elevations of the water surface of Shasta Lake; and alteration of the flow regime of the Sacramento River and associated geomorphic processes, and thus of riparian vegetation. Although causing similar effects, CP1 through CP5 differ in the magnitude of their effects. At Shasta Lake and its vicinity, these potential adverse effects would be similar for all alternatives, but differ with the height of the dam raise: the effects of CP2 would be greater than CP1, the same as CP4A, and less than CP3 through CP5 (which would be identical). Along the upper Sacramento River and in the extended study area, potential adverse effects would be the result of altered flow regimes and would differ with both the height of the dam raise and operation of the dam: the effects of CP2 would be greater than CP1 and CP4 (which would be identical), the same as CP4A, and less than CP3 and CP5 (which also would have identical effects).

At Shasta Lake and vicinity, CP1 through CP5 would cause the take and loss of habitat for numerous species, including Shasta salamander, foothill yellow-legged frog, tailed frog, Northwestern pond turtle, American peregrine falcon, bald eagle, northern spotted owl, purple martin, Vaux's swift, yellow warbler, yellow-breasted chat, long-eared owl, northern goshawk, Cooper's hawk, osprey, Pacific fisher, and other special-status species. The wildlife mitigation measures described in Section 13.3.5 would reduce impacts on wildlife resources, although the adverse effects of CP1 through CP5 caused by construction activities and inundation would not be eliminated. Because the overall effect of past actions on these species has been cumulatively significant, and the likely additional effects of reasonably foreseeable future actions on wildlife habitat at Shasta Lake and in its vicinity, the adverse effects under CP1 through CP5 would cause a cumulatively considerable incremental contribution to the significant cumulative impact on wildlife.

Upper Sacramento River and Extended Study Area

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability As described in Chapter 2, "Alternatives," 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 adverse effects from CP1

would be a cumulatively considerable incremental contribution to significant cumulative effects on vegetation, wildlife habitats, and special-status wildlife species. With implementation of Mitigation Measure Bot-7, "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" (see Chapter 12, "Botanical Resources and Wetlands"), adverse effects from CP1 would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on these resources.

As stated previously, effects of climate change on operations at Shasta Lake could include a higher frequency of high-flow events, potentially resulting in changes to downstream habitats. Potentially significant effects on vegetation, wildlife habitats, and special-status wildlife species that would occur with implementation of CP1 could contribute to potentially significant effects of climate change on habitat acreages and distribution. However, with implementation of the mitigation measures listed above to reduce project-related impacts of CP1, CP1 would not make a cumulatively considerable incremental contribution to a significant cumulative 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 a cumulatively considerable incremental contribution to significant cumulative effects on vegetation, wildlife habitats, and special-status wildlife species. With implementation of Mitigation Measure Bot-7, "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" (see Chapter 12, "Botanical Resources and Wetlands"), adverse effects from CP2 would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on these resources.

As stated previously, effects of climate change on operations at Shasta Lake could include a higher frequency of high-flow events, potentially resulting in changes to downstream habitats. Potentially significant effects on vegetation, wildlife habitats, and special-status wildlife species that would occur with implementation of CP2 could contribute to potentially significant effects of climate change on habitat acreages and distribution. However, with implementation of the mitigation measures listed above to reduce project-related impacts of CP2, CP2 would not make a cumulatively considerable incremental contribution to a significant cumulative effect.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival 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 a cumulatively considerable incremental

contribution to significant cumulative effects on vegetation, wildlife habitats, and special-status wildlife species. With implementation of Mitigation Measure Bot-7, "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" (see Chapter 12, "Botanical Resources and Wetlands"), adverse effects from CP3 would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on these resources.

As stated previously, effects of climate change on operations at Shasta Lake could include a higher frequency of high-flow events, potentially resulting in changes to downstream habitats. Potentially significant effects on vegetation, wildlife habitats, and special-status wildlife species that would occur with implementation of CP3 could contribute to potentially significant effects of climate change on habitat acreages and distribution. However, with implementation of the mitigation measures listed above to reduce project-related impacts of CP3, CP3 would not make a cumulatively considerable incremental contribution to a significant cumulative effect.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability The cumulative effects of CP4 or CP4A 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 or CP4A would be a cumulatively considerable incremental contribution to significant cumulative effects on vegetation, wildlife habitats, and special-status wildlife species. With implementation of Mitigation Measure Bot-7, "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" (see Chapter 12, "Botanical Resources and Wetlands"), adverse effects from CP4 or CP4A would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on these resources.

As stated previously, effects of climate change on operations at Shasta Lake could include a higher frequency of high-flow events, potentially resulting in changes to downstream habitats. Potentially significant effects on vegetation, wildlife habitats, and special-status wildlife species that would occur with implementation of CP4 or CP4A could contribute to potentially significant effects of climate change on habitat acreages and distribution. However, with implementation of the mitigation measures listed above to reduce project-related impacts of CP4 or CP4A, there would not be a cumulatively considerable incremental contribution to a potentially significant cumulative 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 a cumulatively considerable incremental contribution to significant cumulative effects on vegetation, wildlife habitats, and special-status wildlife species. With implementation of Mitigation Measure Bot-7, “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” (see Chapter 12, “Botanical Resources and Wetlands”), adverse effects from CP5 would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on these resources.

As stated previously, effects of climate change on operations at Shasta Lake could include a higher frequency of high-flow events, potentially resulting in changes to downstream habitats. Potentially significant effects on vegetation, wildlife habitats, and special-status wildlife species that would occur with implementation of CP5 could contribute to potentially significant effects of climate change on habitat acreages and distribution. However, with implementation of the mitigation measures listed above to reduce project-related impacts of CP5, CP5 would not make a cumulatively considerable incremental contribution to a significant cumulative effect.

Chapter 14
Cultural Resources

This chapter describes the affected environment and environmental consequences related to cultural resources for the dam and reservoir modifications proposed under SLWRI action alternatives. More detailed discussion of cultural resources is presented in *Cultural Resources Alternatives Assessment for the Shasta Lake Water Resources Investigation, Shasta and Tehama Counties, California* (Byrd et al. 2008) and *Native American Tribal Coordination, Shasta Lake Water Resources Investigation, California* (Nilsson et al. 2008), which were prepared for the project. These Technical Reports will not be publicly distributed because they contain confidential information on the locations of cultural resources.

14.1 Affected Environment

For the cultural resources assessment, studies were limited to the Shasta Lake and vicinity (77,088 acres) and the upper Sacramento River (16,113 acres), for a total of 93,201 acres (Byrd et al. 2008). Project impacts to cultural resources are not expected to extend beyond this primary study area. Shasta Lake and vicinity includes the existing reservoir, the maximum inundation area, and a 0.25-mile buffer. The 0.25-mile buffer encompasses the area around the reservoir where infrastructure would need to be relocated (recreation facilities, roads, utilities, trails, etc.). The majority of lands in the reservoir area are under Federal ownership and management responsibilities, and a detailed discussion of this topic can be found in Chapter 17. The upper Sacramento River is defined by the 100-year floodplain from Keswick Dam, north of Redding, southward to the Red Bluff Pumping Plant.

To evaluate the potential effects that the proposed undertaking may have on cultural resources within the 93,201-acre study area, archival and records searches were conducted. Information concerning potential Native American concerns within the study area was gathered from historic and ethnographic literature and from initial discussions with tribes and Native American individuals. The results of these efforts are summarized below, following a brief discussion of the regional context.

14.1.1 Regional Setting

This section provides a regional framework of the study area including sections on the prehistoric, ethnohistorical, and historical context of the study area. Because of the regional nature of cultural resources, the Shasta Lake vicinity and upper Sacramento River area are discussed together.

Prehistoric Context

The following presentation provides a temporally organized discussion of the archaeological record. There is a long history of archaeological investigations in the upper Sacramento Valley region, although the early investigations were sporadic rather than sustained research programs. Notably, a great deal of fieldwork has been carried out around Shasta Lake, largely on USFS lands. Radiocarbon dating and temporally diagnostic artifacts have been used to create a framework for understanding the age of cultural resources in the area as well as changes through time. This framework provides baseline information on how cultural resources can contribute to history and regional research issues.

The Terminal Pleistocene time segment (ca. 13,500-11,600 before present, calibrated using radiocarbon dating (cal BP)) is minimally represented and poorly understood in this region. What little evidence exists suggests that people passing through the area were wide-ranging, mobile hunters and gatherers who periodically exploited large game (Haynes 2002). Archaeological data from this time period, primarily represented by isolated fluted and/or bifacially thinned spear points and Pleistocene fauna remains, is limited to two cave sites in the study area.

The earliest evidence for occupation of the region largely falls between ca. 8000-5000 BP. Most assemblages dating to this interval are affiliated with the Borax Lake Pattern (Fredrickson 1974) and include wide-stemmed projectile points, handstones, milling slabs, and ovoid flake tools, along with a variety of other utilitarian items. The diversified nature of these artifact assemblages indicates people occupying the area were likely foragers who moved their residential bases frequently to exploit seasonal changes in resource distribution (Hildebrandt and Hayes 1983, 1993; Kowta et al. 2000; Sundahl and Henn 1993).

Several new projectile point forms appeared in the archaeological record around 5000 BP, including Squaw Creek Contracting-stemmed, Pollard Diamond-shaped, and McKee series. These points have been assigned to the Squaw Creek Pattern (5700-3200 BP) by Sundahl (1992b). Despite the appearance of these new forms, similarities in the rest of the assemblage composition with the preceding Borax Lake Pattern suggest people occupying the area during this time period were also relatively mobile foragers (Basgall and Hildebrandt 1989, Kowta et al. 2000).

A major change in the regional settlement-subsistence pattern appears to have occurred between ca. 4,000 to 1,600 years ago. This period has been identified as the Whiskeytown Pattern (Sundahl 1992b), and is represented by a wide range of corner- and side-notched projectile points assigned to the Clikapudi series, as well as hand stones, milling slabs, notched pebble net weights, and mortars and pestles (see also the Deadman and Kingsley complexes in Tehama County; Greenway 1982, Johnson 1984). Analysis of data from archaeological sites dating to this time period has led Basgall and Hildebrandt (1989) to

propose a shift from the preceding generalized forager strategy to a "fission-fusion" model of subsistence-settlement where larger groups of people occupied residential camps during the fall and winter months, but then split into smaller foraging groups who moved between productive resource patches during the remainder of the year. The fall-winter residential sites are thought to have been concentrated along the northern Sacramento Valley foothills, where salmon and acorns could be readily obtained (Baker 1990, Bevill and Nilsson 1993, Sundahl 1999).

Two distinct patterns have been identified as corresponding with the most recent time period (from 1,600 years ago to contact) in the region. The first, referred to as the Augustine Pattern/Shasta Complex, is thought to reflect a more sedentary subsistence-settlement adaptation than what was practiced in the preceding time periods. Initially, from 1,250 to 750 years ago, square-stemmed Gunther Barbed projectile points (with lower frequencies of expanding-stem variants), winged drills, bipointed fish gorges, bone gaming pieces, incised bone pendants, and varied shell beads are characteristic. These materials have been associated with the arrival of the Wintu in Northern California, and are thought to reflect a sedentary adaptation made possible by a subsistence system dependent on the large-scale storage of salmon and acorns (Broughton 1988; George 1981; Sundahl 1982, 1992a; Wohlgemuth 1992).

During this same time frame, a contrasting record is found in upland areas surrounding the northern Sacramento Valley. It is represented by much smaller sites and rather simple assemblages consisting of small side- and corner-notched projectile points, a limited number of Gunther series forms, hopper mortars and pestles, hand stones, milling slabs, and notched pebble weights. On the east side of the valley, these findings are assigned to the Tehama Pattern (Clewett and Sundahl 1982, Sundahl 1992a), and are thought to reflect a more mobile pattern of settlement by populations speaking Hokan languages (e.g., Yana) pushed to the hinterlands by the late-arriving Wintu, who ultimately restricted access to the Sacramento River.

Ethnohistorical Context

Ethnohistorical investigations indicate that at the end of the prehistoric era and into the historic era, much of the study area was primarily occupied by the Wintu (LaPena 1978), but some of their territorial boundaries have been contested for many years. The most commonly accepted map of Wintu territory was produced by Du Bois (1935), and shows that the Wintu controlled the Sacramento, McCloud, and Squaw Creek drainages, and all but the easternmost segment of the Pit River Arm. This arm crosses into a boundary area between Northern Yana (Johnson 1978, Sapir and Spier 1943) and Achomawi (Pit River) tribes (Olmsted and Stewart 1978). Wintu people also lived along the Sacramento River from Shasta Dam down to the confluence of the river with Cottonwood and Battle creeks. Nomlaki territory took over south of Cottonwood Creek/Battle Creek and extended down past what is now the Red Bluff Pumping Plant (Goldschmidt 1951, 1978).

There has been a great deal of ethnohistoric and ethnographic discussion of the Wintu owing largely to the records amassed by late nineteenth- and early twentieth-century observers. Therefore, the Wintu can be considered one of the best known Native American groups in California. Most of the villages were located on the McCloud and Pit rivers and the general area south of the Pit River to just south of Redding. One hundred and six (43 percent) of the named Wintu ethnographic villages fall within the current study area.

Historical Context

The area that would become Shasta and Tehama counties was not explored by Europeans during the Spanish period of California history. Initial exploration occurred in 1821 when a Mexican expedition explored the Sacramento River nearly as far north as the future site of Redding, encountering Native populations as they traversed the region. Subsequently, European trappers in Northern California spread European diseases that had disastrous effects on the Native Americans. Notably, a devastating epidemic spread through the Sacramento Valley during the 1830s that may have killed as much as 75 percent of the native population.

In 1848, mining (especially for copper) began along the Trinity River and other Sacramento River tributaries, bringing as many as 50,000 people to the area. American immigrants increasingly occupied territory, and new logging and mining operations destroyed hunting grounds and salmon fisheries that were part of the traditional home of Native Americans such as the Wintu. Criminal violence and the policy of relocation to reservations nearly eliminated the Native American population in the upper Sacramento River Valley by 1870. Those who remained lived in the mountains, like the Wintu, who maintained a salmon fishery along the McCloud River.

The mining boom led to the construction of smelters, mills, and towns (such as Keswick) that flourished in the late 1800s and early 1900s. Falling copper prices, growing environmental concerns over pollution from smelters, and the U.S. Government’s efforts at protection and conservation of public lands ended major operations by the 1920s.

Logging started in 1852 and included sugar pine, white pine, red fir, and cedar. Sawmills quickly sprang up, along with associated roads. Transporting logs and milled lumber became easier after the completion of the railroad through Red Bluff and Redding, and the Blue Ridge Flume, completed in 1874. These transportation advances allowed lumber milling to be concentrated in the valley, and Red Bluff and other mill towns to thrive.

Agriculture dominated the valley land along the Sacramento River. Cattle farming was key initially, and remained an important product in the area through the mid-twentieth century, especially with the development of the dairy industry. Early settlers practiced dry farming, growing wheat and fruit, including peaches, pears, and plums. Farmers later diversified and transitioned

from wheat to fruits, nuts, vineyards, and vegetable crops in the late 1800s through the 1920s. Ultimately, intensive irrigated agriculture dominated the area.

Throughout the historic era, transportation was an important focus of infrastructure development. Over time, foot travel and transportation by horse or stage coach on a number of historic trails gave way to river, railroad, and ultimately, automobile travel. Hopeful settlers and miners poured into the study area along the California-Oregon Trail between 1840 and 1860, passing through the upper Sacramento River and Pit River valleys. A segment of the Siskiyou Trail was used by the northern railroad in 1877 and Interstate 5 follows this route today. Many early roads in the study area operated in conjunction with ferries across the Sacramento River. Several important bridges are located in the study area, along with the remains of many others, including the Centennial Bridge in Red Bluff and the Dog Creek Bridge in Shasta County.

Towns such as Red Bluff, Redding, Keswick, and Kennett boomed, along with the region's developing transportation network. The construction of Shasta and Keswick dams promoted a new period of prosperity that carried through the expansion of the lumber industry and the rise of the recreation industry in the mid-twentieth century.

Efforts to preserve the Nation's forests began in the late 1800s. The Shasta Forest Reserve was created in 1905. The area also included many homesteads and Indian allotments granted to local Wintus in the 1880s. In preparation for inundation by Shasta Lake, the United States purchased land including these allotments, homesteads, and many other properties in the late 1930s. Around the same time, fish were recognized as an important natural resource in California, and the first of several salmon fish hatcheries were constructed in 1872 at the salmon spawning grounds near the confluence of the McCloud and Pit rivers.

Recreation, especially in the mountains, also played an important role in the region's history. In the early twentieth century, private fishing clubs, such as the Bollibokka Club, flourished. In the 1930s, USFS began to encourage the recreational use of the forests by the broader public, constructing campgrounds and picnic areas. Recreation in the national forests expanded with the formation of Shasta Lake. New campgrounds were added, along with boat launches and access roads.

Hydroelectric power and water storage were also important facets of the region's history. Starting in 1922, Pacific Gas and Electric Company built dams and power plants in the Pit River area. In 1935, the Federal Government decided to proceed with building the CVP to store and deliver Sacramento River water as far south as Fresno County. Work was completed in the 1940s at Shasta Dam and Keswick Dam and Powerhouse, located downriver from Shasta Dam. Power generated at Shasta Dam and transmitted to the CVP pumps provided electricity to supply the lift pumps raising water into the main canal

system. The system used the natural channels of the Delta to move water from Redding to Tracy, the head of the Delta-Mendota Canal.

14.1.2 Archaeological Resources and Historical Structures

This section discusses known archaeological resources and historic structures within the primary study area.

Shasta Lake and Vicinity

A total of 134 cultural resources studies have been previously conducted that intersect or are fully contained within the Shasta Lake area. Of these, 80 percent were surveys, the remainder being overview/research designs, excavations, or other compliance reports. More than half of the surveys are considered to have had systematic coverage; the rest were either reconnaissance efforts or the methods were unknown. Overall, only 8 percent of the study area has been surveyed; 5 percent in a systematic manner and 3 percent using reconnaissance methods.

The records search identified 261 cultural resources within the study area, including 190 prehistoric sites, 45 historic-era resources, and 26 resources with both prehistoric and historic-era components.

The 215 recorded prehistoric-era resources and components are widely distributed throughout the study area and include the following:

- Forty-two major residential sites (thirteen with documented human remains)
- Thirty-seven residential sites
- Fifty-five artifact scatters
- Seventy-seven scatters of flaked stone tools and manufacturing debris
- Two caves
- Two sites of unknown character

The 71 recorded historic-era resources and components include the following:

- Thirteen structures, including seven bridges, one dam, one railroad bridge and grade, one aerial-tramway, one rock wall/alignment complex, one building foundation, and one concentration of wooden A-frames
- Seven linear features consisting of one railroad, five road segments and one line of wooden poles

- Seven mining locales that include two quarries and five sites with various mining-related features and residential elements.
- Fifteen artifact scatters
- Two ranching complexes
- Fourteen residential sites
- Two town complexes – both are mining-related and one includes a cemetery
- Two orchards represented by wooden poles and fruit trees
- One cemetery represented by two grave stones
- Seven historic-era Native American cemeteries, all but one of which is also associated with a major prehistoric residential component. Each of these cemeteries was subject to government removal of burials and reburial in a government cemetery outside the Shasta Lake inundation area and the current project area.
- One historic-era Native American residential site that also has a prehistoric residential component

Another 19 historic-era cemeteries (containing both Native American and Euro-American burials) within the footprint of Shasta Lake have not been formally recorded. They were subject to burial removal and subsequent reburial outside the reservoir area. It is possible that a number of these cemeteries may retain additional human remains, and are potentially subject to periodic exposure when the reservoir level fluctuates.

The vast majority of cultural resources discussed above have never been formally evaluated with respect to the eligibility for listing on the National Register of Historic Places (NRHP). The NRHP (also referred to as the National Register) is the Nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966 (NHPA), the NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. Properties listed in the NRHP include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. All properties and districts listed in or determined eligible for listing in the NRHP must be considered in the planning of Federal undertakings.

The Dog Creek Bridge is eligible for the NRHP. Shasta Dam and property has also been determined eligible for the NRHP as part of the CVP through a

consensus determination with the State Historic Preservation Officer (SHPO). Another 24 resources have been determined ineligible by consensus determination with the SHPO. These include 15 historic-era resources, seven prehistoric sites, and two resources with both prehistoric and historic-era components. The remaining cultural resources have yet to be evaluated with respect to their eligibility for listing on the NRHP.

Upper Sacramento River (Shasta Dam to Red Bluff)

Based on the records search results, 97 cultural resources studies intersect or are fully contained within this area. Of these, 86 percent are surveys, along with overviews, excavation reports, and historical architectural evaluation reports. Most of the surveys had systematic coverage methods (75 percent). In all, 23 percent of the area has been surveyed, mostly by systematic methods (15 percent), and the rest by reconnaissance methods.

A total of 79 recorded cultural resources fall within this area. These include 45 prehistoric sites, 20 historic-era resources, and 14 resources with both historic-era and prehistoric components.

The 59 prehistoric resources and components within the study area include the following:

- Thirteen major residential sites
- Twenty-two residential sites
- Seven rock shelters
- Five artifact scatters
- Five flaked stone tool and manufacturing debris scatters
- Four rock art (petroglyph) sites
- Three sites of unknown character

The recorded prehistoric sites are concentrated in the southern portion of the study area, from Battle Creek near Table Mountain southward (71 percent), along with a small concentration of sites at the northern end of the upper Sacramento River area near Redding (18.6 percent). Eleven prehistoric sites have been subjected to some form of archaeological excavation.

The 34 recorded historic-era resources and components within the study area include the following:

- Ten structures
- Seven linear features consisting of five roads, one wagon train, and a powerline
- Five flume remnants (two of which were associated with orchards)
- Three mining locales, including a mining complex and two adits
- Five artifact scatters
- One ranching complex
- The historic-era structures include five bridges, a ferry crossing, a rock wall, a dam, one concrete dance pavilion, and a power substation building complex
- Three historic-era Native American residential sites

One archaeological site (referred to as the Benton Track Site or Magmas) is currently listed on the NRHP. In addition, the Diestelhorst Bridge in Redding and the Anderson-Cottonwood Irrigation District Diversion Dam have been determined eligible for the NRHP. Two sites are listed as ineligible for the NRHP by the California Office of Historic Preservation.

14.1.3 Native American Resources

A strong likelihood exists that other important Native American heritage locations are present within the study area, based on ethnohistoric data and initial discussions with Native Americans. The study area was the focus of intensive Native American occupation during historic times, with a variety of religious, economic, historic, and other values identified by Native American groups. Ten groups, including those listed by the Native American Heritage Commission, represent Native American interests in the study area. They include the Grindstone Indian Rancheria, Paskenta Band of Nomlaki Indians, Pit River Environmental Council, Pit River Tribe of California, Redding Rancheria, Shasta Indian Nation, United Tribe of Northern California, Inc., Winnemem Wintu, Wintu Educational and Cultural Council, and the Wintu Tribe of Northern California Toyon-Wintu Center. Notably, the Winnemem Wintu and the Pit River tribes live within the Shasta Lake area, where they continue to actively practice many aspects of their traditional culture. Both groups have related that a complex cultural landscape of village sites, ceremonial areas, burial sites, and resource areas intersects the study area.

The Winnemem Wintu also documented the location of some 155 ancestral villages within the Shasta Lake area. At least 81 village locations are known along the lower McCloud River and lower Pit River. An additional 73 villages are known to have existed on the eastern side of the Sacramento River. These

village locations once contained between one and 30 houses each, some had associated cemeteries and each had a power place. Some of these villages are already under the waters of Shasta Lake, while others are just above the current Shasta Lake water level. The Winnemem Wintu have estimated that 120 of the known villages are still accessible (above the current high-water line).

Traditional Cultural Properties

Federal regulation defines Traditional Cultural Properties as properties that have "association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1998). Examples of Traditional Cultural Properties include: a location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world; a location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice.

The records search at the Information Center revealed that no Traditional Cultural Properties have been formally recorded in the study area.

It is important to note that a traditional cultural properties may not meet the NRHP criteria for a historic property and that, conversely, a historic property may not meet the criteria for a traditional cultural property. However, in those instances where an undertaking may affect a historic property that is also considered by an Indian group to be a site of beliefs, customs, and practices of a living community, circumstances may warrant that in the course of the Section 106 review process, consideration for accommodating access to and ceremonial use of the property and that avoidance of adverse physical effects in accordance with Section 106 are identified.

Tribal consultation has clearly indicated that local Native American groups are deeply concerned regarding the environmental and cultural effects of the project. Native Americans who supplied information for the SLWRI provided general information on the number and nature of resources both in the general region and in specific locations that could meet the definition of Traditional Cultural Properties, which are also supported in ethnohistoric studies.

Members of the Pit River Madesi Band stated that 22 ethnographic villages and associated burial grounds are located within the existing reservoir and proposed reservoir areas. One tribal member also noted that several Traditional Cultural Properties exist within the Pit 6 and Pit 7 Dam areas.

The Winnemem Wintu have identified important localities within the study area, many of which are locations where ceremonies are regularly conducted. Along the McCloud River, these include Children's Rock, Coyote Rock, Dekkas Rock, doctoring pools near Nawtawaket Creek, Eagle Rock and

Samwel Cave, Hirz Bay, *Kaibai* village, North Gray Rocks, Puberty Rock, Saddle Rock, and *Watawacket* village and spiritual area. Along the Sacramento River, important localities include the Antlers area, Delta area, Doney Creek, Gregory Creek, LaMoine area, Packers Bay, Pollard's area, middle Salt Creek, and Sims area. The Winnemem Wintu have strong traditional and contemporary connections with the land, and their ongoing use of many archaeological and religious sites is fundamental to the well-being of their culture, particularly the education of their youth.

Indian Sacred Sites

Executive Order No. 13007 defines an Indian sacred site as "any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site."

Executive Order 13007 pertains only to Federally recognized tribes and Federally managed lands. For groups that are not formally recognized, sacred areas may be listed in the Sacred Lands files of the California Native American Heritage Commission. This commission has reviewed its files and identified sacred lands within the study area, however these lands may or may not meet the definition under EO 13007. Their locations are confidential.

14.2 Regulatory Framework

Under Federal and State of California (State) law, effects to significant cultural resources—which include archaeological remains, historic-period structures, and Traditional Cultural Properties—must be considered as part of the environmental analysis of a proposed project. This section provides a summary of key regulations for the protection of significant resources.

14.2.1 Federal

National Historic Preservation Act

Under Section 106 of the NHPA, Federal agencies must consider effects to eligible resources ("historic properties") from the proposed undertaking, in consultation with SHPO and other parties. This includes affording the Advisory Council a reasonable opportunity to comment on such undertakings. This includes identification (usually through archival research, field inventories, public interpretation, and/or test evaluations) of cultural resources eligible for the NRHP, assessment of adverse effects to eligible properties, and resolution of adverse effects. The implementing regulations at 36 CFR Part 800 define procedures to meet Section 106 responsibilities through consultation among the

Federal agency and other parties with an interest in the effects on historic properties.

Section 106 defines significant archaeological or historical resources as those which are listed on, or eligible for listing on, the NRHP. Eligible properties are those that retain sufficient integrity and meet one or more of the following criteria: "(a)...are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history" (36 Code of Federal Regulations (CFR) 60.4).

Executive Order 13007 – Indian Sacred Sites

Indian Sacred Sites as addressed in Executive Order 13007 (24 May 1996) establishes that Federal agencies are responsible for allowing federally recognized American Indian religious practitioners access to and ceremonial usage of Indian sacred sites on Federal land. An Indian Sacred Site is defined as "any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site." The agency will keep the locations of such sites confidential and will avoid adversely affecting the integrity of these sites. To assist in the implementation of this Executive Order, an interagency memorandum of understanding was signed to improve the protection of tribal access to Indian Sacred Sites through enhanced and improved interdepartmental coordination and collaboration. The Memorandum of Understanding Among the U.S. Department of Defense, U.S. Department of the Interior, U.S. Department of Agriculture, U.S. Department of Energy, and the Advisory Council on Historic Preservation Regarding Interagency Coordination and Collaboration for the Protection of Indian Sacred Sites, was executed on November 30, 2012, and remains in effect until December 31, 2017.

Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (Public Law 101-601; 25 United States Code 3001-3013) pertains to Native American burial sites and regulates the removal of human remains, funerary objects, sacred objects, and items of cultural patrimony on Federal and tribal lands. The Act requires permits for intentional removal or excavation of Native American human remains on Federal lands, covers cases of inadvertent discoveries, and dictates the ultimate disposition process of Native American human remains and cultural items.

American Indian Religious Freedom Act

The American Indian Religious Freedom Act (42 United States Code Section 1996) states that it is the policy of the United States to "protect and preserve for American Indians their inherent right of freedom to exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites." The provisions of American Indian Religious Freedom Act guarantee access to traditional sites on Federal lands for religious practices. Consultation under American Indian Religious Freedom Act with American Indian groups can simultaneously satisfy the requirements of NEPA.

Archaeological Resources Protection Act

The purpose of the Archaeological Resources Protection Act of 1979 (ARPA) (Public Law 95-96 – October 31, 1979) is to protect archaeological resources and sites that are located on public lands and Indian lands, and to foster increased cooperation between governmental authorities, the professional archaeological community, and private individuals in possession of archaeological resources. The act makes it unlawful to excavate, remove, or deface archaeological resources, to sell, purchase, or exchange those resources without applicable permit, and establishes criminal and civil penalties for any such violation.

Archaeological and Historic Preservation Act

This act was formerly known as the Reservoir Salvage Act of 1960, followed by the Moss-Bennet Act (Archaeological Recovery Act). The act can be found under 16 USC 469, and is intended to prevent irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data involving activities in connection with any Federal construction project or federally-licensed project, activity, or program through the recovery, protection, and preservation of such data, including preliminary survey or other investigation as needed.

14.2.2 State

Under CEQA, the lead non-Federal agency (state, county, city, or other) must consider potential effects to important or unique cultural resources. While the language and consultation process is somewhat different between the NHPA and CEQA, the definitions of eligible properties and of adverse impacts are essentially the same. Evaluations under CEQA consider a resource's potential eligibility to the California Register of Historical Resources.

California law also protects Native American burials, skeletal remains, and associated grave goods regardless of their antiquity, and provides for the sensitive treatment and disposition of those remains (California Health and Safety Code Section 7050.5, California Public Resources Code Sections 5097.94 et seq.).

14.2.3 Regulatory Compliance

Currently, there is no undertaking authorized by Congress involving the raising of Shasta Dam. Federal agencies may conduct nondestructive planning activities without completing Section 106, provided that the actions do not prohibit subsequent consideration of alternatives to avoid, minimize, or mitigate the undertaking's adverse effects on historic properties. This environmental document is in support of a feasibility study. Should the undertaking be authorized, Section 106 would resume early in that planning process (36 CFR Section 800. 1(c)).

Under Section 106, these efforts would include the following:

- A complete pedestrian survey and inventory of cultural resources within the area of potential effect (APE) of the selected alternative
- Ethnographic and ethnohistoric investigations to obtain greater detail regarding areas of importance to Native American tribes and groups
- Evaluations to determine whether cultural resources identified within the APE are eligible for inclusion in the NRHP
- Assessment of potential adverse effects to historic properties and consultation to resolve any identified adverse effects

Cultural resources are evaluated for inclusion in the NRHP based on criteria found at 36 CFR Part 60. Once a resource has been evaluated, the lead Federal agency determines eligibility in consultation with the SHPO and other consulting parties, as applicable. Where appropriate this process will include the USFS in the consultation to ensure appropriate consideration is given to the Shasta-Trinity National Forest Land and Resource Management Plan (STNF LRMP). The overall project actions, as authorized by Congress, may not be consistent with the STNF LRMP standards and guidelines (USFS 1995). A project-specific STNF LRMP amendment may be required for the standards associated with caves, visual quality, late successional reserves, riparian reserves, survey and manage species, and Shasta snow-wreath. The USFS decision would include a project specific exception to these standards.

In this process, previous determinations of eligibility may need to be reevaluated because of the passage of time or other factors, and it is important to acknowledge the special expertise of Indian tribes when assessing the eligibility of properties to which they attach ceremonial and cultural significance. It would be possible to evaluate some cultural resources with survey-level data. However, test excavations may be necessary to accurately evaluate many archaeological resources to determine if they are, in fact, historic properties.

The lead Federal agency is required to consider the effects of any potential project on historic properties within the APE. The criteria for assessing adverse effects are found in 36 CFR Part 800.5(a)(1), which states that "an adverse effect is found when an undertaking may alter, directly or indirectly, any characteristic of a historic property that qualify the property for inclusion in the National Register…" Examples of adverse effects include physical destruction, alteration, a change in the property's setting, or the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features (36 CFR Part 800.5(a)(2)).

As part of the Section 106 process, the lead Federal agency is responsible for making a finding regarding whether the undertaking would have an adverse effect on historic properties. This assessment of adverse effects is made in consultation with SHPO, Indian tribes that attach religious and cultural significance to identified historic properties and other consulting parties. Reclamation would then seek concurrence on the findings of effect from the SHPO and the USFS, on National Forest Lands.

Consultation then continues among Reclamation, USFS, other applicable Federal agencies, SHPO, and other consulting parties on possible options for avoiding, minimizing, or mitigating the adverse effects. This includes notifying the Council when adverse effects are found and inviting the Council to participate. If SHPO, Reclamation, USFS, other applicable Federal agencies, and the Council (if participating) agree to measures to resolve adverse effects to historic properties, these are formalized in an MOA. Other consulting parties may be invited to sign the MOA. The Section 106 process (36 CFR Part 800.14) is completed once the terms of the MOA have been met. Alternatively, the Federal agencies may elect to enter into a programmatic agreement (PA) that would be developed as an alternative procedure to implement the Section 106 process (36 CFR Part 800.14). In rare cases, if consultation fails to result in agreement on resolving adverse effects, consultation may be terminated pursuant to the process detailed in 36 CFR Part 800.7.

14.3 Environmental Consequences and Mitigation Measures

This chapter is organized by the project alternatives described in Chapter 2, "Alternatives," and discusses environmental consequences associated with implementation of the project alternatives. It also describes potential mitigation measures associated with impacts to cultural resources that are significant or potentially significant.

The environmental setting for this chapter includes only the primary study area, Shasta Lake and vicinity, and the upper Sacramento River between Shasta Dam and the Red Bluff Pumping Plant, as explained in Section 14.1. No potential impacts are expected in the extended study area; therefore, only impacts to

cultural resources in the primary study area will be discussed. The extended study area is not discussed further in this section.

14.3.1 Impact Assessment Methods and Assumptions

The standard Section 106 process of the NHPA follows a series of steps that are described in the 36 CFR Part 800 regulations that implement the NHPA. These steps are as follows:

- Initiate Section 106 Process, 36 CFR Part 800.3
- Identify Historic Properties, 36 CFR Part 800.4
- Assess Adverse Effects, 36 CFR Part 800.5
- Resolve Adverse Effects, 36 CFR Part 800.6

"Adverse effects" are defined below in Section 14.3.2. In the event that historic properties within the APE for an undertaking would be subject to adverse effects, the lead Federal agency would consider ways to minimize or mitigate ("resolve") such effects, in consultation with the SHPO and other signatories and consulting parties. This often requires an MOA or PA among the consulting parties (Part 800.6).

Section 106 regulations allow Federal agencies to conduct "nondestructive project planning activities before completing compliance with Section 106" (36 CFR Part 800.1[c]), and the regulations encourage Federal agencies to consider a broad range of alternatives during the planning process for the undertaking. The SLWRI feasibility-level study is such a "nondestructive project planning" document, as there is no authorization for raising Shasta Dam at this time. Reclamation will not have a specific undertaking until such time as Congress makes a decision regarding whether to authorize a project that would involve raising the dam and appropriates funding for this purpose.

The purpose of the feasibility study has been to gather existing data that can be used in future environmental documents to estimate the impacts to the types of historic properties known to be present, based on existing data and consultations.

As part of compliance with 36 CFR Part 800 regulations, Reclamation conducted an analysis of the APE to assess which portions of the APE have been previously inventoried, and to identify all previously recorded cultural resources. Methods used for the cultural resources analysis included archival records searches (that identified previously recorded sites, site records, and Native American ethnographic studies), agency consultation, Native American consultations, and comparisons of the study alternatives. Information on archaeological and historical structures was obtained for sites within the primary study area that may be affected by alternative plans. Sensitivity

analyses were also conducted for prehistoric and historic-era resources to address data gaps using methods tailored to each data set. Native American issues and resource locations within the primary study area were discussed during meetings with local Native American groups and individuals.

Also included in the analysis was an assessment of the effects of inundation and drawdown on cultural resources located within the pool of a reservoir. Previous reservoir studies have shown that the greatest impacts occur in the zone of inundation and drawdown (fluctuation zone), where cultural resources are repeatedly exposed to scouring, wave action, wet/dry cycles, and de-vegetation. This means that the most significant impacts will occur where an undertaking increases the size of the fluctuation zone–particularly if it includes areas that are above the current high-water line and thus have not previously been subject to inundation.

Archaeological and Historic-Era Structural Resources

The prior cultural resources inventory efforts and the resulting recorded cultural resources had been previously discussed in Section 14.1.2. Overall, the frequency and distribution of recorded sites within the project study area only give a limited and incomplete picture of the actual number of resources. This is because only a very small percentage of the project area has been systematically inventoried for cultural resources. To estimate site densities for the project area as a whole, sensitivity analysis was undertaken. Separate sensitivity analyses for prehistoric and historic-era sites were conducted to predict where unrecorded sites should be concentrated within unsurveyed areas. The resulting site-density predictions provide the most accurate estimate of site sensitivity by alternative available at present. The following discussion presents the methods and approach taken.

The archival research done for this study was designed to identify the types of cultural resources known to be present in the study area. However, the frequency and distribution of formally recorded resources give only a limited and incomplete picture of the actual number of resources. This is mainly due to limited systematic surveys comprising only 5 percent of the Shasta study area and 15 percent of the upper Sacramento River. As such, there are undoubtedly many more cultural resources that have not been identified or formally recorded.

A comparative sensitivity analysis was therefore conducted that took into account both documented and likely but undocumented resources (including archaeological sites and historic-era structures) for each of the alternatives proposed for raising Shasta Dam. The sensitivity analysis was restricted to the Shasta Lake and vicinity, and did not include the upper Sacramento River since no impact differences between alternatives have been identified within this area.

Separate sensitivity analyses using methods tailored to each data set were conducted for prehistoric and historic-era sites to estimate the total number of

cultural resources present within each alternative (see Byrd et al. (2008) for methodological details and specific data). The prehistoric sensitivity analysis used a weights-of-evidence quantitative analysis to predict the overall density and distribution of sites. In contrast, the historic-era sensitivity analysis gathered archival data (mainly maps) within the study area to make predictions regarding the number and type of potential unrecorded historic-era resources (both structures and sites) by alternative. Results of the prehistoric and historic-era sensitivity analyses were integrated to provide quantitative estimates of the total number of cultural resources after full inventory. These estimates are for planning purposes only; additional pedestrian surveys would be needed if one of the affirmative alternatives were to go forward.

A second records search was completed to identify recorded cultural resources in specific areas of the upper Sacramento River where construction activities would take place in certain alternatives associated with ecosystem restoration, including spawning gravel augmentation and floodplain and riparian habitat restoration. For these construction areas, existing access roads were excluded, but a records search buffer of 0.25 mile was added to all other project elements. It should be noted that the proposed construction areas are concept-level, and may be relocated or deleted as a result of design development, consultation, or other factors.

Traditional Cultural Properties

Public and stakeholder coordination meetings were conducted on behalf of Reclamation with Indian tribes and Native American groups whose traditional territories overlap the study area to identify Traditional Cultural Properties, ceremonial locations, and other areas of concern to the Native American community. This included meetings and/or workshops with groups and individuals representing major tribes and/or extended family groups in the Shasta/Redding area regarding potential effects to cultural resources from a plan to enlarge Shasta Dam and Reservoir. The primary intent of these meetings was to strengthen communication with tribal groups and individuals; solicit, clarify, and document major concerns and issues; and establish a preferred method/approach to maintaining effective communication during the remainder of the SLWRI and in future endeavors.

Federally recognized Native American tribes were invited to begin the consultation process at an information meeting, followed by additional contact by telephone to learn of their concerns regarding the SLWRI, and to gain an initial sense of where sensitive resource localities are situated within the primary study area. Non-Federally recognized Native American groups and individuals with an interest in the study area were also contacted. There were also in-person visits to tribal members to collect information.

Seven tribal groups were invited to an information meeting held on April 4, 2007, in Redding, California. The purpose of the meeting was to provide general information about the SLWRI, initiate Section 106 consultation with

groups desiring to participate in the project, and introduce Elena Nilsson, a consultant for Reclamation, as the Native American Tribal Coordination study lead. Invitations were sent to the groups shown in Table 14-1.

Table 14-1. Native American Groups Involved in Consultations

Native American Group
Grindstone Indian Rancheria of Wintun-Wailaki Indians[1]
Paskenta Band of Nomlaki Indians[1]
Pit River Tribe[1]
Redding Rancheria[1]
Shasta Indian Nation
Winnemem Wintu
Wintu Tribe of Northern California/Toyon-Wintu Center

Note:
[1] Federally recognized tribe as of 2012 (http://www.bia.gov/cs/groups/public/documents/text/idc-041248.pdf)

From August 2007 to March 2008, nine meetings were held with Native American groups whose traditional territories overlap with the SLWRI study area. The purpose of the meetings was to solicit, clarify, and document major concerns and issues regarding the project, and to establish a preferred method/approach to maintaining effective communication during the remainder of the SLWRI study and in future endeavors. Five groups participated in these meetings, including the Grindstone Indian Rancheria (one meeting), Paskenta Band of Nomlaki Indians (one meeting), Pit River Tribe (three meetings), Shasta Indian Nation (one meeting), and Winnemem Wintu (three meetings).

Currently, no formal Traditional Cultural Properties (as defined by Federal regulations) are formally recorded at the Information Center. The California Native American Heritage Commission, however, has stated that sacred lands (as defined by this commission) are present in the study area. Based on consultations, meetings, statements, letters, and public comments provided by Native Americans and previous ethnographic and ethnohistoric studies, it is predicted that a considerable number of Traditional Cultural Properties and other areas of special concern are present in the study area.

14.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with 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 to determine whether an EIS 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 and CEQA Guidelines, Section 15126.4(a)).

Federal Criteria

Under Federal regulation (36 CFR Section 800(a)(1)):

> *"An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative."*

Examples of adverse effects (36 CFR Section 800(a)(2)) include the following:

- Physical destruction, damage, or alteration, including moving the property from its historic location
- Isolation from, or alteration of, the setting
- Introduction of intrusive elements
- Neglect leading to deterioration or destruction
- Transfer, sale, or lease from Federal ownership

Adverse effects often can be resolved or mitigated through additional research, public education, and/or other means.

State Criteria

California regulations require that effects to cultural resources be considered only for resources meeting the criteria for eligibility to the California Register of Historical Resources, outlined in Section 5024.1 of the California Public Resources Code. Demolition, replacement, substantial alteration, or relocation of an eligible resource are actions that could change those elements of the resource which make it eligible. The following eligibility criteria were developed using guidance provided by the State CEQA Guidelines, and they consider the context and intensity of the environmental effects as required under NEPA. Under the State CEQA Guidelines, impacts on cultural resources may be considered significant if a project alternative would result in any of the following:

- Cause a substantial adverse change in the significance of a historical resource, as defined in Guidelines Section 15064.5
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to Guidelines Section 15064.5
- Disturb human remains, including those interred outside formal cemeteries

According to the above criteria, the project would be considered to have a significant impact on cultural resources if it would result in any of the following:

- Substantial adverse change in the significance of an historical resource
- Substantial adverse change in the significance of a unique archaeological resource
- Disturbance or destruction of unique paleontological resource or site or unique geologic feature
- Disturbance of any human remains, including those interred outside of formal cemeteries
- Elimination of important examples of the major periods of California history or prehistory

Under CEQA an impact to a cultural resource can be reduced to a less-than-significant level through mitigation. Statements of impact significance are relative to both existing conditions (Year 2012) and future conditions (Year 2030), unless stated otherwise. Only those elements of a resource which contribute to its eligibility need to be considered; effects to noncontributing elements are less than significant.

14.3.3 Direct and Indirect Effects

This section describes the environmental consequences of the SLWRI alternatives, and proposed mitigation measures for any impacts determined to be significant or potentially significant.

No-Action Alternative

Dam construction, infrastructure and facilities relocation, additional reservoir area inundation, and construction activities adjacent to the upper Sacramento River would not occur under the No-Action Alternative. Therefore, no additional cultural resources above the current reservoir level would be impacted, and conditions would be the same as existing.

Shasta Lake and Vicinity

Impact Culture-1 (No-Action): Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation Archaeological sites (as well as historic cemetery locations) within the existing Shasta Lake fluctuation zone will continue to be impacted by fluctuations in the height of the reservoir during ongoing operations with the No-Action Alternative. As stated above, dam construction, infrastructure and facilities relocation, and additional inundation as a result of the proposed action alternatives would not occur under the No-Action Alternative; therefore, no new impacts on cultural resources related to construction or inundation are expected. Mitigation is not required for the No-Action Alternative, as the proposed activities related to the action alternatives would not occur. Responsibilities to manage ongoing impacts from the No-Action Alternative may fall under other Federal or State laws which would be separate from any implementation requirements related to the action alternatives.

Impact Culture-2 (No-Action): Inundation of Traditional Cultural Properties Any Traditional Cultural Properties within the existing Shasta Lake fluctuation zone will continue to be impacted by fluctuations in the height of the reservoir during ongoing operations with the No-Action Alternative. As stated above, additional inundation as a result of the proposed action alternatives would not occur under the No-Action Alternative; therefore, no new impacts on cultural resources related to inundation are expected. Mitigation is not required for the No-Action Alternative. Responsibilities to manage ongoing impacts from the No-Action Alternative may fall under other Federal or State laws which would be separate from any implementation requirements related to the action alternatives.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Culture-3 (No-Action): Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction Archaeological sites (as well as historic cemetery locations) in or near the upper Sacramento River will continue to be impacted by water operations with the No-Action Alternative. As stated above, construction activities adjacent to the upper Sacramento River would not occur under the No-Action Alternative; therefore, no impacts on cultural resources related to construction are expected. Mitigation is not required for the No-Action Alternative. Responsibilities to manage ongoing impacts from the No-Action Alternative may fall under other Federal or State laws which would be separate from any implementation requirements related to the action alternatives.

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

Cultural resources potentially impacted by this alternative include those within: (1) the proposed additional 1,229-acre inundation area; (2) the portion of the proposed fluctuation zone for this alternative within the existing reservoir area; and (3) those portions of the 0.25-mile buffer around the reservoir where

infrastructure would need to be relocated (recreation facilities, roads, utilities, trails, etc.). It should be noted that sites typically extend into the inundation and reservoir area for more than one alternative.

Shasta Lake and Vicinity

Impact Culture-1 (CP1): Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation Raising Shasta Dam would have a direct impact on cultural resources. This impact would be significant. As noted, previous reservoir studies indicate that impacts are greatest in the zone of inundation and drawdown (fluctuation zone), where cultural resources are repeatedly exposed to scouring, wave action, wet/dry cycles, and de-vegetation. This means that the most significant impacts will occur where an undertaking increases the size of the fluctuation zone.

Sensitivity analyses, which are summarized at the beginning of this section, estimate that, with complete surveys, impacts associated with CP1 inundation and areas would include approximately 212±54 prehistoric resources (Table 14-2). The historic-era archival study documented 355 localities that may potentially contain historic-era remains within this inundation area.

Sensitivity analyses estimate that, with complete surveys, the CP1 fluctuation zone would include approximately 675±172 prehistoric resources. The historic-era archival study documented 529 localities that may potentially contain historic-era remains.

Table 14-2. Cultural Resources Impacts for CP1

Inundation Area	
Prehistoric sites	212±54
Historic-era archival localities	355
Fluctuation Zone	
Prehistoric sites	675±172
Historic-era archival localities	529
0.25-Mile Buffer	
All cultural resources	Fewer than CP2

Notes:
Mean prehistoric site estimates are based on weights-of-evidence quantitative analysis.
An undetermined number of sites will actually be subject to mitigation under NHPA Section 106.

Sensitivity analyses estimate that with complete surveys, the 0.25-mile buffer area for CP1 would include approximately 728±212 prehistoric resources. The historic-era archival study documented 773 localities that may potentially contain historic-era remains. Although the full extent and locations of project impacts within the buffer zone related to construction are not yet available for CP1, impacts would occur within only a small percentage of the overall buffer zone concentrated near the reservoir.

Although it is impossible at this stage to say how many of these resources will be determined eligible for listing under NHPA, and how many of the eligible resources will sustain adverse impacts from this alternative, this impact would be significant. Adverse effects will be avoided, minimized, or mitigated through project redesign, when warranted, or through the development and implementation of an MOA or PA, as discussed in Section 14.3.4.

Impact Culture-2 (CP1): Inundation of Traditional Cultural Properties Due to the confidential nature of sacred land filings, some sites have been identified within the study area, but specific locations are unknown. Several Native American groups have identified Traditional Cultural Properties and important ceremonial locations that would be adversely impacted by CP1. This impact would be significant.

In addition, places used for traditional practices that may be Traditional Cultural Properties have been identified within the study area. These locations are also confidential.

Two particularly important Winnemem Wintu ceremonial locations that would be impacted by CP1 include Puberty Rock and the doctoring pools near Nawtawaket Creek. CP1 could increase the frequency of inundation of Puberty Rock, restricting the Winnemem Wintu from holding the puberty ceremony at this important location during certain periods. Although Puberty Rock would still be accessible for portions of the year, when lake levels are lower, CP1 would increase the frequency of inundation. The relocation of the rock to higher ground is not possible, as, in the Winnemem worldview, its location is preordained and connected with the nearby “two sisters” mountain (Bollibokka Mountain). Puberty Rock also marks the location of an extensive village with housepits and burials. CP1 would inundate additional burials at this location, which would require removal and relocation. The Winnemem Wintu have estimated that 120 ancestral villages still accessible above the current high waterline of Shasta Lake would be adversely impacted by CP1.

The Pit River Madesi Band members state that 22 ethnographic villages, associated burial grounds, and several Traditional Cultural Properties are located within the existing reservoir and proposed inundation or fluctuation areas.

The local Native American community has identified several locations in the study area where ceremonial activities are carried out; notable among these are Puberty Rock and the doctoring pools near Nawtawaket Creek. Inundation or other adverse impacts to these places likely cannot be mitigated because the importance of the identified properties is inextricably tied to physical location, and relocation of these features away from the inundation area is not possible.

Although it is impossible at this stage to say how many of these resources will be adversely impacted due to inundation as a result of implementing CP1, this

impact would be potentially significant. These sites cannot be relocated and continue their importance to Native American cultural practices. Adverse effects will be avoided, minimized, or mitigated through project redesign, when warranted, or through the development and implementation of an MOA or PA. However it is unlikely that effects would be resolved for many Traditional Cultural Properties. Mitigation for this impact is proposed in Section 14.3.4, but it is unlikely that adequate mitigation is available to reduce the impact to a less-than-significant level.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Culture-3 (CP1): Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction

Construction activities adjacent to the upper Sacramento River associated with downstream ecosystem enhancements would not occur under CP1; therefore, no impacts on significant cultural resources related to construction are expected. Mitigation for this impact is not needed, and thus not proposed.

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

Cultural resources potentially impacted by this alternative include those within (1) the proposed additional 1,734-acre inundation area, (2) the portion of the proposed fluctuation zone for this alternative within the existing reservoir area, and (3) those portions of the 0.25-mile buffer around the reservoir where infrastructure would need to be relocated (recreation facilities, roads, utilities, trails, etc.).

Shasta Lake and Vicinity

Impact Culture-1 (CP2): Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation Raising Shasta Dam and enlarging Shasta Reservoir would have a direct impact on cultural resources. This impact would be significant. Sensitivity analyses estimate that, with complete surveys, inundation associated with CP2 would include approximately 224±57 prehistoric resources (Table 14-3). The historic-era archival study documented 371 localities that may potentially contain historic-era remains within this inundation area.

Table 14-3. Cultural Resources Impacts for CP2

Inundation Area	
Prehistoric sites	224±57
Historic-era archival localities	371
Fluctuation Zone	
Prehistoric sites	675±172
Historic-era archival localities	529
0.25-Mile Buffer	
All cultural resources	Fewer than CP3

Notes:
Mean prehistoric site estimates are based on weights-of-evidence quantitative analysis.
An undetermined number of sites will actually be subject to mitigation under NHPA Sec. 106.

Sensitivity analyses estimate that, with complete surveys, the fluctuation zone for CP2 would include approximately 675±172 prehistoric resources. The historic-era archival study documented 529 localities that may potentially contain historic-era remains.

Sensitivity analyses estimate that, with complete surveys, the 0.25-mile buffer zone for CP2 would include approximately 728±212 prehistoric resources. The historic-era archival study documented 773 localities that may potentially contain historic-era remains. Although the full extent and locations of project impacts related to construction activities within the buffer zone are not yet available for this alternative, they would occur within only a small percentage of the overall buffer zone concentrated near the reservoir.

Although it is impossible at this stage to say how many of these resources will be determined eligible, and how many of the eligible resources will sustain adverse impacts from CP2, this impact would be significant. Inundation or other adverse impacts to affected resources likely cannot be mitigated because the importance of the identified properties and ceremonial locations is inextricably tied to physical location, and relocation of these features away from the inundation area is not possible. Adverse effects will be resolved through project redesign, when warranted, or through the development of an MOA or PA, as discussed in Section 14.3.4.

Impact Culture-2 (CP2): Inundation of Traditional Cultural Properties
Alternative CP2 is similar to Alternative CP1 with respect to the potential to cause significant impacts to Traditional Cultural Properties by inundation or affected by the fluctuation zone. The Native American Heritage Commission (NAHC) identified sacred land filings within the study area, and local Native American groups have provided information related to many locations in the inundation and fluctuation zone. These locations are generally confidential, thus making it unclear whether or not they are situated within the CP2 area. For the same reasons that apply to CP1, this impact would be significant. Adverse effects will be avoided, minimized, or mitigated through project redesign, when warranted, or through the development and implementation of an MOA or PA.

However it is unlikely that effects would be resolved for many Traditional Cultural Properties. Mitigation for this impact is proposed in Section 14.3.4, but it is unlikely that adequate mitigation is available to reduce the impact to a less-than-significant level.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Culture-3 (CP2): Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction

Construction activities adjacent to the upper Sacramento River associated with downstream ecosystem enhancements would not occur under CP2; therefore, no impacts on cultural resources related to construction are expected. Mitigation for this impact is not needed, and thus not proposed.

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

Cultural resources potentially impacted by this alternative include those within (1) the proposed additional 2,497-acre inundation area, (2) the portion of the proposed fluctuation zone for this alternative within the existing reservoir area, and (3) those portions of the 0.25-mile buffer around the reservoir where infrastructure would need to be relocated (recreation facilities, roads, utilities, trails, etc.).

Shasta Lake and Vicinity

Impact Culture-1 (CP3): Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation Raising Shasta Dam would have a direct impact on cultural resources. This impact would be significant. Sensitivity analyses estimate that, with complete surveys, inundation associated with CP3 would include approximately 243±63 prehistoric resources (Table 14-4). The historic-era archival study documented 391 localities that may potentially contain historic-era remains within this inundation area.

Table 14-4. Cultural Resources Impacts for CP3

Inundation Area	
Prehistoric sites	243±63
Historic-era archival localities	391
Fluctuation Zone	
Prehistoric sites	675±172
Historic-era archival localities	529
0.25-Mile Buffer	
All cultural resources	Fewer than CP5, same as CP4

Notes:
Mean prehistoric site estimates are based on weights-of-evidence quantitative analysis.
An undetermined number of sites will actually be subject to mitigation under NHPA Sec. 106.

Sensitivity analyses estimate that, with complete surveys, the fluctuation zone for CP3 would include approximately 675±172 prehistoric resources. The historic-era archival study documented 529 localities that may potentially contain historic-era remains.

Sensitivity analyses estimate that, with complete surveys, the 0.25-mile buffer zone for CP3 would include approximately 728±212 prehistoric resources. The historic-era archival study documented 773 localities that may contain historic-era remains. Although the full extent and locations of project impacts related to construction activities within the buffer zone are not yet available for this alternative, they would occur within only a small percentage of the overall buffer zone concentrated near the reservoir.

Although it is impossible at this stage to say how many of these resources will be determined eligible, and how many of the eligible resources will sustain adverse impacts from CP3, this impact would be significant. Inundation or other adverse impacts to affected resources likely cannot be mitigated because the importance of the identified properties and ceremonial locations is inextricably tied to physical location, and relocation of these features away from the inundation area is not possible. Adverse effects will be resolved through project redesign, when warranted, or through the development of an MOA or PA, as discussed in Section 14.3.4.

Impact Culture-2 (CP3): Inundation of Traditional Cultural Properties CP3 is similar to CP1 with respect to the potential to cause significant impacts to Traditional Cultural Properties by inundation or affected by the fluctuation zone. The NAHC identified sacred land filings within the study area, and local Native American groups have provided information related to many locations in the inundation and fluctuation zone. These locations are generally confidential, thus making it unclear whether or not they are situated within the CP3 area. Adverse effects will be avoided, minimized, or mitigated through project redesign, when warranted, or through the development and implementation of an MOA or PA. However it is unlikely that effects would be resolved for many Traditional Cultural Properties. Mitigation for this impact is proposed in Section 14.3.4, but it is unlikely that adequate mitigation is available to reduce the impact to a less-than-significant level.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Culture-3 (CP3): Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction
Construction activities adjacent to the upper Sacramento River associated with downstream ecosystem enhancements would not occur under CP3; therefore, no impacts on cultural resources related to construction are expected. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

Cultural resources potentially impacted by this alternative include those within (1) the proposed additional 2,497-acre inundation area, (2) the portion of the proposed fluctuation zone for this alternative within the existing reservoir area, and (3) those portions of the 0.25-mile buffer around the reservoir where infrastructure would need to be relocated (recreation facilities, roads, utilities, trails, etc.). CP4 and CP4A include downstream ecosystem enhancements with spawning gravel augmentation and floodplain and riparian habitat restoration, both of which would entail construction activities adjacent to the upper Sacramento River.

Shasta Lake and Vicinity

Impact Culture-1 (CP4 and CP4A): Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation

Raising Shasta Dam would have a direct impact on cultural resources. This impact would be significant for CP4 or CP4A. Sensitivity analyses estimate that with complete surveys, inundation associated with CP4 and CP4A would include approximately 243±63 prehistoric resources (Table 14-5). The historic-era archival study documented 391 localities for CP4 and CP4A that may potentially contain historic-era remains within this inundation area.

Table 14-5. Cultural Resources Impacts for CP4 and CP4A

Inundation Area	**CP4**	**CP4A**
Prehistoric sites	243±63	243±63
Historic-era archival localities	391	391
Fluctuation Zone		
Prehistoric sites	601±154	675±172
Historic-era archival localities	524	529
0.25-Mile Buffer		
All cultural resources	Fewer than CP5, same as CP3	Fewer than CP5, same as CP3

Notes:
Mean prehistoric site estimates are based on weights-of-evidence quantitative analysis.
An undetermined number of sites will actually be subject to mitigation under NHPA Sec. 106.

Sensitivity analyses estimate that, with complete surveys, the fluctuation zone for CP4 would include approximately 601±154 prehistoric resources. Sensitivity analyses estimate that, with complete surveys, the fluctuation zone for CP4A would include approximately 675±172 prehistoric resources. The historic-era archival study documented 524 localities for CP4 and 529 localities for CP4A that may potentially contain historic-era remains.

Sensitivity analyses estimate that, with complete surveys, the 0.25-mile buffer zone for CP4 and CP4A would include approximately 728±212 prehistoric resources. The historic-era archival study documented 773 localities for CP4 and CP4A that may potentially contain historic-era remains. Although the full

extent and locations of project impacts related to construction activities within the buffer zone are not yet available, they would occur within only a small percentage of the overall buffer zone concentrated near the reservoir.

Although it is impossible at this stage to say how many of these resources will be determined eligible, and how many of the eligible resources will sustain adverse impacts, this impact would be significant for CP4.

Although it is impossible at this stage to say how many of these resources will be determined eligible, and how many of the eligible resources will sustain adverse impacts, this impact would be significant for CP4A.

Inundation or other adverse impacts to affected resources likely cannot be mitigated because the importance of the identified properties and ceremonial locations is inextricably tied to physical location, and relocation of these features away from the inundation area is not possible. Adverse effects will be resolved through project redesign, when warranted, or through the development of an MOA or PA, as discussed in Section 14.3.4.

Impact Culture-2 (CP4 and CP4A): Inundation of Traditional Cultural Properties CP4 and CP4A are similar to CP1 with respect to the potential to cause significant impacts to Traditional Cultural Properties by inundation or affected by the fluctuation zone. The NAHC identified sacred land filings within the study area, and local Native American groups have provided information related to many locations in the inundation and fluctuation zone. These locations are generally confidential, thus making it unclear whether or not they are situated within the CP4 and CP4A area. For the same reasons that apply to CP1, this impact would be significant. Adverse effects will be avoided, minimized, or mitigated through project redesign, when warranted, or through the development and implementation of an MOA or PA. However it is unlikely that effects would be resolved for many Traditional Cultural Properties. Mitigation for this impact is proposed in Section 14.3.4, but it is unlikely that adequate mitigation is available to reduce the impact to a less-than-significant level.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Culture-3 (CP4 and CP4A): Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction Previous cultural resource studies indicated the presence of cultural resources in or near proposed downstream construction areas related to spawning gravel augmentation and floodplain and riparian habitat restoration. This impact would be significant for CP4 or CP4A.

A total of 17 cultural resources have been recorded within the records search areas, consisting of eight prehistoric sites, six historic-era resources, and three resources with prehistoric and historic-era components. As mapped, thirteen of these cultural resources exist only in the 1/8-mile buffer areas, and only four of

these cultural resources extend into proposed construction areas. It should be noted that the proposed construction areas are concept-level and may be relocated or deleted as a result of design development, consultation, or other factors.

Although it is impossible at this stage to say how many eligible resources will sustain adverse impacts from CP4 or CP4A, this impact would be significant. Adverse effects will be resolved through project redesign, when warranted, or through the development of an MOA or PA, as discussed in Section 14.3.4.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Cultural resources potentially impacted by this alternative include those within (1) the proposed additional 2,497-acre inundation area, (2) the portion of the proposed fluctuation zone for this alternative within the existing reservoir area, and (3) those portions of the 0.25-mile buffer around the reservoir where infrastructure would need to be relocated (recreation facilities, roads, utilities, trails, etc.). CP5 also includes downstream ecosystem enhancements with spawning gravel augmentation and floodplain and riparian habitat restoration, both of which would entail construction activities adjacent to the upper Sacramento River.

Shasta Lake and Vicinity

Impact Culture-1 (CP5): Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation Raising Shasta Dam would have a direct impact on cultural resources. This impact would be significant. Sensitivity analyses estimate that, with complete surveys, inundation associated with CP5 would include approximately 243±63 prehistoric resources (Table 14-6). The historic-era archival study documented 391 localities that may potentially contain historic-era remains within this inundation area.

Table 14-6. Cultural Resources Impacts for CP5

Inundation Area	
Prehistoric sites	243±63
Historic-era archival localities	391
Fluctuation Zone	
Prehistoric sites	675±175
Historic-era archival localities	529
0.25-Mile Buffer	
All cultural resources	Largest quantity

Notes:
Mean prehistoric site estimates are based on weights-of-evidence quantitative analysis.
An undetermined number of sites will actually be subject to mitigation under NHPA Sec. 106.

Sensitivity analyses estimate that, with complete surveys, the fluctuation zone for CP5 would include approximately 675±172 prehistoric resources. The

historic-era archival study documented 529 localities that may potentially contain historic-era remains.

Sensitivity analyses estimate that, with complete surveys, the 0.25-mile buffer zone for CP5 would include approximately 728±212 prehistoric resources. The historic-era archival study documented 773 localities that may potentially contain historic-era remains. Although the full extent and locations of project impacts related to construction activities within the buffer zone are not yet available for this alternative, they would occur within only a small percentage of the overall buffer zone concentrated near the reservoir.

Although it is impossible at this stage to say how many of these resources will be determined eligible, and how many of the eligible resources will sustain adverse impacts from CP5, this impact would be significant. Inundation or other adverse impacts to affected resources likely cannot be mitigated because the importance of the identified properties and ceremonial locations is inextricably tied to physical location, and relocation of these features away from the inundation area is not possible. Adverse effects will be resolved through project redesign, when warranted, or through the development of an MOA or PA, as discussed in Section 14.3.4.

Impact Culture-2 (CP5): Inundation of Traditional Cultural Properties
Alternative CP5 is similar to Alternative CP1 with respect to the potential to cause significant impacts to Traditional Cultural Properties by inundation or affected by the fluctuation zone. The NAHC identified sacred land filings within the study area, and local Native American groups have provided information related to many locations in the inundation and fluctuation zone. These locations are generally confidential, thus making it unclear whether or not they are situated within the CP5 area. For the same reasons that apply to CP1, this impact would be significant. Adverse effects will be avoided, minimized, or mitigated through project redesign, when warranted, or through the development and implementation of an MOA or PA. However it is unlikely that effects would be resolved for many Traditional Cultural Properties. Mitigation for this impact is proposed in Section 14.3.4, but it is unlikely that adequate mitigation is available to reduce the impact to a less-than-significant level.

Upper Sacramento River (Shasta Dam to Red Bluff)
Impact Culture-3 (CP5): Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction
This impact would be significant. Previous cultural resource studies indicated the presence of cultural resources in or near proposed downstream construction areas related to spawning gravel augmentation and floodplain and riparian habitat restoration.

A total of 17 cultural resources have been recorded within the records search areas, consisting of eight prehistoric sites, six historic-era resources, and three resources with prehistoric and historic-era components. As mapped, thirteen of

these cultural resources exist only in the 1/8-mile buffer areas, and only four of these cultural resources extend into proposed construction areas. It should be noted that the proposed construction areas are concept-level and may be relocated or deleted as a result of design development, consultation, or other factors.

Although it is impossible at this stage to say how many eligible resources will sustain adverse impacts from CP5, this impact would be significant. Adverse effects will be resolved through project redesign, when warranted, or through the development of an MOA or PA, as discussed in Section 14.3.4.

14.3.4 Mitigation Measures

This section discusses mitigation measures for each significant impact described in the environmental consequences section, as presented in Table 14-7. In coordination with project designers, there will be opportunities to avoid, minimize, or mitigate adverse effects to historic properties through project redesign or through the development of an MOA or PA. An MOA or PA will ensure compliance with Section 106 and resolution of adverse effects.

Table 14-7. Summary of Mitigation Measures for Cultural Resources

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Culture-1: Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Culture-1: Develop and Implement measures identified in an NHPA Section 106 MOA or PA				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Culture-2: Inundation of Traditional Cultural Properties	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Culture-2:Adverse effects will be avoided, minimized, or mitigated through project redesign, when warranted, or through the development and implementation of an MOA or PA				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU

Table 14-7. Summary of Mitigation Measures for Cultural Resources (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Culture-3: Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction	LOS before Mitigation	NI	NI	NI	NI	S	S
	Mitigation Measure	None required.	No mitigation needed; thus, none proposed.			Mitigation Measure Culture-3: Implement Mitigation Measure Culture-1: Develop and Implement measures identified in an NHPA Section 106 MOA or PA	
	LOS after Mitigation	NI	NI	NI	NI	LTS	LTS

Key:
LOS = level of significance
LTS = less than significant
MOA = Memorandum of Agreement
NHPA = National Historic Preservation Act
NI = No Impact
PA = Programmatic Agreement
S = significant
SU = significant and unavoidable

No-Action Alternative

No mitigation measures are required for this alternative.

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

As this alternative is likely to cause significant, adverse impacts to historic properties, it will be necessary to mitigate those impacts.

Mitigation Measure Culture-1 (CP1): Develop and Implement measures identified in an NHPA Section 106 MOA or PA Avoid, minimize, or mitigate adverse effects through project redesign, when warranted, or through the development and implementation of an MOA or PA.

These impacts would be less than significant after mitigation.

Mitigation Measure Culture-2 (CP1) Avoid, minimize, or mitigate adverse effects to Traditional Cultural Properties through project redesign, when warranted, or through the development and implementation of an MOA or PA.

This impact would remain significant and unavoidable after mitigation.

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

As this alternative is likely to cause significant, adverse impacts to historic properties, it will be necessary to mitigate those impacts.

Mitigation Measure Culture-1 (CP2): Develop and Implement measures identified in an NHPA Section 106 MOA or PA Avoid, minimize, or mitigate adverse effects through project redesign, when warranted, or through the development and implementation of an MOA or PA.

These impacts would be less than significant after mitigation.

Mitigation Measure Culture-2 (CP2) Avoid, minimize, or mitigate adverse effects to Traditional Cultural Properties through project redesign, when warranted, or through the development and implementation of an MOA or PA.

This impact would remain significant and unavoidable after mitigation.

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

As this alternative is likely to cause significant, adverse impacts to historic properties, it will be necessary to mitigate those impacts.

Mitigation Measure Culture-1 (CP3): Develop and Implement measures identified in an NHPA Section 106 MOA or PA Avoid, minimize, or mitigate adverse effects through project redesign, when warranted, or through the development and implementation of an MOA or PA.

These impacts would be less than significant after mitigation.

Mitigation Measure Culture-2 (CP3) Avoid, minimize, or mitigate adverse effects to Traditional Cultural Properties through project redesign, when warranted, or through the development and implementation of an MOA or PA.

This impact would remain significant and unavoidable after mitigation.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

As CP4 or CP4A are likely to cause significant, adverse impacts to historic properties, it will be necessary to mitigate those impacts.

Mitigation Measure Culture-1 (CP4 and CP4A): Develop and Implement measures identified in an NHPA Section 106 MOA or PA Avoid, minimize, or mitigate adverse effects through project redesign, when warranted, or through the development and implementation of an MOA or PA.

These impacts would be less than significant after mitigation.

Mitigation Measure Culture-2 (CP4 and CP4A) Avoid, minimize, or mitigate adverse effects to Traditional Cultural Properties through project redesign, when warranted, or through the development and implementation of an MOA or PA.

This impact would remain significant and unavoidable after mitigation.

Mitigation Measure Culture-3 (CP4 and CP4A): Implement Mitigation Measure Culture-1 (CP4 and CP4A): Develop and Implement measures identified in an NHPA Section 106 MOA or PA This mitigation measure is the same as Mitigation Measure Culture-1 (CP4 and CP4A). Implementation of Mitigation Measure Culture-1 (CP4 and CP4A) would reduce Impact Culture-3 (CP4 and CP4A) to a less than significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

As this alternative is likely to cause significant, adverse impacts to historic properties, it will be necessary to mitigate those impacts.

Mitigation Measure Culture-1 (CP5): Develop and Implement measures identified in an NHPA Section 106 MOA or PA Avoid, minimize, or mitigate adverse effects through project redesign, when warranted, or through the development and implementation of an MOA or PA.

These impacts would be less than significant after mitigation.

Mitigation Measure Culture-2 (CP5) Avoid, minimize, or mitigate adverse effects to Traditional Cultural Properties through project redesign, when warranted, or through the development and implementation of an MOA or PA.

This impact would remain significant and unavoidable after mitigation.

Mitigation Measure Culture-3 (CP5): Implement Mitigation Measure Culture 1 (CP5): Develop and Implement measures identified in an NHPA Section 106 MOA or PA This mitigation measure is the same as Mitigation Measure Culture-1 (CP5). Implementation of Mitigation Measure Culture-1 (CP5) would reduce Impact Culture-3 (CP5) to a less than significant level.

14.3.5 Cumulative Effects

Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences,” gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, “Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area,” in Chapter 3, lists the projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the programs or projects listed in Table 3-1 under Quantitative Analysis would impact cultural resources in the primary study, nor overlap with resources affected in the extended study

area. The remainder of this analysis is focused on programs and projects in the Qualitative Analysis section of Table 3-1.

Past programs and projects have impacted cultural resources in the primary and extended study area through land use changes, inundation, erosion, construction, abandonment and illegal activities. The past projects such as Shasta Dam and Reservoir, road construction, and recreation development have cumulatively impacted cultural resources. Reasonably foreseeable projects listed on Table 3-1 that may impact cultural resources include but are not limited to Antlers Bridge Replacement, Moody Flats Quarry, and Mountain Gate at Shasta Mixed Use Area Plan. The project alternatives would result in a cumulatively considerable incremental contribution to a significant cumulative impact related to effects on cultural resources in the primary study area. Also in the Upper Sacramento River (Shasta Dam to Red Bluff) region of the extended study area, the project would result in a cumulatively considerable incremental contribution to a significant cumulative impact on cultural resources. The SLWRI alternatives would not impact cultural resources in other areas of the extended study area, so there would be no cumulative impacts from the project in these areas.

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Chapter 15
Indian Trust Assets

15.1 Affected Environment

This section describes the affected environment related to Indian Trust Assets (ITA) for the proposed dam and reservoir modifications under SLWRI action alternatives.

The affected environment for ITAs is the primary study area, within which all construction activities will take place, and which includes Shasta Lake's expanded inundation area, relocations within approximately 0.25 miles of the shoreline, and the upper Sacramento River from Shasta Dam to the Red Bluff Pumping Plant.

The extended study area would only be affected by changes in CVP and SWP operations, and includes the Sacramento River to the Delta and the CVP and SWP water service areas. For additional details on the primary and extended study areas, please refer to Section 1.3 and Figures 1-1 and 1-2 of the EIS. Since the action alternatives are not anticipated to have potential impacts to ITAs as a result of changes in CVP and SWP operations, an analysis of potential impacts to ITAs was determined unwarranted.

Indian Trust Lands in the region around the primary study area are shown in Figure 15-1.

Several Federally recognized tribes are located in the region surrounding the primary study area (Table 15-1).

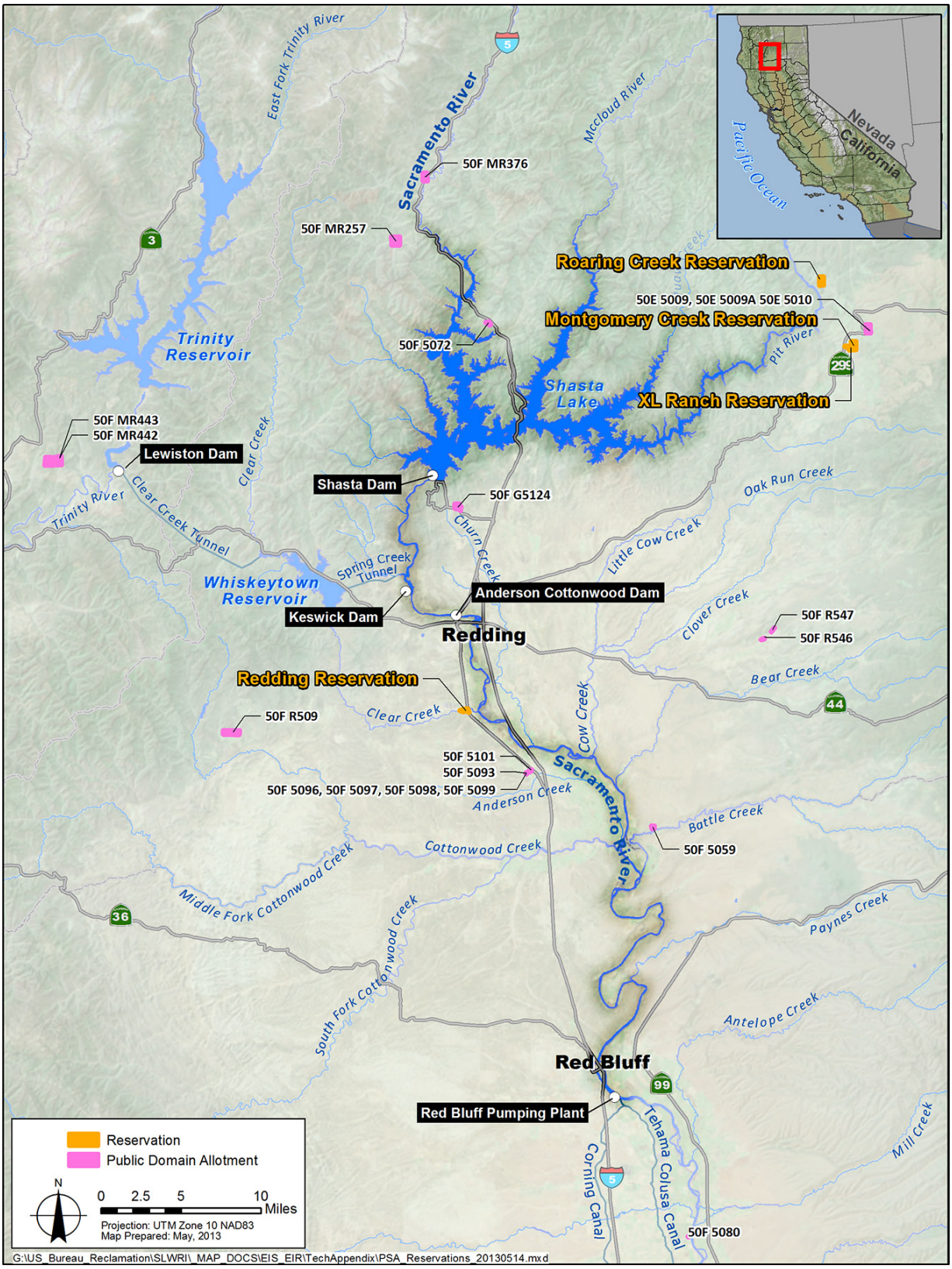

Figure 15-1. Reservations, Rancherias and Public Domain Allotments in Primary Study Area

Table 15-1. Federally Recognized Tribes in Region Surrounding Primary Study Area

Tribe	Affiliation
Grindstone Indian Rancheria of Wintun- Wailaki Indians	Wintun, Wailaki
Paskenta Band of Nomlaki Indians	Nomlaki
Pit River Tribe Environmental Office	Pit River, Wintun
Pit River Tribe	Pit River Achumawi Wintun
Redding Rancheria	Wintu, Pit River, Yana

15.2 Regulatory Framework

ITAs are legal interests in property held in trust by the U.S. for Federally recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, Federally reserved hunting and fishing rights, Federally reserved water rights, and in-stream flows associated with trust land. Beneficiaries of the Indian trust relationship are Federally recognized Indian tribes with trust land; the United States is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the United States. The characterization and application of the United States trust relationship have been defined by case law that interprets Congressional acts, executive orders, and historic treaty provisions.

The Federal Government, through treaty, statute, or regulation, may take on specific, enforceable fiduciary obligations that give rise to a trust responsibility to Federally recognized tribes and individual Indians possessing trust assets. Courts have recognized an enforceable Federal fiduciary duty with respect to Federal supervision of Indian money or natural resources, held in trust by the Federal Government, where specific treaties, statutes, or regulations create such a fiduciary duty.

Consistent with President William J. Clinton's 1994 memorandum, *Government-to-Government Relations with Native American Tribal Governments* (Federal Register, Vol. 59, No. 85, May 4, 1994, pages 22951–22952), Reclamation assesses the effect of its programs on tribal trust resources and Federally recognized tribal governments. Reclamation is tasked to actively engage Federally recognized tribal governments and consult with such tribes on a government-to-government level when its actions affect ITAs. The U.S. Department of the Interior Departmental Manual, Part 512.2 (1995), ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices. The Department of the Interior is required to "protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion" (Secretarial Order No. 3215, *Principles for the Discharge of the Secretary's Trust Responsibility*, Reclamation 2000). It is the general policy of the

Department of the Interior to perform its activities and programs in such a way as to protect ITAs and avoid adverse effects whenever possible. Reclamation complies with procedures contained in Departmental Manual, Part 512.2, guidelines, which protect ITAs. Reclamation carries out its activities in a manner that protects trust assets and avoids adverse impacts, when possible. When Reclamation cannot avoid adverse impacts, it will provide appropriate mitigation or compensation. Reclamation is responsible for assessing whether action alternatives CP1 through CP5 have the potential to affect ITAs. Reclamation will comply with procedures contained in Departmental Manual, Part 512.2, guidelines, which protect ITAs.

15.3 Environmental Consequences and Mitigation Measures

This section discusses environmental consequences and potential mitigation associated with ITAs that could result from implementing the alternatives described in this EIS.

15.3.1 Methods and Assumptions

A detailed description of both the primary and extended study areas was provided to the Bureau of Indian Affairs' Regional ITA Coordinator. The Regional ITA Coordinator examined both the project area descriptions and records held by the Bureau of Indian Affairs and Reclamation, and determined that the proposed action does not have potential to affect ITAs. There are no ITAs in the primary study area.

15.3.2 Direct and Indirect Effects

The following section describes the potential environmental consequences of the project.

No-Action Alternative

Under the No-Action Alternative, there are no potential impacts to ITAs because no new facilities would be constructed and existing operations would continue as historically.

CP1 Through CP5

There are no tribes possessing legal property interests held in trust by the United States in the study area for any of the proposed comprehensive plans (CP1 through CP5). The nearest ITA is a Public Domain Allotment approximately 5 miles north-northwest of the project location. This property would not be affected by inundation from the enlarged reservoir or have ground disturbing activities.

Cumulative Impacts

There are no potential impacts to ITAs as a result of the proposed action; therefore, the proposed action would not contribute to cumulative impacts to ITAs.

Chapter 16
Socioeconomics, Population, and Housing

16.1 Affected Environment

This chapter describes socioeconomics, population, and housing characteristics in the primary and extended study areas. For a more detailed discussion of the information presented in this chapter, see the *Socioeconomics, Population, and Housing Technical Report*.

16.1.1 Socioeconomics

Socioeconomics covers age, race/ethnicity, income/poverty, employment and labor force, business and industry, and government and finance. For a more detailed discussion of the information presented in this chapter, see the *Socioeconomics, Population, and Housing Technical Report*.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Race/Ethnicity In 2010, the white population represented more than 90 percent of the populations of Shasta and Tehama counties, but substantial increases were observed in many minority groups (U.S. Census Bureau 2010a). Tehama County's minority populations also increased between 2000 and 2010. Trends observed in the two counties generally coincide with statewide trends; Hispanic, Asian-Pacific Islander, and American Indian populations all grew by more than 9 percent over the 10-year period.

Income/Poverty Jurisdictions within the primary study area have underperformed when compared to the statewide averages for income levels and poverty rates. Median household incomes in Shasta and Tehama counties were sizably lower than the statewide average in 2000 and 2010, although Shasta County experienced a substantial increase in the 10-year period. With median household incomes of $42,931 and $39,392 in 2010, respectively, Shasta and Tehama counties had incomes averaging between $17,000 and $20,000 less than the statewide average for 2010 (U.S. Census Bureau 2011a). Overall poverty rates and child poverty rates also have been higher in the primary study area than in the State of California (State) as a whole.

Employment and Labor Force Because of the cyclical nature of the area's natural resource-related industries and other factors, Shasta and Tehama counties were characterized by substantially higher unemployment rates during the 1990s (Shasta County 2004). Unemployment rates in both counties have continued to increase and have exceeded State rates since 2007. From 2007

through 2010, unemployment rates in the two counties ranged between 1.8 percent and 3.3 percent above the statewide rate. The two counties recorded similar unemployment rates (varying between 0.1 and 0.7 percent) since 2007. In 2010, Tehama County registered a 15.6 percent unemployment rate, while unemployment in Shasta County totaled 15.7 percent of the population (EDD 2010a). As a result of its larger population, Shasta County maintained a labor force of just under 84,400 people in 2010, or more than three times that of Tehama County.

Business and Industry Economic activities in the primary study area coincide in many ways with the industrial composition of California as a whole. Education and health services, followed by governmental services, made up the top two industrial sectors both locally and statewide in 2010. In Shasta and Tehama counties, employees in the education and health services, which includes teachers and health workers, and government employees accounted for more than 40 percent of the total workforce. Similarly, retail trade, which includes general merchandise stores, food and beverage stores, and other miscellaneous stores and retailors, also ranks in the top five industries in both counties and California generally.

Some differences also exist between the industrial makeup of the two counties and that of California as a whole. For example, manufacturing plays an important role in Tehama County (7.6 percent) and California (10.0 percent) as a whole, but a comparatively small role in Shasta County. Professional and business services registers as the third largest industry at the statewide level (12.5 percent), but represents a smaller portion of employment in Shasta County (9.7 percent) and Tehama County (7.0 percent). Additionally, farm employment makes up a sizeable portion of the total workforce in Tehama County (8.3 percent), but accounts for a comparatively small portion of the workforce in Shasta County (3.1 percent) and California as a whole (2.3 percent).

Projections of future growth depict slightly different economic trends in Shasta and Tehama counties than at the statewide level. California's construction industry is expected to grow by 26 percent by 2020 (compared to 2010 levels), and the wholesale trade industry is expected to grow by more than 25 percent in that time. The construction industry represents the fifth largest growth industry in Tehama County (9.4 percent); however, it does not rank in the top growth industries in Shasta County. The wholesale trade industry also represents the fourth and third growth industries in Shasta and Tehama counties, respectively, but growth rates are expected to be less than the State rate (U.S. Census Bureau 2011a).

Established businesses, along with new businesses that locate in the area, will play an important role in the expansion of the local economy, as projected by the State. Table 1-11 in the *Socioeconomics, Population, and Housing Technical Report* displays a number of the major employers in the primary study area. This list of employers includes a range of businesses with a payroll

of more than 500 people. Three of the 10 businesses provide health care to local residents. Other employers with a payroll of over 500 people include: a wholesale nursery; insurance, pest management, and fuel management companies; a college; a manufacturer of industrial materials (mill work); and a wholesale distributor, identified as employing more than 1,000 people (EDD 2013a, 2013b).

Government and Finance Shasta and Tehama counties are the critical local governments in the primary study area. Each county has a primary urban center (Redding in Shasta County and Red Bluff in Tehama County), with a limited number of small cities and towns, and large amounts of rural land surrounding it. Because the two counties are largely rural, their total revenues and expenditures are relatively low when compared to other jurisdictions in California.

Revenues generated by Shasta County are used for a range of governmental activities. As described in the *Socioeconomics, Population, and Housing Technical Report*, expenditures increased from $302.8 million in the 2007 – 2008 fiscal year to $319.7 million in the 2008 – 2009 fiscal year. Expenditures decreased substantially in the 2009 – 2010 fiscal year to $309.6 million, as a result of decreased spending on transportation-related projects. Welfare, social services, and other public assistance have consistently been the largest expenditures for Shasta County (totaling more than $94.1 million in 2010), but remained relatively constant between 2007 and 2010. Police, fire, and other public safety activities represented the second largest expenditure category with more than $79.7 million in the 2009 – 2010 fiscal year.

Observed trends in Tehama County's revenues and expenditures have been generally similar to those experienced in Shasta County. Because of its smaller size, Tehama County's total revenues are substantially less than those of Shasta County ($112.3 million in the 2009 – 2010 fiscal year, compared to $309.6 million in Shasta County), but Tehama County experienced an overall decrease in revenue growth between 2007 and 2010.

Expenditures in Tehama County also are consistent with the trends observed in Shasta County.

Lower Sacramento River and Delta

Race/Ethnicity Overall, the majority of people in the nine-county lower Sacramento River and Delta portion of the extended study area are white (57.4 percent), but the proportion of population identified as white varies substantially between counties. In 2010, the white population of Glenn County (71.1 percent) was the highest proportion of any county in the area, while Sacramento and San Joaquin counties had the lowest proportion of white residents (51.0 percent) (U.S. Census Bureau 2010b). These proportions were less than that observed at the statewide level in 2010 (57.6 percent).

Income/Poverty Income and poverty characteristics for the lower Sacramento River and Delta area are similar to those for California as a whole. The median household income of the majority of counties within the nine-county area is similar to or higher than the statewide median household income ($59,641).

Poverty levels for both individuals and children in the lower Sacramento River and Delta counties are similar to the statewide level. Sacramento (16.6 percent), San Joaquin (17.7 percent), Glenn (18.2 percent), Yolo (19.9 percent), and Butte (20.3 percent) had higher overall poverty rates than California as a whole (15.5 percent) in 2010 (U.S. Census Bureau 2011b). The percentage of people below the poverty level is expected to follow national and statewide economic trends.

Employment and Labor Force Employment and labor trends in the nine lower Sacramento River and Delta counties generally are consistent with statewide trends. The area maintains a labor force of more than 1.9 million people, representing approximately 10 percent of California's labor force (18.3 million).

In the nine-county area in 2010, approximately 13.2 percent of the labor force was classified as unemployed, as compared to 12.4 percent statewide for the same period. Although the total unemployment rate was only 0.8 percent greater than the State's unemployment rate, unemployment within the lower Sacramento River and Delta counties varied substantially. Generally, the counties with the highest unemployment rates in 2010 had greater dependence on the agricultural industry and a reduced industrial diversity. Frequently, unemployment rates tend to be higher in rural areas than in urban areas, and farm workers commonly have seasonal and temporary jobs.

Business and Industry Business and industry in the lower Sacramento River and Delta counties are composed primarily of five sectors: government; educational and health services; professional and business services; retail trade; and leisure and hospitality (U.S. Census Bureau 2011b). These consistently rank in the top five sectors of the nine lower Sacramento River and Delta counties.

Government and Finance A total of 55 cities and towns and a range of special districts are located within the nine counties of the lower Sacramento River and Delta. This collection of governmental entities provides valuable public services to the lower Sacramento River and Delta area—education, fire protection, employment development, emergency services, and crime prevention and control. These agencies and special districts rely primarily on tax revenue disbursed by the State government, local sales and property taxes and fees, and the disbursement of Federal funds. This greater reliance on existing tax structures and rates, and a productive economic base, makes relatively reliable and affordable CVP and SWP water and power even more valuable, because its availability and affordability helps foster local business activity, and thus indirectly helps sustain the fiscal health of local service

providers. Similarly, flood protection provided by Shasta Dam helps protect and sustain the appraised value of property within the dam's floodplain, again helping to protect the fiscal health of local service providers.

Total revenues and expenditures vary substantially between the nine counties of the lower Sacramento River and Delta because of the relative sizes of the counties and the services they provide. Revenues include payments received through taxes, licenses and permits, grants from other governments, charges for services, and others. Expenditures include payments made by a jurisdiction to buy goods, pay its employees, and provide services to its residents. Glenn County had the smallest total of revenues and expenditures, each at $82.2 million for 2009-2010, while Sacramento County had the greatest total of revenues and expenditures at $2.4 billion and $2.5 billion, respectively, for 2009-2010 (Glenn County 2009; Sacramento County 2009).

CVP/SWP Service Areas

Race/Ethnicity The population within the CVP and SWP service areas continues to diversify. The proportion of the statewide population made up of minority groups has been steadily increasing. The population of individuals in California who identify themselves as Asian–Pacific Islander or multiracial experienced double-digit population growth between 2000 and 2010 (U.S. Census Bureau 2002, 2010b). Hispanics are the largest minority population in California and many members of this ethnic group work on farms that receive some or all of their water from the CVP and SWP.

Income/Poverty Poverty levels for both individuals and children in California increased slightly between 2000 and 2010. The percentage of people below the poverty level is expected to follow national and statewide economic trends.

Employment and Labor Force Employment and labor force trends observed in the CVP and SWP service areas generally are synonymous with the trends observed at the statewide level because of the expanse of the CVP and SWP service areas. California's total labor force increased consistently from year to year between 2007 and 2010. Between 2007 and 2008, the labor force increased by approximately 282,100 individuals, which was the largest annual increase over the 4-year period. Between 2009 and 2010, the labor force increased by approximately 108,100 individuals. California's total labor force exceeded 18.3 million in 2010.

Although increases in the State's total labor force were relatively consistent, the State's unemployment rate fluctuated between 2007 and 2010. The State's unemployment rate was 5.4 percent in 2007 and increased steadily over the next 4 years to 12.4 percent. This increase in the unemployment rate at the State level coincided with similar national employment trends (EDD 2010a).

Business and Industry Business and industry trends for the CVP and SWP service areas are assumed to be equal to those at the statewide level because of

the expanse of these service areas. The education and health services sector represents the largest industry in California, measured by total employees. Government is California's second largest work sector, and the retail trade, professional and business services, and leisure and hospitality industries all play important roles in the State's economy.

Government and Finance The State represents the most appropriate level of detail for the CVP and SWP service areas because of the expanse of the service areas and the interdependent nature of government and finance provision. California currently ranks as the seventh largest economy in the world and provides goods and services to more than 38 million people, making it the largest state in the nation. As a result, State government manages a large annual volume of revenues and expenditures. The State's adopted 2012–2013 budget includes a total of approximately $132.9 billion in revenues and transfers and $142.4 billion in total expenditures (State of California 2012). Many of the State's expenditures represent grants and other funding, made available to local jurisdictions throughout California. These funds may be used for a variety of services, such as health and human services, environmental protection, and resource management.

16.1.2 Population

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

The area surrounding Shasta Dam includes generally smaller cities and towns with two larger, primary urban areas in each of the two counties (Shasta County and Tehama County). Almost 39 percent of the population in Shasta County and more than 65 percent in Tehama County lived in unincorporated areas in 2010. By comparison, only 17.2 percent of the population in the entire State lived in unincorporated areas in 2010. In total, the populations of Shasta and Tehama counties make up less than 1 percent of the total population in California.

The cities of Redding and Red Bluff are the two largest urban areas in the primary study area. Redding, with a total of 91,561 residents in 2010, is the most populous city in the region. Red Bluff is the second largest city in the region and the largest city in Tehama County, with a total of 13,825 residents in 2010. Remaining cities within the primary study area – Anderson, Shasta Lake, and Tehama – all contained fewer than 11,000 residents in 2010.

Although Shasta and Tehama counties are still comparatively small, both counties have been growing substantially over the past 15-20 years. Since 1990, the population of Shasta County has increased by more than 25 percent. During that time, the populations of Redding and Anderson have increased by approximately 38 percent and 30 percent, respectively. A similar situation has been observed in Tehama County, where the total population has grown by more than 27 percent since 1990. Most of this new growth has occurred in the unincorporated areas of Tehama County, rather than in its cities.

Shasta and Tehama counties are expected to continue this growth trend, with substantial growth in Tehama County. The State of California projects that Shasta County's population will increase by 27 percent by 2050, to a total of approximately 233,500 residents (DOF 2012). This increase is less than that total expected at the statewide level (32.0 percent). Tehama County is expected to have a larger population increase compared to the state level, where the population is expected to increase approximately 44 percent between 2010 and 2050 (DOF 2012).

Lower Sacramento River and Delta

As described in the *Socioeconomics, Population, and Housing Technical Report*, roughly 4 million people live in the nine-county area that makes up the lower Sacramento River and Delta area (Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, and Yolo counties). This population represents approximately 11 percent of California's total population. Sacramento County and Contra Costa County are the two largest counties in the area, with approximately 1.4 million and 1.0 million residents, respectively, in 2010 (DOF 2010). All of the nine-county area is expected to grow at a faster rate than California as a whole (32.0 percent increase) through 2050. Population increases of at least 34 percent are expected in all nine counties in the area, over that time (DOF 2012).

CVP/SWP Service Areas

In 2010, California contained a total of 38.7 million residents. Approximately 80 percent of the State's population resided in the incorporated areas of its 58 counties (DOF 2010). Similar to the State as a whole, most of the population of the CVP and SWP service areas is concentrated within urban areas. Outside of these fast-growing population centers, most of the lands within the CVP and SWP service areas are rural, with irrigated agriculture being the predominant land use and driver of the local and regional economies.

California's population has increased by almost 25 percent since 1990, and it is projected to increase by approximately 32 percent to more than 51 million people by 2050. This substantial population increase will result in a sizeable increase in water and energy demand across the State. The proportion of the statewide population made up of minority groups has been steadily increasing.

16.1.3 Housing

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

As shown in the *Socioeconomics, Population, and Housing Technical Report*, as would be expected, provision of housing in the primary study area generally coincides with the population trends discussed above. Shasta County (77,857 units in 2010) maintains almost three times the amount of housing units as that of Tehama County (27,729 units) (DOF 2010). Of the nearby cities, Redding provides the largest supply of housing in the region, with more than 38,000

housing units. Redding's units represent roughly half the total housing units in Shasta County. Red Bluff provides the second largest housing stock in the area, with more than 6,000 units. Within Redding and Anderson, the increase in housing units between 1990 and 2010 was substantially greater than the percentage increase at the State level (21.5 percent). Redding observed the greatest increase in housing units since 1990 (40.9 percent).

Overall, single-family dwelling units are the predominant housing type in the primary study area. Vacancy rates generally were higher than the statewide average (5.9 percent), with the exception of Redding (5.0 percent) and Anderson (5.8 percent). Tehama County registered the highest vacancy rate in the primary study area, with 10.9 percent of all its housing units vacant. The average household size in jurisdictions of the primary study area ranged from as low as 2.33 persons per household (Tehama) to as high as 2.64 persons per household (Anderson and Shasta Lake). All of these totals were lower than the average number of persons per household at the statewide level (2.96 persons).

Lower Sacramento River and Delta

As shown in the *Socioeconomics, Population, and Housing Technical Report*, housing characteristics in the nine lower Sacramento River and Delta counties generally are similar to those at the statewide level. In 2010, the area contained approximately 1.6 million housing units. Similar to population, this total represents approximately 11 percent of California's housing stock (approximately 14 million houses). Overall, single-family housing makes up a larger proportion of the total housing stock in the nine-county area (72.7 percent) than recorded at the statewide level (64.4 percent) in 2010 (DOF 2010).

The vacancy rate in the nine-county area in 2010 was higher (5.3 percent) than the rate observed at the statewide level (4.8 percent). Vacancy in the majority of counties (six of nine counties) within the lower Sacramento River and Delta area was substantially lower than California as a whole (DOF 2010).

Average household size in the lower Sacramento River and Delta area is generally lower than that observed at the statewide level. In total, an average of 2.82 persons lived in the households of the nine-county area in 2010. This compared to an average of 2.96 persons for California as a whole (DOF 2010).

CVP/SWP Service Areas

A description of housing in the CVP and SWP service areas is not included because it would not be affected by the project.

16.2 Regulatory Framework

The analysis of socioeconomic resources is guided primarily by Federal laws and policies. State and local laws and policies typically promote economic development and diversity, environmental justice, public health and safety, and

housing, and address the concerns of the residents within their jurisdictions. As noted in the following discussion, NEPA documents must include an assessment of potential conflicts with State and local plans and policies.

16.2.1 Federal

The major Federal laws and regulations guiding the assessment of socioeconomic resources are summarized below.

National Environmental Policy Act

Section 102 of NEPA requires Federal agencies to "insure the integrated use of the natural and social sciences" in planning and decision making (42 U.S. Code Section 4332).

Section 1502.16(c) of NEPA requires Federal agencies to identify potential conflicts between a proposed action and related plans and policies of Federal, State, and local agencies and Indian tribes. This requirement helps Federal agencies identify potential conflicts that may cause adverse effects on the social and economic environment of a study area because many agency and tribal plans and policies are designed to protect the people residing within their jurisdictions and/or the local economy they depend on for their economic livelihoods.

Council on Environmental Quality

The Council on Environmental Quality's "Regulations for Implementing the Procedural Provisions of NEPA" (40 Code of Federal Regulations (CFR) Sections 1500–1508) provide guidance related to social and economic impact assessment by noting that the "human environment" assessed under NEPA is to be "interpreted comprehensively" to include "the natural and physical environment and the relationship of people with that environment" (40 CFR 1508.14). Furthermore, these regulations require agencies to assess "aesthetic, historic, cultural, economic, social, or health" effects, whether direct, indirect, or cumulative (40 CFR 1508.8). Some Federal agencies, including the U.S. Bureau of Land Management and USFS, have developed socioeconomics-related handbooks and instructional memoranda to help EIS preparers comply with NEPA, with respect to socioeconomics resources.

Executive Order 12898 – Environmental Justice

In 1994, President Bill Clinton issued Executive Order 12898 regarding environmental justice. It requires Federal agencies to "identify and address" disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States. The Council on Environmental Quality issued guidance in 1997, to help Federal agencies incorporate environmental justice concerns into their NEPA procedures. Environmental justice issues are specifically addressed in Chapter 24, "Environmental Justice," of this EIS.

16.2.2 State

Most State and local governments have plans and policies intended to protect and expand local and regional economies affecting the communities and residents within their jurisdictions. Some of these plans and policies also are intended to promote public health and safety while minimizing conflicts between new development projects of all types; their associated traffic, air, and noise impacts; and the social environment within which local residents live and work. State plans and policies also frequently address other social and economic impact topics, including fiscal conditions and related public services that affect local residents' quality of life.

In California, the California Environmental Protection Agency adopted its own environmental justice policy in 2004. Pursuant to Sections 71110–71113 of the California Public Resources Code, the agency has developed this policy (or strategy) to provide guidance to its resource boards, departments, and offices. It is intended to help achieve the State's goal of "achieving fair treatment of people of all races, cultures and incomes with respect to the development, adoption, implementation and enforcement of environmental laws and policies."

16.2.3 Regional and Local

Each of California's counties, including Shasta and Tehama counties, has its own plans, ordinances, and other policies designed to protect and improve a wide range of socioeconomic conditions. Specifically addressed in these plans, ordinances, and policies are housing; employment opportunities for minorities and low-income populations, and others; economic diversification; and business activity in general.

Shasta County

Shasta County General Plan Two primary elements of the Shasta County General Plan (Shasta County 2004) address socioeconomic resources: Housing, and Economic Development. The Housing Element of the Shasta County General Plan (Shasta County 2011) establishes several goals and policies related to ensuring adequate housing provision, especially affordable housing, in the county. Shasta County's housing policies and programs are grouped into six primary categories, each supporting an identified goal. These categories and the goal associated with each are as follows:

- **Housing Supply**
  - **Goal** – To establish and implement policies and programs that will:
    - Contribute to the provision of an adequate supply and diversity of safe, healthy, and affordable housing for all income levels to meet the needs of residents in the unincorporated areas of Shasta County.

    - Satisfy the requirements of the Regional Housing Needs Allocation Plan for Shasta County for the 2004-2009 Housing Element period, specifically to realize the construction of new units as follows: Very Low Income – 300 units; Low Income – 255 units; Moderate Income – 1,035 units; and Above Moderate Income – 810 units.

- **Conserve and Improve Existing Affordable Housing**

  - **Goal** – To conserve, improve, and expand the inventory of existing affordable housing stock in the incorporated areas of the County, specifically to realize the conservation and/or rehabilitation of the following units: Rehabilitation (150): 60 units – Very Low Income; 55 units – Low Income; 25 units – Moderate Income; and 10 units – Above Moderate Income; Conservation (150): 90 units – Very Low Income; 53 units – Low Income; and 7 units – Moderate Income.

- **Housing Development Constraints**

  - **Goal** – To continue to remove all County constraints, as is practical and legal, which have the potential to hinder or impede the development of affordable housing projects.

- **Special Needs**

  - **Goal** – To continue to work collectively with local agencies to enhance and expand the outreach programs designed to provide accessible and affordable housing, including supportive services, for those persons with special needs including the elderly, large families, single mothers, children, developmentally and physically disabled persons, the mentally ill, farmworkers, and the homeless.

- **Energy Conservation**

  - **Goal** – To explore, implement, and promote energy conservation practices in all eligible existing and new housing projects.

- **Fair Housing**

  - **Goal** – To continue to use all feasible means to promote, expand, and ensure equal access to available, safe, decent, affordable housing opportunities in the unincorporated area without bias or prejudice for any reason for all economic segments of the County.

The Economic Development Element of the Shasta County General Plan (Shasta County 2004) establishes the following two overall objectives for economic development:

- **ED-1** – Economic development plans, programs, and policies shall contribute to a stable and healthy economy in Shasta County, which includes provision of a land development pattern, planning process, and regulatory atmosphere conducive to maintaining employment opportunities for County residents and fostering new economic development.

- **ED-2** – Seek economic diversity that increases the variety, type and scale of business, industrial, and manufacturing activities.

To support these objectives, Shasta County has established three primary policies for implementation. These policies emphasize the reuse and revitalization of existing development and full use of existing infrastructure for new business opportunities. To attract business to Shasta County, a number of incentive programs are employed, including community development block grants, economic assistance through a county redevelopment agency, and business development and retention assistance through an economic development corporation. Additionally, a 50-square-mile, State-defined enterprise zone (one of only 39 in California) has been designated in portions of Redding, Shasta Lake, Anderson, and unincorporated Shasta County. Enterprise zones are generally designated in locations characterized by high poverty rates. Businesses locating within these areas may receive State-supported incentives, such as sales and use tax credits, hiring assistance tax credits, and special business expense deductions (Shasta County 2004).

Tehama County

In the Tehama County General Plan, updated in 2009 (Tehama County 2009), Tehama County set out three "fundamental concepts" that relate to population growth and demographic shifts: (1) accommodating growth, but not limiting growth or accepting uncontrolled growth; (2) locating major growth along the Interstate 5 transportation corridor; and (3) organizing growth according to a range of community types. These concepts emphasize where Tehama County expects to locate new growth and how they plan to accommodate it. Specifically, the Interstate 5 corridor plays a significant role for the placement of new development, and Tehama County attempts to provide a range of housing types for the diversity of needs created within the community. This emphasis on housing diversity may become more crucial as aging residents' housing preferences change.

The following housing-related goals in the general plan are relevant to the project:

- **Goal HE-3: Adequate Sites** – Ensure the provision of adequate sites and facilities to support future housing needs.

- **Goal HE-5: Housing Conservation** – Work to improve, maintain and conserve the County's existing housing stock.

- **Goal HE-6: Addressing Constraints** – Address and wherever possible remove, governmental constraints to the maintenance, improvement, or development of housing to meet the needs of County residents.

- **Goal HE-7: Fair Housing/Equal Opportunity** – Promote equal housing opportunities for all persons without discrimination regardless of age, race, sex, marital status, ethnic background, household composition, sources of income, or other arbitrary factors.

Relevant economic development-related goals contained in the draft general plan are as follows:

- **Goal ED-3** – Expand the economic base while maintaining a healthy and diverse local economy that meets the present and future employment, shopping, recreational, public safety, and service needs of Tehama County residents.

- **Goal ED-4** – Work toward providing adequate infrastructure to support commercial, industrial, and recreational development within Tehama County including clean-up of contaminated industrial sites.

- **Goal ED-7** – Protect and enhance environmentally sensitive lands and natural resources while, at the same time, promoting business expansion, retention, and recruitment.

Shasta and Tehama counties function as the primary agencies responsible for implementing policies and programs aimed at addressing employment and labor force issues within the project's primary study area.

16.3 Environmental Consequences and Mitigation Measures

Based on the review of the affected environment provided in Section 16.1 of this chapter, this section describes the potential environmental consequences resulting from each of the proposed alternatives. Direct, indirect, and cumulative effects of the alternatives are discussed below. When potential environmental consequences are identified, specific mitigation measures to offset the potential effects of the alternatives are presented. Potential effects and mitigation measures address topics related to population, demographics, and housing; employment and labor force; business and industry; and government and finance.

16.3.1 Methods and Assumptions

Population, Housing, and Demographics

The analysis of the potential impacts of the project alternatives on population, housing, and demographic characteristics was based on a review of published

material pertaining to the primary and extended study areas. California Department of Finance population and demographics databases and projections, U.S. Census Bureau population and demographics data, the general plans of jurisdictions within the study areas, and other similar source documents were reviewed.

Population effects were evaluated based on changes in the total number of temporary and/or permanent residents likely to result from construction and operations activities that would be performed as part of project implementation. Housing effects were assessed based on estimated short- and long-term housing needs resulting from population changes, expected as a result of the project's construction and operational activities. Effects of the project on local and regional demographic characteristics were assessed quantitatively, when available data allowed. When quantitative analysis of effects was not possible at this broader geographic level, qualitative effects were identified based on the projected makeup (e.g., ethnicity, economic class) of any population changes expected to result from project implementation.

Employment and Labor Force

The determination of potential impacts on employment and the labor force was based on a review of relevant information related to current conditions. Documents such as the California Employment Development Department's employment and labor force databases, the Economic Development and Housing elements of the Shasta County General Plan (2004), and the Tehama County General Plan Update (2009) were reviewed, along with estimates of employment (temporary and permanent jobs created) for each proposed alternative.

To quantify the potential job creation resulting from each proposed alternative, IMPLAN (IMpact analysis for PLANning model, Version 3.0.17.2) modeling was performed. IMPLAN modeling uses a branch of economics known as Input/Output analysis originally developed from the analytical work conducted by Wassily Leontief in the late 1930s. Input/Output models are essentially accounting tables that trace the linkages of interindustry purchases and sales within a specific region, and within a given year. The Input/Output model yields "multipliers" that are used to calculate the total direct, indirect, and induced effects on jobs, income, and output generated per dollar of spending on various types of goods and services in the local economic study area. IMPLAN was originally developed by the USFS and now is maintained and marketed by the Minnesota IMPLAN Group, Inc.

The IMPLAN modeling incorporated project construction-related economic activity in the four-county region surrounding Shasta Lake. The primary set of effects analyzed using the regional model was how project construction would affect output, personal income, and employment within the four-county area containing the dam and reservoir. The project costs and duration over which construction activity would take place were developed for each action

alternative. The costs were organized into categories to assess the required investment that would take place in certain primary sectors of the local economy, namely concrete- and steel-related manufacturing, rock and aggregate, and dam and non-residential construction.

Several specific assumptions were necessary to complete IMPLAN modeling of the project. The following assumptions were used:

- IMPLAN modeling was completed for CP1 (which involves raising Shasta Dam by 6.5 feet); CP2 (which involves raising the dam by 12.5 feet); and CP3, CP4, CP4A, and CP5 (all of which involve raising the dam by 18.5 feet).
- A construction period of approximately 4.5 years was assumed under CP1, and 5 years under CP2, CP3, CP4, CP4A, and CP5.
- The "local economic study area" was defined as the four-county area of Shasta, Siskiyou, Tehama, and Trinity counties.
- A total labor force of 300 construction workers would be needed for CP1 and CP2; 350 construction workers would be needed for CP3, CP4, and CP4A; and 360 construction workers would be needed for CP5.
- All 300–360 construction workers would be drawn directly from the local economic study area (used in IMPLAN modeling). (High unemployment in the primary study area and the availability of necessary worker skill sets supports this assumption.)

In addition to IMPLAN modeling, the Statewide Agricultural Production (SWAP) model, Version 6, was used to determine the effects of the action alternatives on CVP and SWP agricultural users. The SWAP model is a regional economic model of irrigated agricultural production that simulates the decisions of agricultural producers (farmers) in the Central Valley of California. The model included 27 crop production regions in the Central Valley and 20 categories of crops. Based on the changes in water availability expected with each alternative, the SWAP model predicted cropping patterns, land use, and water use in the Central Valley. These predictions then were used to calculate expected changes in net income resulting from each alternative during dry, wet, and average water years.[1] Although the model's income-related projections were generally used to determine effects on business and industrial activity, the overall change in business net income (or profits) is a good indicator for potential changes in employment opportunities in affected sectors.

[1] Throughout this document, water year types are defined according to the Sacramento Valley Index Water Year Hydrologic Classification unless specified otherwise.

Additional information on methods and assumptions for the IMPLAN and SWAP models is provided in the Modeling Appendix.

Business and Industry

The discussion of potential impacts on business and industry is based on a review of relevant information on current conditions, specifically California Employment Development Department documents, the Economic Development Element of the Shasta County General Plan (2004), the Tehama County General Plan Update (2009), and estimates of business and industry effects for each action alternative.

To quantify the potential effect on job creation and personal incomes resulting from each action alternative, IMPLAN modeling was completed by Reclamation economists. A description of IMPLAN modeling, generally, and the specific assumptions used, related to the project, are provided in the previous section.

Government and Finance

The determination and discussion of potential impacts on government and finance was based on a review of relevant information on existing conditions, specifically the Economic Development Element of the Shasta County General Plan (2004), the Tehama County General Plan Update (2009), and estimates of local government and finance effects for each dam-raise alternative.

Because no quantitative analysis of the effect of the action alternatives on local government and finance has been completed yet, this analysis depends heavily on a qualitative discussion of potential impacts. Areas of potential impacts were identified by comparing existing conditions and probable future conditions. In many cases, the estimates completed as part of the IMPLAN and SWAP modeling served as the basis for impact estimates. These two models determine expected trends in employment, personal incomes, business incomes, agricultural production, and other data types to quantifiably estimate the impacts of the proposed alternatives. Because these local characteristics directly influence activities at the local level, they represent critical considerations in the analysis and conclusions presented in this section.

16.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with 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 EIS 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, and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative on socioeconomics, population, and housing would be significant if project implementation would do any of the following:

- Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)
- Displace substantial numbers of people or housing, necessitating the construction of replacement housing elsewhere
- Produce a substantial burden on the existing housing stock within the local community because of an increased housing demand created by nonlocal project employees
- Require sizeable numbers of new workers in a particular industrial sector from outside the local area during construction or operation for effective implementation
- Substantially increase the risk of housing or other property damage caused by flooding
- Cause a substantial decrease in the number of opportunities for temporary or long-term direct employment within the primary study area or the extended study area (within Shasta County, Tehama County, or nearby cities and towns, specifically Redding, Anderson, Shasta Lake, and Red Bluff)
- Compete with established industries for workers within the labor force or associated resources to the extent that a shortage of workers available to related businesses would exist
- Cause a substantial decrease in the number of opportunities for temporary or long-term increases in personal and/or disposable incomes within the primary or extended study area (within Shasta County, Tehama County, or nearby cities and towns, specifically Redding, Anderson, Shasta Lake, and Red Bluff)
- Considerably decrease the sales and/or incomes of businesses in the primary or extended study areas

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

16.3.3 Topics Eliminated from Further Discussion

In contrast to the primary study area and the lower Sacramento River and Delta portion of the extended study area, additional flood control capacity provided by the action alternatives is not expected to substantially affect the CVP and SWP service areas beyond the lower Sacramento River and Delta. Dam operations (i.e., storage and release scenarios) in the CVP and SWP service areas are expected to continue, according to management plans similar to those currently in place. Therefore, no flood-related impact on population and housing would occur in the CVP and SWP service areas. This topic is not discussed further under CP1–CP5.

16.3.4 Direct and Indirect Effects

Similar to the approach used in Section 16.1, “Affected Environment,” the following discussion of environmental consequences in the primary study area does not separate Shasta Lake and vicinity from the upper Sacramento River (Shasta Dam to Red Bluff) because of the regional interdependence of their socioeconomic characteristics. Instead, environmental consequences are discussed for the entire primary study area and the two counties that encompass it, Shasta and Tehama counties.

No-Action Alternative

Under the No-Action Alternative, no additional Federal action would be taken to address water reliability issues or increase anadromous fish survival. Therefore, Shasta Dam and Shasta Lake would continue to operate as they currently do, with some modifications (currently not known) expected in the future. With the No-Action Alternative, water reliability is expected to become an increasing issue as demand for water increases to meet the needs of California’s growing population. Over time, water conservation and reuse efforts would increase, and water provision is expected to shift from such areas as agricultural production to urban uses. Environmental restoration, flood control, and hydropower generation are expected to continue similar to existing conditions. Like water demand, electricity demand in California is expected to increase substantially in the future. This increased demand is expected to create localized shortages in energy availability over time.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) Under the No-Action Alternative, population, demographics, and housing conditions are expected to continue following the current growth trends described in Section 16.1, “Affected Environment.” The projected employment and labor force characteristics summarized in Section 16.1 also would continue. The relatively large number of new construction-related jobs that would be created by all of the action alternatives would not be created. Therefore, this alternative would have no impact on population and housing or on employment and the labor force.

In addition, the business and industrial activity in the primary study area would continue, as summarized in Section 16.1, "Affected Environment." The relatively large and temporary increase in business activity that would occur during project construction would not occur. Therefore, the No-Action Alternative would have no impact on business and industrial activity.

Furthermore, the local government and finance conditions and trends, projected in Section 16.1, "Affected Environment," would continue because new facilities would not be constructed and existing facilities would not be altered, expanded, or demolished. The positive fiscal effects associated with the increase in sales and income tax revenue from construction-related spending would not occur. Therefore, the No-Action Alternative would have no impact on government and finance.

Lower Sacramento River and Delta Under the No-Action Alternative, the projected population, demographics, and housing conditions as well as development conditions, described in Section 16.1, "Affected Environment," would remain unchanged. No impact on population, demographics, or housing would occur.

In addition, the local government and finance conditions, described in Section 16.1, "Affected Environment," would continue because no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. The positive fiscal effects associated with the increase in sales and income tax revenue resulting from project construction-related spending would not occur. Therefore, the No-Action Alternative would have no impact on government and finance.

The impacts of the No-Action Alternative on employment and the labor force and on business and industrial activity in the lower Sacramento River and Delta area are described below.

Impact Socio-1 (No-Action): Potential for Reduced Employment Opportunities for Lower Sacramento River and Delta Area Residents The No-Action Alternative has the potential to result in periodic water and power supply disruptions from increasing demand on the existing supply caused by population growth. These disruptions could result in adverse economic effects on the lower Sacramento River and Delta portion of the extended study area. This impact would be potentially significant.

Under the No-Action Alternative, the risk of CVP and SWP water supply disruptions as well as Western Area Power Administration and DWR power supply disruptions in the lower Sacramento River and Delta area would be higher than the risk of such disruptions in the long term under the action alternatives. Although the likelihood of such disruptions is difficult to predict, the CalSim-II Version) modeling performed to simulate future water and power supply conditions under 2030 No-Action Alternative conditions, and 2030

conditions under each of the action alternatives, indicates that all of the action alternatives would enhance CVP and SWP water and power supply conditions relative to 2030 No-Action Alternative conditions. (CalSim-II modeling of power supply conditions for the 2030 No-Action Alternative currently is not available.)

An increase in the risk of water and power supply disruptions could, in turn, increase the likelihood that temporary and adverse socioeconomic effects would take place during related reductions in economic activity, including reductions in employment opportunities. Adverse economic effects during times of drought, blackouts, or other types of water or power supply disruptions also could include delays in hiring employees or layoffs, if businesses experience water and/or power rate increases as a result of water and power purveyors seeking other, more expensive replacement sources. This impact would be potentially significant. Mitigation is not required for the No-Action Alternative.

Impact Socio-2 (No-Action): Potential for Temporary Disruptions in Business and Industrial Activity in the Lower Sacramento River and Delta Area If water or power supply disruptions were to occur, they could cause temporary reductions in business and industrial activity, especially where water- and power-intensive industries and businesses are found. This impact would be potentially significant.

As discussed under Impact Socio-1 (No-Action) above, an increase in the risk of water or power supply disruptions could occur in the lower Sacramento River and Delta portion of the extended study area under the No-Action Alternative. If such disruptions were to occur, they could cause temporary reductions in business and industrial activity, especially in areas where water- and power-intensive industries and businesses are found. Because the No-Action Alternative could have adverse effects on businesses and industrial activity in the case of drought, blackouts, or other types of water or power supply disruptions, this impact would be potentially significant. Mitigation is not required for the No-Action Alternative.

CVP/SWP Service Areas Under the No-Action Alternative, the projected population, demographic, and housing conditions as well as development conditions, described in Section 16.1, “Affected Environment,” would remain unchanged. No impact would occur. Therefore, potential effects of the No-Action Alternative on population, demographics, or housing in this geographic region are not discussed further.

In addition, the local government and finance conditions in the CVP and SWP service areas described in Section 16.1, “Affected Environment,” would continue. The positive fiscal effects associated with the increase in sales and income tax revenue resulting from construction-related spending would not occur. Therefore, no impact would occur under the No-Action Alternative.

Potential effects of this alternative on government and finance in this geographic region are not discussed further.

The impacts of the No-Action Alternative on employment and the labor force and on business and industrial activity in the CVP and SWP service areas are described below.

Impact Socio-3 (No-Action): Potential for Reduced Employment Opportunities for Residents within the CVP and SWP Service Areas The No-Action Alternative has the potential to result in periodic water and power supply disruptions from increasing demand on the existing supply, caused by population growth. These disruptions could result in variability in economic activity, which could reduce or delay employment opportunities in the CVP and SWP service areas. This impact would be potentially significant.

Under the No-Action Alternative, the risk of CVP and SWP water supply disruptions as well as Western Area Power Administration and DWR power supply disruptions would be higher than the risk of such disruptions in the long term under each of the action alternatives. The likelihood of such disruptions is difficult to predict; however, the CalSim-II modeling performed to simulate future water and power supply conditions under 2030 No-Action Alternative conditions, and 2030 conditions under each of the action alternatives, indicates that all of the action alternatives would enhance CVP and SWP water and power supply conditions relative to 2030 No-Action Alternative conditions. (CalSim-II modeling of power supply conditions for the 2030 No-Action Alternative currently is not available.)

An increase in the risk of water and power supply disruptions, including drought, blackouts, or other types of water or power disruptions, could in turn increase the likelihood of temporary and adverse socioeconomic effects. Adverse economic effects during times of these disruptions could reduce economic activity and also result in delays in hiring employees or layoffs if businesses were to experience water and/or power rate increases as a result of water and power purveyors seeking other, more expensive replacement sources. This impact would be potentially significant. Mitigation is not required for the No-Action Alternative.

Impact Socio-4 (No-Action): Potential for Temporary Disruptions in Business and Industrial Activity in the CVP and SWP Service Areas If water or power supply disruptions were to occur, they could cause temporary reductions in business and industrial activity, especially where water- and power-intensive industries and businesses are found. This impact would be potentially significant.

As discussed under Impact Socio-3 (No-Action) above, an increase in the risk of water or power supply disruptions could occur in the CVP and SWP service areas under the No-Action Alternative. If such disruptions were to occur, they

could cause temporary reductions in some business and industrial activity, especially in areas where water- and power-intensive industries and businesses are found. Because the No-Action Alternative could have adverse effects on businesses and industrial activity in the case of drought, blackouts, or other types of water or power supply disruptions, this impact would be potentially significant. Mitigation is not required for the No-Action Alternative.

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

CP1 focuses on increasing water supply reliability and increasing anadromous fish survival. This plan primarily consists of raising Shasta Dam by 6.5 feet, which, in combination with spillway modifications, would increase the height of the reservoir's full pool by 8.5 feet and enlarge the total storage capacity in the reservoir by 256,000 acre-feet to 4.81 million acre-feet (MAF). CP1 would increase the maximum surface area of the pool to 30,800 acres. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 70,000 acre-feet and 35,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing municipal and industrial (M&I) deliveries.

Implementing CP1 is expected to result in the replacement or modification of 8 bridges and relocation of approximately 45 existing structures. The total construction cost associated with CP1 would be approximately $990 million.

CP1 would help reduce estimated future agricultural and M&I water shortages and would increase water supply reliability in the CVP/SWP service areas by increasing water supplies for agricultural and M&I deliveries, by at least 47,300 acre-feet per year in dry and critical years, and increasing average annual deliveries by about 31,000 acre-feet per year. The majority of the increased dry and critical year water supplies (i.e., 42,700 acre-feet) would be for south-of-Delta agricultural and M&I deliveries. In addition, CP1 would provide hydropower benefits by increasing hydropower generation, by approximately 54 gigawatt-hours (GWh) per year. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Socio-1 (CP1): Short-Term Increase in Population and Housing Demand in the Primary Study Area Resulting from Construction-Related Activities According to Reclamation estimates, approximately 300 direct jobs would be created as a result of construction activities associated with CP1. All 300 construction workers are expected to come from the local labor force; therefore, a temporary population increase is not expected. This impact would be less than significant.

Approximately 300 construction workers would be needed over the 4.5-year construction period to support the construction activities related to the 6.5-foot raise of Shasta Dam. Because of the availability, experience, and expertise of the existing labor force within the primary study area, the necessary workers are expected to be available in the surrounding two counties (Shasta and Tehama counties). Therefore, no construction workers are expected to be sourced from outside the primary study area, and no employees (or very few) would need to relocate to the project area during the construction period. Even if a relatively small number of workers were to come from outside the local area, sufficient housing capacity (e.g., rental housing, motel, and apartment vacancies) exists in the area. Thus, effects on population and housing in the primary and extended study areas are not expected; if they were to occur, they would be very minor. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-2 (CP1): Short-Term Increases in Direct, Indirect, and Induced Employment in the Primary Study Area Related to Construction Activities
Construction activities associated with CP1 would generate approximately 300 construction jobs, 400 indirect jobs in various construction-related support industries, and 610 induced jobs because of increased household spending in the primary study area. Individuals to fill these jobs are expected to be drawn from the local community. These new jobs are expected to provide important but temporary employment opportunities to many unemployed construction workers in the primary study area. This impact would be beneficial.

Concrete workers, workers with large-scale construction experience, general laborers, and others would be drawn from the existing local construction industry. These jobs would represent a relatively small increase (less than 0.3 percent) in the total labor force in the two counties (109,960 employees) of the primary study area, but would represent a substantial increase in employment for many of the cities surrounding the project site, where employment has consistently been below countywide and statewide averages (EDD 2010a, 2010b).

Although the increase in employment would represent a small percentage increase for the two-county area, the employment opportunities created by CP1 would represent a substantial contribution in counties that have consistently registered high unemployment rates. Unemployment rates steadily increased in both Shasta and Tehama counties, from around 7 percent in 2007 to over 15 percent in 2010 (EDD 2010a). Similarly, unemployment rates in the cities of Anderson, Shasta Lake, and Red Bluff steadily increased between 2007 and 2010, with Anderson and Shasta Lake exceeding those recorded at both county levels (EDD 2010b). Within Trinity and Siskiyou counties (i.e., the remaining two counties in the local economic study area, the area used in IMPLAN modeling), the 2010 unemployment rates exceeded 16 percent and 18 percent, respectively (EDD 2010c).

As stated above, IMPLAN modeling calculates "direct" employment generated by individual alternatives as well as "indirect and induced" positions that are created by construction-related and operational activities. Indirect employment may be to support hiring in businesses that provide materials to the construction effort; in service-related industries that provide food, beverages, and other goods to construction workers; or in more technical industries, such as consulting firms and other businesses. Induced employment is jobs that are created in the region because of increased household spending and not limited to construction-related activities.

In addition to the 300 direct, construction-related jobs to be created from CP1, an additional 400 indirect jobs are expected to be created from construction support industries, and 610 induced jobs from increased household spending near the project area. The generation of 1,320 new positions (direct, indirect, and induced) would represent a 1.0 percent increase from the total 2010 labor force of the four counties in the local economic study area used in the IMPLAN modeling (Shasta, Tehama, Trinity, and Siskiyou counties), which totaled approximately 135,100 employees (EDD 2010c). A 1.0 percent increase in employment would represent a substantial increase in total employment, especially for an area experiencing unemployment rates like those observed in the primary study area.

Because CP1 would create direct, indirect, and induced jobs in an area with high unemployment rates, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-3 (CP1): Potential for Temporary Reduction in the Labor Force of Related Industrial Sectors in the Primary Study Area as a Result of Direct Construction-Related Employment With the creation of 300 construction jobs resulting from CP1, the potential would exist for workers from other industries to move to jobs related to construction at Shasta Dam. Because of the size of the construction industry in the primary study area, and the high unemployment rate in the area, this impact would be less than significant.

As the 300 positions created under CP1 are filled, the potential would exist for the positions to be filled by individuals currently working in related industries within the local community. This transfer of workers from related industries to the Shasta project could create a labor shortage in the related industry, if particularly skilled workers are required. In 2010, Shasta County registered 4,700 employees in the construction industry, while construction industry workers in Tehama County equaled only 1,600 individuals, for a total of 6,300 construction workers in the area (U.S. Census Bureau 2011a). Based on total employment levels and current unemployment trends in the primary study area, the 300 new construction-related jobs are not expected to substantially affect the local labor force. If a high number of workers were to be sourced from Tehama County, a limited effect could be observed because of the small number of workers in the construction industry in that county. Overall, however, this

impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-4 (CP1): Short-Term Increases in Direct, Indirect, and Induced Personal Income Paid to Employees in the Primary Study Area Hired for Construction-Related Activities Based on calculations completed as a part of the IMPLAN socioeconomic model process, more than $85.9 million in personal income is expected to be directly paid to employees in the primary study area each year of construction under CP1. In addition, more than $48.3 million in personal income is expected to be generated from various indirect and induced construction-related and other industries in the primary study area each year of construction under CP1. The combined $134.2 million in personal income to be generated would represent an approximately 92 percent increase in all annual personal income in the local economic study area. This impact would be beneficial.

Based on the results of modeling that was performed using the IMPLAN model, an estimated $85.9 million would be directly paid each year to the approximately 300 construction workers required to complete work for CP1during the proposed 4.5-year construction period. The positions expected from implementation of project construction are anticipated to be union positions, and workers would be paid according to union wage and benefit standards.

Based on the generation of 1,010 indirect and induced jobs resulting from implementation of CP1, $48.3 million in personal income is expected to be available for residents of the local economic study area each year during the proposed 4.5-year construction period. This personal income would be generated in industries that would support the construction efforts at Shasta Dam.

Personal income in the four counties of the local economic study area has substantially decreased, from $8.9 billion in 2007 to $9.8 million in 2010 (EDD 2010d). Most of this decline can be attributed to high unemployment rates and other recessionary factors. With more than $6.2 million in personal income in 2010, Shasta County contributed more than 60 percent of personal income in the four counties.

The combined direct, indirect, and induced personal income resulting from CP1 is expected to exceed $134.2 million per year of construction activities within the local economic study area. This increase in personal income would represent an approximately 92 percent increase in all annual personal income in the local economic study area. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-5 (CP1): Short-Term Increases in Sales and Profits for Businesses in the Primary Study Area that Support the Construction Industry Most of the

construction materials used for CP1 are expected to be purchased within the primary study area. These purchases would provide the local economy with increased sales and profits over the 4.5-year construction period. This impact would be beneficial.

A large amount of construction material would be needed to raise Shasta Dam by 6.5 feet, as prescribed in CP1. These purchases may include raw or refined materials, infrastructure-related products, and/or equipment required for the construction process. Most of this material likely would be sourced from businesses within the primary study area. As a result of the large quantity of purchases expected, local businesses would experience temporary increases in sales and profits over the 4.5-year construction period. During the construction period, implementation of CP1 is expected to generate more than $349.8 million per year in sales and profits for construction-related and service-oriented businesses that support the construction industry, with approximately $220.0 million in direct income and $129.8 in indirect and induced income. Increased sales and profits could be reinvested into existing businesses, invested in new ventures or diversification, translated into increased salaries and wages for employees, or used in other ways. Therefore, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-6 (CP1): Short-Term Increase in State and Local Sales Tax Revenues in the Primary Study Area from Construction-Related Personal Income and Purchases As stated above, implementation of CP1 is expected to result in a substantial increase in total personal income (direct, indirect, and induced) during the construction period. This additional income, in combination with the construction-related purchases in the primary study area, would result in a substantial increase in local sales tax revenues from increased consumer spending in nearby cities and counties. Construction-related activities under CP1 likely also would result in a temporary increase in State sales and income tax revenues received from businesses and residents of the primary study area. The exact amount of State and local sales tax revenue increases would be speculative; however, this impact would be beneficial.

Based on the results of modeling performed using the IMPLAN model, implementation of CP1 is expected to generate more than $603.8 million in total personal income, with approximately $386.5 million in direct income and $217.4 million in indirect and induced income during the proposed 4.5-year construction period (see Impact Socio-4 (CP1), above). In addition to this increase in personal income, most of the construction materials would be purchased within the primary study area, generating a substantial amount of revenue and profits for local businesses (see Impact Socio-5 (CP1), above).

In combination, increased personal income and construction-related spending are expected to substantially increase the total sales tax revenues of local jurisdictions within the primary study area. Larger amounts of local sales tax revenue then could be used to establish new programs and initiatives or bolster

existing ones through additional funding. New and improved programs and initiatives would provide benefits to local residents.

As a result of the increased employment and personal income anticipated from implementation of CP1, a temporary increase in State sales and income tax would be likely to occur. During the construction period, more than $603.8 million in personal income is expected to be generated by direct, indirect, and induced employment, produced by the project. The increase in personal income would increase spending at local businesses within the primary study area. The exact amount of State and local sales tax revenue increases would be speculative; however, this additional spending would result in sizeable State sales tax revenues. This increased revenue source would be likely to return to the primary study area via statewide programs and policies.

For the reasons described above, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-7 (CP1): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Primary Study Area As a result of the added reservoir capacity created by CP1, the overall risk of flooding below Shasta Dam and its related consequences to the primary study area are expected to be reduced. Although heavy rain events would continue to occur in the region and locally, the project is intended to provide greater flexibility in flood control downstream because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents of the primary study area, as well as business and personal income losses from such damage. Therefore, this impact would be beneficial.

In Reclamation's Initial Alternatives Information Report (2004), flood control was identified as a secondary objective of the project. Increased flood control is to be emphasized when the two primary objectives of the project, increased anadromous fish survival and increased water supply reliability, can be met. Periodic flood events in the Sacramento Valley frequently cause substantial damage to properties adjacent to the valley's many waterways. Currently, Shasta Dam provides substantial protection from such flooding damage for downstream residents.

CP1 would increase the storage capacity of Shasta Lake by 256,000 acre-feet. This added capacity would provide greater flexibility in Reclamation's ability to use the reservoir for flood control purposes, thereby increasing the threshold at which seasonal heavy rain events produce flood conditions downstream from the dam. The benefits of this increase in capacity and related flood control options would be most evident along the upper Sacramento River within the primary study area. Structures and inhabitants in this floodplain experience the most direct effects from storage releases during flood events. CP1 would reduce

the frequency, magnitude, and duration of future flood events that have affected structures and their residents in this part of the primary study area in the past.

The loss of jobs and adverse effects on economic well-being and livelihoods is an often overlooked consequence of catastrophic flood events. Avoiding a larger number of these events, and possibly decreasing the magnitude and duration of flooding under certain high-flow events, is expected to reduce the overall economic hardships faced by residents of the primary study area under CP1.

Structures and businesses located on the river and inhabitants of the floodplain experience the most direct effects from flood releases downstream. However, flood events also could affect those not living on the river or in the floodplain but working downstream from the dam at businesses subject to flood damage. The reduced risk of flood events associated with CP1 also is expected to reduce the business and personal income losses resulting from substantial damage to structures and businesses located adjacent to downstream waterways in the primary study area.

Implementation of CP1 would reduce damage to structures, loss of business and personal income, loss of jobs, and other adverse effects on economic well-being in the primary study area. Therefore, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-8 (CP1): Long-Term Increases in Direct Employment in the Primary Study Area Related to Project Operations In the long term, implementation of CP1 is expected to create at least two new maintenance-related positions at the Shasta Dam facilities. These two positions are expected to be permanent and would continue once the 4.5-year construction period is completed. This impact would be minor but beneficial.

Reclamation estimates that with the 6.5-foot increase of Shasta Dam proposed in CP1, at least two new permanent maintenance positions would be required to ensure efficient operation of dam facilities. These two positions are expected to be union positions, and consequently would provide union-level wages and benefits. Both positions would be filled after completion of the construction activities associated with CP1 and would continue for the foreseeable future. This impact, though small, would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact Socio-9 (CP1): Potential Temporary Increase in Indirect Employment in Construction-Related Businesses of the Lower Sacramento River and Delta Construction activities associated with CP1 have the potential to result in a temporary increase in indirect employment within the lower Sacramento River and Delta portion of the extended study area. Depending on the location of construction materials sourced outside of the primary study area, indirect

increases in employment within construction-related businesses may result in the lower Sacramento River and Delta area. This impact would be minor but beneficial.

As a result of construction activities that would be completed during implementation of CP1, temporary increases in indirect employment would be expected in the lower Sacramento River and Delta portion of the extended study area. A small amount of the construction materials necessary for CP1 would be obtained outside the primary study area. During the construction period, businesses that provide construction materials are expected to increase employment to meet project demand. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-10 (CP1): Short-Term Increases in Sales and Profits for Businesses in the Lower Sacramento River and Delta Area that Support the Construction Industry A small amount of the construction materials used for CP1 would be purchased within the extended study area. These purchases are predicted to increase sales and profits of businesses within the lower Sacramento River and Delta area during the construction period. This impact would be beneficial.

A significant amount of construction materials would be needed to raise Shasta Dam by 6.5 feet, as prescribed in CP1. Of these materials, a small amount would be purchased from construction-related businesses in the extended study area, including the lower Sacramento River and Delta area. These purchases may include raw or refined materials, infrastructure-related products, and/or equipment required for the construction process. As a result of the purchases expected, businesses in the lower Sacramento River and Delta portion of the extended study area are expected to experience a temporary increase in sales and profits during the construction period. Similar to businesses within the primary study area, increased sales and profits could be reinvested into the existing businesses, invested in new ventures or diversification, translated into increased salaries and wages for employees, or used in other ways. The exact scale of the increase in business sales and profits within the lower Sacramento River and Delta area would be speculative, but this amount likely would be substantial. Therefore, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-11 (CP1): Short-Term Increase in State Sales and Income Tax Revenues in the Lower Sacramento River and Delta Area from Construction-Related Personal Income and Purchases In addition to local tax revenues, CP1 is expected to increase short-term, construction-related State sales and income tax revenues received from businesses and residents of the lower Sacramento River and Delta portion of the extended study area. These additional revenues are expected to be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial.

As a result of the increased employment and personal income anticipated as a part of implementation of CP1, a short-term increase in State sales and income tax revenues also is expected to occur. In the construction period, more than $603.8million in personal income would be generated by direct, indirect, and induced employment, generated by the project. This large amount of income would direct substantial income tax revenues to the State via State income tax requirements. These additional revenues would contribute substantially to the State budget and would be distributed to jurisdictions within the lower Sacramento River and Delta portion of the extended study area via statewide programs and policies. This impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-12 (CP1): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Lower Sacramento River and Delta Area As a result of the added reservoir capacity under CP1, the overall risk of flooding and its related consequences below Shasta Dam is expected to be reduced. Although heavy rain events would continue to occur in the region, CP1 is intended to provide greater flexibility in flood control in the lower Sacramento River and Delta area because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would be expected; this, in turn, would reduce salary and wage losses for residents in and near the lower Sacramento River floodplain and the Delta resulting from these catastrophic events, as well as business and personal income losses from such damage. Therefore, this impact would be beneficial.

Residents of the lower Sacramento River and Delta portion of the extended study area would benefit from the additional flexibility and flood control operations during flood events that would occur as a result of CP1. With the additional capacity provided by this alternative, the effects of large rain events would be reduced as a result of the improved management of systemwide flood control operations. Hydroelectric facilities within the lower Sacramento River and Delta area would be likely to experience flood events of somewhat less duration and magnitude, thus reducing the potential effects on vulnerable houses and property within the floodplain.

The loss of jobs and adverse effects on economic well-being and livelihoods often is an overlooked consequence of catastrophic flood events. Avoiding a larger number of these events and possibly decreasing the magnitude and duration of floods under certain high-flow events are expected to reduce the overall economic hardships faced by residents of the lower Sacramento River and Delta areas. The effects of heavy rain events would be better managed and the risk of flood-related effects could be reduced as far downstream as Sacramento.

In addition, fewer flooding events would result in less damage to businesses located adjacent to waterways during some flood events. This reduction in damage would reduce the amount of time employees would be without pay

because of flood conditions and damage. This reduction in flood damage would reduce residents' salary and wage losses from these catastrophic events.

Implementation of CP1 would reduce damage to structures, loss of business and personal income, loss of jobs, and other adverse effects on economic well-being in the lower Sacramento River and Delta areas. Therefore, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact Socio-13 (CP1): Short-Term Increases in Sales and Profits for Businesses in the CVP and SWP Service Areas that Support the Construction Industry A small amount of the construction materials used during construction under CP1 would be purchased within the extended study area, including the CVP and SWP service areas. These purchases would result in a minor increase in sales and profits for a few businesses within the CVP and SWP service areas during the construction period of CP1. This impact would be minor but beneficial.

A small amount of the construction materials used during construction under CP1 is expected to be purchased from some construction-related businesses in the extended study area, including the CVP and SWP service areas. These purchases may include raw or refined materials, infrastructure-related products, and/or equipment required for the construction process. As a result of the purchases expected, a few businesses in the CVP and SWP service areas are expected to experience a short-term increase in sales and profits over the construction period. The exact scale of the increase in business sales and profits within the CVP and SWP service areas would be speculative, but would be minor given the large geographic area of the service areas. Therefore, this impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-14 (CP1): Potential Temporary Reduction in Shasta Project Water or Hydropower Supplied to the CVP and SWP Service Areas during Construction Implementation of CP1 may require temporarily reducing the reservoir level at critical times during the construction period. This reduction in the reservoir level could temporarily reduce the amount of water or hydropower available from the dam and related hydropower infrastructure. Should this occur, sources of replacement water or hydropower would need to be secured. If these replacement resources were substantially more expensive, a minor negative effect on water or power customers may result. This impact would be potentially significant.

Construction activities implemented as part of CP1 would require adding large quantities of concrete to Shasta Dam. To complete this effort, it may be necessary to reduce the reservoir's water table to accommodate construction. A reduced water table may be needed at critical points in the construction process. Regardless of the approach needed, a reduced water table would limit the

amount of water and/or hydropower that would be available from the dam for use in the CVP and SWP service areas. As a result, periods could occur in which water or hydropower availability within the CVP and SWP service areas may be more limited, especially during dry periods.

To address potential temporary shortages in water or hydropower caused by reduced availability at Shasta Dam, replacement water or hydropower supplies would need to be sourced elsewhere to maintain existing service needs. Depending on the conditions of the water or energy markets at the time of need, these replacement resources could be more expensive than water or hydropower obtained from Shasta Dam. The additional expense of obtaining water or hydropower resources could produce a minor negative effect on water and power customers if replacing these resources would be substantially more expensive. This impact would be potentially significant. Mitigation for this impact is proposed in Section 16.3.5, "Mitigation Measures."

Impact Socio-15 (CP1): Short-Term Increase in State Sales and Income Tax Revenues in the CVP and SWP Service Areas from Construction-Related Personal Income and Purchases CP1 is expected to increase short-term, construction-related, State sales and income tax revenues received from businesses and residents of the CVP and SWP service areas. These additional revenues are expected to be cycled back to local government coffers through statewide programs and policies. This impact would be beneficial.

As a result of the increased employment and personal income anticipated as a part of implementation of CP1, a short-term increase in State sales and income tax revenues would be likely to occur. During the construction period for CP1, more than $603.8 million in personal income would be generated by direct, indirect, and induced employment produced by the project. This large amount of income would direct substantial income tax revenues to the State, to meet State income tax requirements. These additional revenues would contribute substantially to the State budget and would be distributed to jurisdictions within the CVP and SWP service areas via statewide programs and policies. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-16 (CP1): Long-Term Increase in Agricultural Income and Jobs in the CVP and SWP Service Areas as a Result of Improved Water Availability and Reliability Based on SWAP modeling, improved water availability and reliability expected to result from implementation of CP1 would substantially increase agricultural net income in the CVP and SWP service areas and would increase the number of agricultural positions in these areas. This increase in production and jobs would contribute substantially to the continuation of this already strong industry in California. This impact would be beneficial.

Among CVP and SWP's water consumers, agricultural users benefit the most from increased water availability and reliability because of more consistent

irrigation opportunities throughout the year. Based on the outputs of SWAP modeling, CP1 would improve long-term water availability and reliability within the CVP and SWP service areas by adding to water storage capacity. Long-term improvements to the availability and reliability of water are expected to allow farmers within the CVP and SWP service areas to substantially increase agricultural production, especially in dry years. It was estimated that CP1 would increase the net agricultural income within the 27 SWAP regions by more than $1.27 million in a normal year and up to $1.50 million during dry years. In wet years, net income is projected to increase to $1.89 million.

To support the increased agricultural production expected during the implementation of CP1, more agricultural workers would be needed. SWAP does not estimate the number of additional agricultural positions that would be created as a result of improved irrigation, but the resulting increase in water reliability and availability would have the potential to strengthen and extend the existing growing season in the CVP and SWP service areas. This would enable existing employees to work for longer periods in the fields and also would increase the number of workers needed during the growing season. These additional agricultural workers are expected to be distributed across the CVP and SWP service areas. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-17 (CP1): Reduction in Risk of Potential Water and Power Shortages (and Related Economic Activity) in the CVP and SWP Service Areas as a Result of Long-Term Improvements to Water and Power Supply Reliability
Implementation of CP1 would substantially increase Shasta Dam's storage capacity. As stated in Impact Socio-16 (CP1), this additional storage capacity would improve the long-term availability and reliability of water in the CVP and SWP service areas. Beyond increasing agricultural production, this improved availability and reliability would reduce the long-term risk of urban water and power shortages, and their related adverse economic consequences. This impact would be beneficial.

In addition to improving agricultural production, implementation of CP1 would increase water availability and reliability for industrial and urban users within the CVP and SWP service areas. For these users, the additional 265,000 acre-feet of storage capacity proposed by CP1 is expected to substantially reduce the long-term risk of water and power shortages from periodic flow constraints. As a result, water and power users would be likely to experience fewer water and power shortages caused by reduced reservoir levels, such as those experienced in dry years. This reduction in water and power shortages, along with avoidance of the related loss of economic production, would represent a substantial benefit for users in the CVP and SWP service areas. This benefit would be most pronounced for water- and power-intensive industries that are heavily dependent on consistent water and power availability. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

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

As with CP1, CP2 focuses on increasing water supply reliability and increasing anadromous fish survival. CP2 primarily consists of raising Shasta Dam by 12.5 feet, which, in combination with spillway modifications, would increase the height of the reservoir's full pool by 14.5 feet and enlarge the total storage capacity in the reservoir by 443,000 acre-feet to 5.0 MAF. CP2 would increase the maximum surface area of the pool of the reservoir to 31,600 acres. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 120,000 acre-feet and 60,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries.

Implementing CP2 would result in the replacement or modification of 8 bridges and relocation of approximately 100 existing structures. The total construction cost associated with CP2 would be approximately $1,089 million.

CP2 would help reduce estimated future agricultural and M&I water shortages and would increase water supply reliability in the CVP/SWP service areas, by increasing water supplies for agricultural and M&I deliveries by at least 77,800 acre-feet per year in dry and critical years and increasing average annual deliveries by about 51,300 acre-feet per year. The majority of the increased dry and critical year water supplies (i.e., 67,100 acre-feet) would be for south-of-Delta agricultural and M&I deliveries. In addition, CP2 would provide hydropower benefits by increasing hydropower generation by approximately 90 GWh per year. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Socio-1 (CP2): Short-Term Increase in Population and Housing Demand in the Primary Study Area Resulting from Construction-Related Activities According to Reclamation estimates, approximately 300 new direct jobs would be created as a result of construction activities associated with CP2. All 300 construction workers are expected to come from the local labor force; therefore, a short-term population increase is not expected. This impact would be less than significant.

This impact would be similar to Impact Socio-1 (CP1). Approximately 5 years of work (compared to the 4.5 years proposed under CP1) would be required to complete the construction activities proposed under CP2. As described above under Impact Socio-1 (CP1), a short-term population increase is not expected with implementation of CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-2 (CP2): Short-Term Increases in Direct, Indirect, and Induced Employment in the Primary Study Area Related to Construction Activities Construction activities associated with CP2 are expected to generate approximately 300 new direct construction jobs, 600 indirect jobs in various construction-related support industries, and 600 induced jobs because of increased household spending in the primary study area. Individuals to fill these jobs would be drawn from the local community. These new jobs would provide important but temporary employment opportunities to many unemployed construction workers in the primary study area. This impact would be beneficial.

This impact would be the same as Impact Socio-2 (CP1) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-3 (CP2): Potential for Temporary Reduction in the Labor Force of Related Industrial Sectors in the Primary Study Area as a Result of Direct Construction-Related Employment With the creation of 300 new construction jobs resulting from CP2, the potential would exist for workers from other industries to move to jobs related to construction at Shasta Dam. Because of the size of the construction industry in the primary study area and the high unemployment rate in the area, this impact would be less than significant.

This impact would be the same as Impact Socio-3 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-4 (CP2): Short-Term Increases in Direct, Indirect, and Induced Personal Income Paid to Employees in the Primary Study Area Hired for Construction-Related Activities Based on calculations completed as a part of the IMPLAN socioeconomic model process, more than $85.1 million in personal income would be directly paid to employees in the primary study area each year of the 5-year construction period under CP2. The combined $132.8 million in personal income that would be generated would represent an approximately 92percent increase in all annual personal income in the local economic study area. In addition, approximately $47.8 million in indirect and induced income is expected to be generated in various construction-related and other industries in the primary study area each year of construction under CP2. This impact would be beneficial.

This impact would be the same as Impact Socio-4 (CP1) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-5 (CP2): Short-Term Increases in Sales and Profits for Businesses in the Primary Study Area that Support the Construction Industry Most of the construction materials used for CP2 are expected to be purchased within the primary study area. These purchases would provide the local economy with increased sales and profits over the 5-year construction period. This impact would be beneficial.

This impact would be similar to but more beneficial than Impact Socio-5 (CP1). Because of the longer project duration and larger dam raise proposed under CP2, short-term increases in sales and profits for businesses that support the construction industry in the primary study area would be larger than those under CP1. During the construction period, implementation of CP2 is expected to generate more than $346.3 million per year in sales and profits for construction-related and service-oriented businesses that support the construction industry, with approximately $217.8 million in direct income and $128.5 indirect and induced income. The direct income would be $2.2 million less than under CP1; and, the induced income would be $600,000 less than under CP1. The additional time and materials required to implement CP2 over 5 years would generate more in sales and profits than CP1 for construction-related and service-oriented businesses. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-6 (CP2): Short-Term Increase in State and Local Sales Tax Revenues in the Primary Study Area from Construction-Related Personal Income and Purchases As stated above, implementation of CP2 is expected to result in a substantial increase in total personal income (direct, indirect, and induced) over the 5-year construction period. This additional income, in combination with construction-related purchases in the primary study area, would result in a substantial increase in local sales tax revenues from increased consumer spending in nearby cities and counties. Construction-related activities under CP2 also would be likely to result in a temporary increase in State sales and income tax revenues received from businesses and residents of the primary study area. The exact amount of State and local sales tax revenue increases would be speculative; however, this impact would be beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-6 (CP1). Because of the larger total personal income (direct, indirect, and induced) and larger sales and profits for businesses over the construction period expected to result from implementation of CP2, the short-term increase in local sales tax revenues generated by CP2 would be greater than that from CP1 (see Impacts Socio-4 (CP2) and Socio-5 (CP2), above). Construction-related activities under CP2 also are expected to result in a temporary increase in State sales and income tax revenues received from businesses and residents of the primary study area. These additional revenues would likely be cycled back to local government coffers through statewide programs and policies. The increases in State sales and income taxes are expected to be larger under CP2 than under CP1. All of these increases would be beneficial for the relevant local jurisdictions. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-7 (CP2): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Primary Study Area As a result of the added reservoir capacity created by CP2, the overall risk of flooding below Shasta Dam and its related consequences to the primary study area would be reduced. Although

heavy rain events would continue to occur in the region and locally, the project is intended to provide greater flexibility in flood control downstream because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents of the primary study area, as well as business and personal income losses from such damage. Therefore, this impact would be beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-7 (CP1). CP2 would increase the total storage capacity of Shasta Lake by 443,000 acre-feet. Therefore, CP2 would provide approximately 187,000 acre-feet more storage capacity in the reservoir than CP1. This additional capacity provided with the 12.5-foot dam raise would increase the flood control capabilities compared to both existing conditions and CP1, by further reducing the risk of flooding downstream from Shasta Dam. Therefore, the overall risk of flooding and its associated adverse effects on property, housing, and businesses downstream from Shasta Dam and residents throughout the primary study area would be further reduced.

The increased storage capacity proposed as a part of CP2 also would reduce the risk of job loss from flooding and its related effects to a greater extent than the capacity increase proposed under CP1. The increased storage capacity would further reduce the risk of flood-level conditions downstream from the dam. Related effects from flooding on the economic livelihood of residents of the primary study area would be similarly reduced.

Fewer flooding events would occur and less damage would be inflicted on property adjacent to downstream waterways during some flood events. This reduction in flood damage also would reduce residents' salary and wage losses resulting from these catastrophic events.

For the reasons described above, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-8 (CP2): Long-Term Increases in Direct Employment in the Primary Study Area Related to Project Operations In the long term, implementation of CP2 is expected to create at least two new maintenance-related positions at the Shasta Dam facilities. These two positions would be permanent and would continue after the 5-year construction period is completed. This impact would be minor but beneficial.

This impact would be the same as Impact Socio-8 (CP1) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact Socio-9 (CP2): Potential Temporary Increase in Indirect Employment in Construction-Related Businesses of the Lower Sacramento River and Delta
Construction activities associated with CP2 would have the potential to result in a short-term increase in indirect employment within the lower Sacramento River and Delta portion of the extended study area. Depending on the location of construction material sourced outside of the primary study area, indirect increases in employment within construction-related businesses may result in the lower Sacramento River and Delta area. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-9 (CP1). A larger potential temporary increase in indirect employment in construction-related businesses of the lower Sacramento River and Delta area would be expected under CP2 than under CP1. Estimated total construction costs for CP2 are approximately 9.5 percent higher than costs for CP1. Therefore, more income would be allocated to indirect positions in construction-related businesses under CP2. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-10 (CP2): Short-Term Increases in Sales and Profits for Businesses in the Lower Sacramento River and Delta Area that Support the Construction Industry A small amount of the construction materials used for CP2 would be purchased within the extended study area. These purchases are predicted to increase sales and profits of businesses within the lower Sacramento River and Delta area over the 5-year construction period of CP1. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-10 (CP1). Because of the longer project duration and larger dam raise proposed under CP2, short-term increases in sales and profits for construction-related businesses in the lower Sacramento River and Delta area would be larger than those under CP1. The exact scale of the increase in business sales and profits within the lower Sacramento River and Delta area would be speculative, but because additional time and materials would be required, implementing CP2 would likely generate more sales and profits for construction-related and service-oriented businesses. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-11 (CP2): Short-Term Increase in State Sales and Income Tax Revenues in the Lower Sacramento River and Delta Area from Construction-Related Personal Income and Purchases In addition to local tax revenues, CP2 would increase short-term construction-related State sales and income tax revenues received from businesses and residents of the lower Sacramento River and Delta portion of the extended study area. These additional revenues would be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-11 (CP1) because the construction period would be longer and more construction materials would be needed. The increased employment and personal incomes anticipated as a part of implementation of CP2 would cause an increase in short-term construction-related State sales and income tax revenues received from businesses and residents of the lower Sacramento River and Delta portion of the extended study area. These additional revenues would be likely to be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-12 (CP2): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Lower Sacramento River and Delta Area As a result of the added reservoir capacity under CP2, the overall risk of flooding and its related consequences below Shasta Dam would be reduced. Although heavy rain events would continue to occur in the region, CP2 would provide greater flexibility in flood control in the lower Sacramento River and Delta area because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents in or near the lower Sacramento River floodplain and the Delta resulting from these catastrophic events, as well as would reduce business and personal income losses from such damage. Therefore, this impact would be beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-12 (CP1). CP2 would provide approximately 187,000 acre-feet more storage capacity in the reservoir than CP1. This additional capacity would increase the flood control capabilities beyond the existing capabilities at Shasta Dam and the capabilities proposed under CP1, and would further reduce the risk of flooding downstream from the dam. The overall risk of flooding and its associated adverse effects on property, housing, businesses, and residents of the lower Sacramento River and Delta area would be reduced with implementation of CP2. Flood risk reduction effects identified earlier for CP1 would apply to CP2, but the positive effects would be greater because of the direct relationship between the proposed dam heights, corresponding capacity of the reservoir, and associated increase in flood control operations and management flexibility.

Increased storage capacity proposed as a part of CP2 also would reduce the risk of job loss from flooding and its related effects in the lower Sacramento River and Delta area, when compared to CP1. A reduction in the risk of flood-level conditions downstream from the dam would strengthen the economic livelihood of downstream residents in the lower Sacramento River and Delta area.

Fewer flooding events would occur and less damage would be inflicted on businesses located adjacent to downstream waterways during some flood events. This reduction in flood damage would reduce residents' salary and wage losses resulting from these catastrophic events.

For the reasons described above, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact Socio-13 (CP2): Short-Term Increases in Sales and Profits for Businesses in the CVP and SWP Service Areas that Support the Construction Industry A small amount of the construction materials used during construction under CP2 would be purchased within the extended study area, including the CVP and SWP service areas. These purchases would result in a minor increase in sales and profits for a few businesses within the CVP and SWP service areas over the 5-year construction period of CP2. This impact would be minor but beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-13 (CP1). Because of the longer project duration and larger dam raise proposed under CP2, short-term increases in sales and profits for some construction-related businesses in the extended study area, including the CVP and SWP service areas, would be larger than those for CP1. These increases have not been quantified, but the additional time and materials required to implement CP2 would be expected to generate more sales and profits for some construction-related and service-oriented businesses. This impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-14 (CP2): Potential Temporary Reduction in Shasta Project Water or Hydropower Supplied to the CVP and SWP Service Areas during Construction Implementation of CP2 may require temporarily reducing the reservoir level at critical times during the construction period. This reduction in the reservoir level could temporarily reduce the amount of water or hydropower available from the dam and related hydropower infrastructure. Should this occur, sources of replacement water or hydropower would need to be secured. If these replacement resources were substantially more expensive, a minor negative effect on water or power customers may result. This impact would be potentially significant.

This impact would be similar to Impact Socio-14 (CP1), except that the project construction period would be longer and reductions in reservoir levels could last longer under CP2. This impact would be potentially significant. Mitigation for this impact is proposed in Section 16.3.5, “Mitigation Measures.”

Impact Socio-15 (CP2): Short-Term Increase in State Sales and Income Tax Revenues in the CVP and SWP Service Areas from Construction-Related Personal Income and Purchases In addition to local tax revenue, CP2 would increase short-term construction-related State sales and income tax revenues received from businesses and residents of the CVP and SWP service areas. These additional revenues are expected to be cycled back to local government

coffers through statewide programs and policies. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-15 (CP1). Short-term increases in State sales and income taxes would be larger under CP2 than under CP1. All of these increases are expected to be more beneficial for the relevant local jurisdictions. This impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-16 (CP2): Long-Term Increase in Agricultural Income and Jobs in the CVP and SWP Service Areas as a Result of Improved Water Availability and Reliability Based on SWAP modeling, improved water availability and reliability expected to result from implementation of CP2 would substantially increase agricultural net income in the CVP and SWP service areas and increase the number of agricultural positions in these areas. This increase in production and jobs would contribute substantially to the continuation of this already strong industry in California. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-16 (CP1). Water supply reliability in the CVP/SWP service areas would be greater under CP2 than under CP1. Because of the increase in the availability and reliability of water associated with implementation of CP2, the long-term increase in indirect employment within the agricultural sector would be larger than under CP1. Based on the outputs of SWAP modeling, CP2 is expected to generate an additional $1.3 million in net income during normal years and up to $2.7 million during dry years, when compared to existing conditions. In wet years, net income under CP2 is projected to increase to $2.9 million. This overall increase in net income is expected to stimulate more employment opportunities in the agricultural sector to support the higher crop production that likely would be the result of additional irrigation deliveries under CP2 (compared to CP1). This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-17 (CP2): Reduction in Risk of Potential Water and Power Shortages (and Related Economic Activity) in the CVP and SWP Service Areas as a Result of Long-Term Improvements to Water and Power Supply Reliability Implementation of CP2 would substantially increase Shasta Dam's storage capacity. As stated in Impact Socio-16 (CP2), this additional storage capacity would improve the long-term availability and reliability of water in the CVP and SWP service areas. Beyond increasing agricultural production, this improved availability and reliability would reduce the long-term risk of urban water and power shortages, and their related adverse economic consequences. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-17 (CP1). Mitigation for this impact is not needed, and thus not proposed.

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

CP3 focuses on increasing agricultural water supply reliability while also increasing anadromous fish survival. This plan primarily consists of raising Shasta Dam by 18.5 feet, which, in combination with spillway modifications, would increase the height of the reservoir's full pool by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet to 5.19 MAF. CP3 would increase the maximum surface area of the pool to 32,300 acres. Because CP3 focuses on increasing agricultural water supply reliability, none of the increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, with the additional storage retained for water supply reliability and to expand the cold-water pool for downstream anadromous fisheries.

Implementing CP3 would result in the replacement or modification of 8 bridges and relocation of approximately 130 existing structures. The total construction cost associated with CP3 would be approximately $1,257 million.

CP3 would help reduce estimated future agricultural water shortages and would increase water supply reliability in the CVP service area by increasing water supplies for agricultural deliveries, by at least 63,100 acre-feet per year in dry and critical years and increasing average annual deliveries by about 61,700 acre-feet per year. Almost half of the increased dry and critical year water supplies (i.e., 28,000 acre-feet) would be for south-of-Delta agricultural deliveries, with the remainder for north-of-Delta agricultural deliveries. In addition, CP3 would provide hydropower benefits by increasing hydropower generation, by approximately 90 GWh per year.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Socio-1 (CP3): Short-Term Increase in Population and Housing Demand in the Primary Study Area Resulting from Construction-Related Activities According to Reclamation estimates, approximately 350 direct jobs would be created as a result of construction activities associated with CP3. All 350 construction workers are expected to come from the local labor force; therefore, a short-term population increase is not expected. This impact would be less than significant.

This impact would be similar to Impacts Socio-1 (CP1) and Socio-1 (CP2). CP3 would add 191,000 acre-feet of storage capacity beyond the capacity anticipated in CP2, for a total increase of 634,000 acre-feet. Approximately 350 construction workers would be needed to complete the 18.5-foot raise proposed for CP3, compared to 300 new construction workers required for CP1 and CP2. Approximately 5 years of work (compared to the 4.5 years proposed under CP1) would be required to complete the construction activities proposed under CP3. Workers for this effort also would come from the local labor pool. This impact

would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-2 (CP3): Short-Term Increases in Direct, Indirect, and Induced Employment in the Primary Study Area Related to Construction Activities Construction activities associated with CP3 are expected to generate approximately 350 direct construction jobs, 450 indirect jobs in various construction-related support industries, and 700 induced jobs because of increased household spending in the primary study area. Individuals to fill these jobs are expected to be drawn from the local community. These jobs are expected to provide important but temporary employment opportunities to many unemployed construction workers in the primary study area. This impact would be beneficial.

This impact would be similar to Impact Socio-2 (CP1) and Socio-2 (CP2). Under CP3, approximately 350 short-term, direct construction jobs would be created, in addition to 450 indirect jobs expected to be created in various construction-related support industries, and 700 induced jobs created because of increased household spending near the project area. Total direct, indirect, and induced employment under CP3 would be greater than CP1 and CP2, and these positions would last approximately 5 years under CP3, compared to 4.5 years under CP1. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-3 (CP3): Potential for Temporary Reduction in the Labor Force of Related Industrial Sectors in the Primary Study Area as a Result of Direct Construction-Related Employment With the creation of 350 construction jobs resulting from CP3, the potential would exist for workers from other industries to move to jobs related to construction at Shasta Dam. Because of the size of the construction industry in the primary study area and the high unemployment rate in the area, this impact would be less than significant.

This impact would be similar to Impacts Socio-3 (CP1) and Socio-3 (CP2). CP3 would require 50 more construction workers than required for CP1 and CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-4 (CP3): Short-Term Increases in Direct, Indirect, and Induced Personal Income Paid to Employees in the Primary Study Area Hired for Construction-Related Activities Based on calculations completed as a part of the IMPLAN socioeconomic model process, more than $98.2 million in personal income would be directly paid to employees in the primary study area each year of the 5-year construction period under CP3. In addition, more than $55.2 million in indirect and induced income is expected to be generated in various construction-related and other industries in the primary study area each year of construction under CP3. The combined $153.3 million in personal income to be generated would represent an approximately 93 percent increase in

all annual personal income in the local economic study area. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-4 (CP1) and Socio-4 (CP2). CP3 would generate $98.2 million in direct personal income each year of construction, from the 350 direct construction-related jobs that would be created. In addition, indirect and induced personal income totaling $55.2 million per year of construction would be generated in various construction-related and other industries in the primary study area that would support construction under CP3. The combined direct, indirect, and induced personal income resulting from CP3 would be approximately $153.3 million per year of construction within the local economic study area. This increase in personal income would represent an approximately 93 percent increase in all annual personal income in the local economic study area.

Direct, indirect, and induced annual personal income under CP3 would be greater than CP1 and CP2. Overall, a total income of $766.6 million would be generated under CP3 over the 5-year construction period, compared to a total of $603.8 million for CP1 and to a total of $664.1 million for CP2. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-5 (CP3): Short-Term Increases in Sales and Profits for Businesses in the Primary Study Area that Support the Construction Industry Most of the construction materials used for CP3 are expected to be purchased within the primary study area. These purchases would provide the local economy with increased sales and profits over the 5-year construction period. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-5 (CP1) and Socio-5 (CP2). CP3 would require the largest dam height increase and, therefore, the greatest construction expenditures over the total construction period. As a result, CP3 would generate more business sales and profits than CP1 and CP2 in construction-related and service-oriented businesses in the primary study area. During the construction period, implementation of CP3 is expected to generate more than $399.7 million per year in sales and profits for businesses that support the construction industry, with approximately $251.4 million in direct income and $148.3 in direct and induced income. CP3 would generate an overall total of $424.5 million and $267.1 million more in sales and profits than CP1 and CP2, respectively, for construction-related and service-oriented businesses. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-6 (CP3): Short-Term Increase in State and Local Sales Tax Revenues in the Primary Study Area from Construction-Related Personal Income and Purchases As stated above, implementation of CP3 is expected to result in a substantial increase in total personal income (direct, indirect, and

induced) over the 5-year construction period. This additional income, in combination with the construction-related purchases in the primary study area, would result in a substantial increase in local sales tax revenues from increased consumer spending in nearby cities and counties. Construction-related activities under CP3 would be likely also to result in a temporary increase in State sales and income tax revenues received from businesses and residents of the primary study area. The exact amount of State and local sales tax revenue increases would be speculative: however, this impact would be beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-6 (CP1) and Socio-6 (CP2). CP3 would generate more direct, indirect, and induced personal income and more sales and profits for businesses over the construction period than CP1 and CP2 (see Impacts Socio-4 (CP3) and Socio-5 (CP3), above). This larger amount of personal income generated is expected to result in more local sales tax revenues in the primary study area than under the other two alternatives. Construction-related activities under CP3 also are expected to result in a temporary increase in State sales and income tax revenues received from businesses and residents of the primary study area. These additional revenues would be likely to be cycled back to local government coffers through statewide programs and policies. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-7 (CP3): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Primary Study Area As a result of the added reservoir capacity created by CP3, the overall risk of flooding and its related consequences below Shasta Dam are expected to be reduced. Although heavy rain events would continue to occur in the region and locally, and potentially increase with global climate change, the project is intended to provide greater flexibility in flood control downstream because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents of the primary study area, as well as business and personal income losses from such damage. Therefore, this impact would be beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-7 (CP1) and Socio-7 (CP2). CP3 would create 634,000 acre-feet more storage capacity than current capacity, more than 40 percent more than would be provided by CP2. CP3 would, therefore, provide substantially more flood protection than either CP1 or CP2. As a result, CP3 would result in a greater reduction than CP1 and CP2 in the risk of damage to property and structures from flooding along the upper Sacramento River.

The increased storage capacity proposed as a part of CP3 would result in a larger decrease in the risk of job loss from flooding and its related effects than would occur under CP1 or CP2. CP3 would increase storage space in Shasta

Lake and would provide approximately 191,000 more acre-feet of storage than either of the two previous alternatives. The increased storage capacity would create a greater reduction in the risk of flood-level conditions downstream from the dam. Related effects from flooding on the economic livelihood of residents of the primary study area would similarly be reduced. In addition, the reduction in flood damage would reduce residents' salary and wage losses resulting from these catastrophic events.

For the reasons described above, this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-8 (CP3): Long-Term Increases in Direct Employment in the Primary Study Area Related to Project Operations In the long term, implementation of CP3 would create at least two new maintenance-related positions at the Shasta Dam facilities. These two positions are expected to be permanent and would continue once the 5-year construction period is completed. This impact would be minor but beneficial.

This impact would be the same as Impacts Socio-8 (CP1) and Socio-8 (CP2) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact Socio-9 (CP3): Potential Temporary Increase in Indirect Employment in Construction-Related Businesses of the Lower Sacramento River and Delta Construction activities associated with CP3 would have the potential to result in a short-term increase in indirect employment within the lower Sacramento River and Delta portion of the extended study area. Depending on the location of construction materials sourced outside of the primary study area, indirect increases in employment within some construction-related businesses may result in the lower Sacramento River and Delta area. This impact would be minor but beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-9 (CP1) and Socio-9 (CP2). A larger potential temporary increase in indirect employment in construction-related businesses of the lower Sacramento River and Delta area would be expected under CP3. Estimated total construction costs for CP3 are approximately 22.3 percent higher than costs for CP1 and 14.2 percent higher than costs for CP2. Therefore, more income would be allocated to indirect positions in construction-related businesses than would be expected under CP1 and CP2. This impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-10 (CP3): Short-Term Increases in Sales and Profits for Businesses in the Lower Sacramento River and Delta Area that Support the Construction Industry A small amount of the construction materials used for CP3 would be purchased within the extended study area. These purchases are

predicted to increase sales and profits of businesses within the lower Sacramento River and Delta area over the 5-year construction period of CP3. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-10 (CP1) and Socio-1 (CP2). Because of the longer project duration and greater construction expenditures associated with the larger dam raise proposed under CP3, short-term increases in sales and profits for construction-related businesses in the lower Sacramento River and Delta area would be larger than those for CP1 and CP2. These increases have not yet been quantified, but because additional time and materials would be required, implementing CP3 would generate more sales and profits for construction-related and service-oriented businesses. This impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-11 (CP3): Short-Term Increase in State Sales and Income Tax Revenues in the Lower Sacramento River and Delta Area from Construction-Relate Personal Income and Purchases In addition to local tax revenues, CP3 is expected to increase short-term, construction-related, State sales and income tax revenues received from businesses and residents of the lower Sacramento River and Delta portion of the extended study area. These additional revenues are expected to be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-11 (CP1) and Socio-11 (CP2) because the construction period would be longer and more construction materials would be needed. The increased employment and personal incomes anticipated as a part of implementation of CP3 would cause an increase in short-term, construction-related, State sales and income tax revenues received from some businesses and residents of the lower Sacramento River and Delta portion of the extended study area. These additional revenues likely would be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-12 (CP3): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Lower Sacramento River and Delta Area As a result of the added reservoir capacity under CP3, the overall risk of flooding and its related consequences below Shasta Dam would be reduced. Although heavy rain events would continue to occur in the region, as well as potentially increase with global climate change, CP3 is intended to provide greater flexibility in flood control in the lower Sacramento River and Delta area because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents in and near the lower Sacramento River floodplain and the Delta resulting from these catastrophic events, as well as would reduce

business and personal income losses from such damage. Therefore, this impact would be beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-12 (CP1) and Socio-12 (CP2). CP3 would provide approximately 191,000 acre-feet more storage capacity in the reservoir than either of the two previous alternatives. This additional capacity would increase the flood control capabilities beyond the existing capabilities at Shasta Dam and the capabilities proposed under CP1 and CP2, and would further reduce the risk of flooding downstream from the dam. The overall risk of flooding and its associated adverse effects on property, housing, businesses, and residents of the lower Sacramento River and Delta area would be reduced with implementation of CP3. Flood risk reduction effects identified for CP1 and CP2 would apply to CP3, but the positive effects would be greater because of the direct relationship between the proposed dam heights, corresponding capacity of the reservoir, and associated increase in flood control operations and management flexibility.

Increased storage capacity proposed as a part of CP3 also would reduce the risk of job loss from flooding and its related effects in the lower Sacramento River and Delta area. A reduction in the risk of flood-level conditions downstream from the dam would strengthen the economic livelihood of downstream residents in the lower Sacramento River and Delta portion of the extended study area. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact Socio-13 (CP3): Short-Term Increases in Sales and Profits for Businesses in the CVP and SWP Service Areas that Support the Construction Industry A small amount of the construction materials used during construction under CP3 would be purchased within the extended study area. These purchases are predicted to increase sales and profits of some businesses within the CVP and SWP service areas over the 5-year construction period of CP3. This impact would be minor but beneficial.

This impact would be similar to but would be more beneficial than Impact Socio-13 (CP1) because the construction period would be longer and more construction materials would be needed. This impact would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-14 (CP3): Potential Temporary Reduction in Shasta Project Water or Hydropower Supplied to the CVP and SWP Service Areas during Construction Implementation of CP3 may require temporarily reducing the reservoir level at critical times during the construction period. This reduction in the reservoir level could temporarily reduce the amount of water or hydropower available from the dam and related hydropower infrastructure. Should this occur, sources of replacement water or hydropower would need to be secured. If these replacement resources were substantially more expensive, a minor

negative effect on water or power customers may result. This impact would be potentially significant.

This impact would be similar to Impact Socio-14 (CP1), except that the project construction period would be longer. This impact would be potentially significant. Mitigation for this impact is proposed in Section 16.3.5, "Mitigation Measures."

Impact Socio-15 (CP3): Short-Term Increase in State Sales and Income Tax Revenues in the CVP and SWP Service Areas from Construction-Related Personal Income and Purchases In addition to local tax revenue, CP3 is expected to increase short-term, construction-related, State sales and income tax revenues received from businesses and residents of the CVP and SWP service areas. These additional revenues are expected to be cycled back to local government coffers through statewide programs and policies. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-15 (CP1) and Socio-15 (CP2). Short-term increases in State sales and income taxes are expected to be larger under CP3 than under CP1 and CP2. All of these increases are expected to be more beneficial for the relevant local jurisdictions. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-16 (CP3): Long-Term Increase in Agricultural Income and Jobs in the CVP and SWP Service Areas as a Result of Improved Water Availability and Reliability Based on SWAP modeling, improved water availability and reliability expected to result from implementation of CP3 would substantially increase agricultural net income in the CVP and SWP service areas and increase the number of agricultural positions in these areas. This increase in production and jobs would contribute substantially to the continuation of this already strong industry in California. This impact would be beneficial.

This impact would be similar to but would be more beneficial than Impacts Socio-16 (CP1) and Socio-16 (CP2). CP3 would increase water supply reliability by increasing dry and critical year water supplies for CVP irrigation deliveries. Because of the increase in the availability and reliability of water associated with implementation of CP3, the long-term increase in indirect employment within the agricultural sector is expected to be larger than under CP1 and CP2. Based on the outputs of SWAP modeling, CP3 would generate an additional $5.1 million in net income during normal years and $8.5 million during dry years, when compared to existing conditions. In wet years, net income under CP3 is projected to decrease to $4.4 million. Overall, CP3 is projected to result in a greater increase in net income during average, dry, and wet years, when compared to net income projected for CP1 and CP2. The projected increase in net income under CP3 is expected to stimulate a greater number of employment opportunities in the agricultural sector than under CP1

and CP2, because higher crop production would be likely. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-17 (CP3): Reduction in Risk of Potential Water and Power Shortages (and Related Economic Activity) in the CVP and SWP Service Areas as a Result of Long-Term Improvements to Water and Power Supply Reliability
Implementation of CP3 would substantially increase Shasta Dam's storage capacity. As stated in Impact Socio-16 (CP3), this additional storage capacity would improve long-term water availability and reliability in the CVP and SWP service areas. Beyond increasing agricultural production, this improved availability and reliability would reduce the long-term risk of urban water and power shortages, and their related adverse economic consequences. This impact would be beneficial.

This impact would be the similar to CP1 and CP2 and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

CP4 and CP4A focus on increasing anadromous fish survival while also increasing water supply reliability. By raising Shasta Dam 18.5 feet, in combination with spillway modifications, CP4 or CP4A would increase the height of the reservoir full pool by 20.5 feet. This increase in full pool height would add approximately 634,000 acre-feet of storage to the reservoir's capacity. Accordingly, storage in the overall full pool would be increased from 4.55 MAF to 5.19 MAF. CP4 or CP4A would involve augmenting spawning gravel and restoring riparian, floodplain, and side-channel habitat at up to six potential locations in the upper Sacramento River.

CP4A is identical to CP4 with the exception of Shasta Dam and Reservoir operations. CP4 and CP4A have similar reservoir operations in that they each dedicate a portion of the new storage in Shasta Lake for fisheries purposes; however, the portion of this dedicated storage varies. Approximately 378,000 acre-feet of the increased reservoir storage space of CP4 would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4, operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as in CP1, with 70,000 acre-feet reserved in dry years and 35,000 acre-feet reserved in critical years to specifically focus on increasing M&I deliveries.

Similarly, approximately 191,000 acre-feet of the increased reservoir storage space of CP4A would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4A, operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as in CP2, with 120,000 acre-feet reserved in dry years and 60,000 acre-feet reserved in critical years to specifically focus on increasing M&I deliveries. Implementing CP4 or CP4A would result in the replacement or modification of

8 bridges and relocation of approximately 130 existing structures. The total construction cost associated with CP4 or CP4A would be approximately $1,265 million and $1,266 million, respectively.

CP4 would help reduce estimated future agricultural and M&I water shortages and would increase water supply reliability in the CVP/SWP service areas by increasing water supplies for agricultural and M&I deliveries by at least 47,300 acre-feet per year in dry and critical years and increasing average annual deliveries by about 31,000 acre-feet per year. The majority of the increased dry and critical year water supplies (i.e., 42,700 acre-feet) would be for south-of-Delta agricultural and M&I deliveries. In addition, CP4 would provide hydropower benefits by increasing hydropower generation by approximately 133 GWh per year. Water supply reliability under CP4A would the same as under CP2. Implementing CP4A would help reduce estimated future agricultural water shortages in the CVP/SWP service areas by increasing water supplies for agricultural deliveries by at least 37,600 acre-feet per year in dry and critical years and increasing average annual deliveries by about 31,400 acre-feet per year. CP4A would provide hydropower benefits by increasing hydropower generation by approximately 130 GWh per year.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Socio-1 (CP4 and CP4A): Short-Term Increase in Population and Housing Demand in the Primary Study Area Resulting from Construction-Related Activities According to Reclamation estimates, approximately 350 direct jobs would be created as a result of construction activities associated with CP4 or CP4A. All 350 construction workers are expected to come from the local labor force; therefore, a short-term population increase is not expected. This impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Socio-1 (CP3) and would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be the same as Impact Socio-1 (CP3) and would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-2 (CP4 and CP4A): Short-Term Increases in Direct, Indirect, and Induced Employment in the Primary Study Area Related to Construction Activities Construction activities associated with CP4 or CP4A are expected to generate approximately 350 construction jobs, 450 indirect jobs in various construction-related support industries, and 700 induced jobs because of increased household spending in the primary study area. Individuals to fill these jobs are expected to be drawn from the local community. These new jobs would provide important but temporary employment opportunities to many

unemployed construction workers in the primary study area. This impact would be beneficial for CP4 or CP4A.

This impact would be the same as Impact Socio-2 (CP3) and would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be the same as Impact Socio-2 (CP3) and would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-3 (CP4 and CP4A): Potential for Temporary Reduction in the Labor Force of Related Industrial Sectors in the Primary Study Area as a Result of Direct Construction-Related Employment With the creation of 350 construction jobs resulting from CP4 or CP4A, the potential would exist for workers from other industries to move to jobs related to construction at Shasta Dam. Because of the size of the construction industry in the primary study area and the high unemployment rate in the area, this impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Socio-3 (CP3) and would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be the same as Impact Socio-3 (CP3) and would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-4 (CP4 and CP4A): Short-Term Increases in Direct, Indirect, and Induced Personal Income Paid to Employees in the Primary Study Area Hired for Construction-Related Activities Construction activities for CP4 or CP4A would last 5-years, compared to 4.5 years for CP1. Additional construction activities would be required for augmenting spawning gravel and restoring riparian, floodplain, and side-channel habitat. Based on calculations completed as a part of the IMPLAN socioeconomic model process, more than $98.7 million and $98.8 million in personal income would be directly paid to employees in the primary study area each year of construction for CP4 and CP4A, respectively. In addition, more than $55.4 million in indirect and induced income would be generated in various construction-related and other industries in the primary study area each year of construction under CP4 or CP4A. The combined $154.2 million and 154.3 million for CP4 and CP4A, respectively, in personal income generated would represent an approximately 93 percent increase in all annual personal income in the local economic study area. This impact would be beneficial for CP4 or CP4A.

This impact for CP4 or CP4A would be similar to Impact Socio-4 (CP3). CP3 is estimated to generate $98.2 million in direct personal income each year of

construction from the 350 direct construction-related jobs that would be created. In addition, indirect and induced personal income totaling $55.2 million per year of construction would be generated in various construction-related and other industries in the primary study area that would support construction under CP3. In combination, direct, indirect, and induced personal income resulting from CP3 would be approximately $153.3 million per year of construction within the local economic study area. This increase in personal income would represent an approximately 93 percent increase in all annual personal income in the local economic study area.

Additional construction activities associated with augmenting spawning gravel and restoring riparian, floodplain, and side-channel habitat would occur under CP4 or CP4A. During the 5-year construction period, more than $770.9 million and $771.4 million in personal income would be generated by direct, indirect, and induced employment produced with CP4 and CP4A, respectively, and this would be $4.3 million and $4.8 million more personal income than generated under CP3, respectively.

This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-5 (CP4 and CP4A): Short-Term Increases in Sales and Profits for Businesses in the Primary Study Area that Support the Construction Industry
Most of the construction materials used for CP4 or CP4A would be purchased within the primary study area. These purchases would provide the local economy with increased sales and profits over the 5-year construction period. This impact would be beneficial for CP4 or CP4A.

This impact for CP4 or CP4A would be similar to but more beneficial than Impact Socio-5 (CP3). During the construction period, implementation of CP4 or CP4A would generate more than $401.9 million and $402.2 million, respectively, per year in sales and profits for construction-related and service-oriented businesses that support the construction industry, with approximately $252.8 million and $253.0 million in direct income, respectively, and $149.1 million and $149.3 million in indirect and induced income, respectively. CP4 or CP4A would generate an overall total of $2.2 million and $2.5 million more per year, respectively, in sales and profits than CP3 for construction-related and service-oriented businesses.

This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-6 (CP4 and CP4A): Short-Term Increase in State and Local Sales Tax Revenues in the Primary Study Area from Construction-Related Personal Income and Purchases As stated above, implementation of CP4 or CP4A is expected to result in a substantial increase in total personal income (direct, indirect, and induced) over the 5-year construction period. This additional income, in combination with the construction-related purchases in the primary study area, would result in a substantial increase in local sales tax revenues from increased consumer spending in nearby cities and counties. Construction-related activities under CP4 or CP4A would likely result in a temporary increase in State sales and income tax revenues received from businesses and residents of the primary study area. The exact amount of State and local sales tax revenue increases would be speculative; however, this impact would be beneficial for CP4 or CP4A.

This impact for CP4 or CP4A would be similar but more beneficial than Impact Socio-6 (CP3). CP4 or CP4A would generate more direct, indirect, and induced personal income and more sales and profits for businesses over the construction period than CP3 (see Impacts Socio-4 (CP4 and CP4A) and Socio-5 (CP4 and CP4A), above).

This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-7 (CP4 and CP4A): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Primary Study Area As a result of the added reservoir capacity created by CP4 or CP4A, the overall risk of flooding and its related consequences below Shasta Dam would be reduced. Although heavy rain events would continue to occur in the region and locally, and potentially increase with global climate change, the project is intended to provide greater flexibility in flood control downstream because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents of the primary study area, as well as would reduce business and personal income losses from such damage. Therefore, this impact would be beneficial for CP4 or CP4A.

This impact for CP4 would be the same as Impact Socio-7 (CP3) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be the same as Impact Socio-7 (CP3) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-8 (CP4 and CP4A): Long-Term Increases in Direct Employment in the Primary Study Area Related to Project Operations In the long term,

implementation of CP4 or CP4A would create at least two new maintenance-related positions at the Shasta Dam facilities. These two positions would be permanent and would continue once the 5-year construction period is completed. This impact would be minor but beneficial for CP4 or CP4A.

This impact for CP4 would be the same as Impact Socio-8 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be the same as Impact Socio-8 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact Socio-9 (CP4 and CP4A): Potential Temporary Increase in Indirect Employment in Construction-Related Businesses of the Lower Sacramento River and Delta Construction activities associated with CP4 or CP4A have the potential to result in a short-term increase in indirect employment within the lower Sacramento River and Delta portion of the extended study area. Depending on the location of construction material sourced outside of the primary study area, indirect increases in employment within construction-related businesses may result in the lower Sacramento River and Delta area. This impact would be minor but beneficial for CP4 or CP4A.

This impact for CP4 would be similar to Impact Socio-9 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be similar to Impact Socio-9 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-10 (CP4 and CP4A): Short-Term Increases in Sales and Profits for Businesses in the Lower Sacramento River and Delta Area that Support the Construction Industry A small amount of the construction materials used for CP4 or CP4A would be purchased within the extended study area. These purchases are predicted to increase sales and profits of some businesses within the lower Sacramento River and Delta area over the 5-year construction period of CP4 or CP4A. This impact would be minor but beneficial for CP4 or CP4A.

This impact for CP4 would be similar to Impact Socio-10 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be similar to Impact Socio-10 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-11 (CP4 and CP4A): Short-Term Increase in State Sales and Income Tax Revenues in the Lower Sacramento River and Delta Area from Construction-Related Personal Income and Purchases In addition to local tax revenues, CP4 or CP4A is expected to increase short-term, construction-related, State sales and income tax revenues received from businesses and residents of the lower Sacramento River and Delta portion of the extended study area. These additional revenues are expected to be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial for CP4 or CP4A.

This impact for CP4 would be similar to Impact Socio-11 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be similar to Impact Socio-11 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-12 (CP4 and CP4A): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Lower Sacramento River and Delta Area As a result of the added reservoir capacity under CP4 or CP4A, the overall risk of flooding and its related consequences below Shasta Dam would be reduced. Although heavy rain events would continue to occur in the region, and potentially increase with global climate change, CP4 and CP4A are intended to provide greater flexibility in flood control in the lower Sacramento River and Delta area because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents in and near the lower Sacramento River floodplain and the Delta resulting from these catastrophic events, as well as would reduce business and personal income losses from such damage. Therefore, this impact would be beneficial for CP4 or CP4A.

This impact for CP4 would be the same as Impact Socio-12 (CP3) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be the same as Impact Socio-12 (CP3) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact Socio-13 (CP4 and CP4A): Short-Term Increases in Sales and Profits for Businesses in the CVP and SWP Service Areas that Support the Construction Industry A small amount of the construction materials used during construction under CP4 or CP4A would be purchased within the extended study area. These purchases are predicted to increase sales and profits of some businesses within the CVP and SWP service areas over the 5-year

construction period of CP4 or CP4A. This impact would be minor but beneficial for CP4 or CP4A.

This impact for CP4 would be similar to Impact Socio-13 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be similar to Impact Socio-13 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-14 (CP4 and CP4A): Potential Temporary Reduction in Shasta Project Water or Hydropower Supplied to the CVP and SWP Service Areas during Construction Implementation of CP4 or CP4A may require temporarily reducing the reservoir level at critical times during the construction period. This reduction in the reservoir level could temporarily reduce the amount of water or hydropower available from the dam and related hydropower infrastructure. Should this occur, sources of replacement water or hydropower would need to be secured. If these replacement resources were substantially more expensive, a minor negative effect on water or power customers may result. This impact would be potentially significant for CP4 or CP4A.

This impact for CP4 would be the same as Impact Socio-14 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 16.3.5, “Mitigation Measures.”

This impact for CP4A would be the same as Impact Socio-14 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 16.3.5, “Mitigation Measures.”

Impact Socio-15 (CP4 and CP4A): Short-Term Increase in State Sales and Income Tax Revenues in the CVP and SWP Service Areas from Construction-Related Personal Income and Purchases In addition to local tax revenue, CP4 or CP4A is expected to increase short-term, construction-related, State sales and income tax revenues received from some businesses and residents of the CVP and SWP service areas. These additional revenues are expected to be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial.

This impact for CP4 would be similar to Impact Socio-15 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be similar to Impact Socio-15 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-16 (CP4 and CP4A): Long-Term Increase in Agricultural Income and Jobs within the CVP and SWP Service Areas as a Result of Improved Water Availability and Reliability Based on SWAP modeling, improved water availability and reliability expected to result from implementation of CP4 or CP4A would substantially increase agricultural net income in the CVP and SWP service areas. This increase in production would contribute substantially to the continuation of this already strong industry in California. This impact would be beneficial for CP4 or CP4A.

This impact for CP4 would be the same as Impact Socio-16 (CP1) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be similar to, but more beneficial than Impact Socio-16 (CP1) because water supply reliability in the CVP/SWP service areas would be greater under CP2 than under CP1. Because of the increase in the availability and reliability of water associated with implementation of CP4A, the long-term increase in indirect employment within the agricultural sector would be larger than under CP1. Therefore, the impact for CP4A would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-17 (CP4 or CP4A): Reduction in Risk of Potential Water and Power Shortages (and Related Economic Activity) in the CVP and SWP Service Areas as a Result of Long-Term Improvements to Water and Power Supply Reliability Implementation of CP4 or CP4A would substantially increase Shasta Dam's storage capacity. As stated in Impact Socio-16 (CP4 and CP4A), this additional storage capacity would improve long-term water availability and reliability in the CVP and SWP service areas. Beyond increasing agricultural production, this improved availability and reliability would reduce the long-term risk of urban water and power shortages, and their related adverse economic consequences. This impact would be beneficial for CP4 or CP4A.

This impact for CP4 would be the similar to Impact Socio-17 (CP1, CP2, and CP3) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be the similar to Impact Socio-17 (CP1, CP2, and CP3) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

CP5 primarily focuses on increasing water supply reliability, anadromous fish survival, Shasta Lake area environmental resources, and recreation opportunities. By raising Shasta Dam 18.5 feet, in combination with spillway modifications, CP5 would increase the height of the reservoir full pool by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet to 5.19 MAF. CP5 would increase the maximum surface area of the pool to 32,300 acres. The existing temperature control device would be extended to

achieve efficient use of the expanded cold-water pool. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 150,000 acre-feet and 75,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries.

CP5 also would involve augmenting spawning gravel and restoring riparian, floodplain, and side-channel habitat at up to six potential locations in the upper Sacramento River. CP5 would involve constructing additional fish habitat in and along the shoreline of Shasta Lake and along the lower reaches of its tributaries, increasing recreation opportunities at Shasta Lake.

Implementing CP5 would result in the replacement or modification of 8 bridges and relocation of approximately 130 existing structures. The total construction cost associated with CP5 would be approximately $1,284 million.

CP5 would help reduce estimated future agricultural and M&I water shortages and would increase water supply reliability in the CVP/SWP service areas by increasing water supplies for agricultural and M&I deliveries by at least 113,500 acre-feet per year in dry and critical years and increasing average annual deliveries by about 75,900 acre-feet per year. The majority of the increased dry and critical year water supplies (i.e., 88,300 acre-feet) would be for south-of-Delta agricultural and M&I deliveries. In addition, CP5 would provide hydropower benefits by increasing hydropower generation by approximately 117 GWh per year.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Socio-1 (CP5): Short-Term Increase in Population and Housing Demand in the Primary Study Area Resulting from Construction-Related Activities According to Reclamation estimates, approximately 360 direct jobs would be created as a result of construction activities associated with CP5. All 360 construction workers are expected to come from the local labor force; therefore, a short-term population increase is not expected. This impact would be less than significant.

This impact would be the similar to Impact Socio-1 (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-2 (CP5): Short-Term Increases in Direct, Indirect, and Induced Employment in the Primary Study Area Related to Construction Activities Construction activities associated with CP5 are expected to generate approximately 360 direct construction jobs, 470 indirect jobs in various construction-related support industries, and 710 induced jobs because of increased household spending in the primary study area. Individuals to fill these jobs are expected to be drawn from the local community. These new jobs would provide important but temporary employment opportunities to many

unemployed construction workers in the primary study area. This impact would be beneficial.

This impact would be very similar to Impact Socio-2 (CP3), varying only with 10 more construction workers. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-3 (CP5): Potential for Temporary Reduction in the Labor Force of Related Industrial Sectors in the Primary Study Area as a Result of Direct Construction-Related Employment With the creation of 360 construction jobs resulting from CP5, the potential would exist for workers from other industries to move to jobs related to construction at Shasta Dam. Because of the size of the construction industry in the primary study area and the high unemployment rate in the area, this impact would be less than significant.

This impact would be similar to Impact Socio-3 (CP3). CP5 would only require 10 more construction workers than required for CP3, and the impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-4 (CP5): Short-Term Increases in Direct, Indirect, and Induced Personal Income Paid to Employees in the Primary Study Area Hired for Construction-Related Activities Construction activities for CP5 would last 5 years, compared to 4.5 years for CP1. Additional construction activities would be required for augmenting spawning gravel; restoring riparian, floodplain, and side-channel habitat; and creating fish habitat in and along the shoreline of Shasta Lake and along the lower reaches of its tributaries. Based on calculations completed as a part of the IMPLAN socioeconomic model process, more than $100.2 million in personal income would be directly paid to employees in the primary study area each year of construction. In addition, more than $56.3 million in indirect and induced income is expected to be generated in various construction-related and other industries in the primary study area each year of construction under CP5. The combined $156.5 million in personal income generated would represent an approximately 94 percent increase in all annual personal income in the local economic study area. This impact would be beneficial.

This impact would be similar to Impact Socio-4 (CP3). Under CP5, more than $100.2 million in personal income would be directly paid to employees in the primary study area each year of construction. In addition, more than $56.3 million in indirect and induced income is expected to be generated in various construction-related and other industries in the primary study area each year of construction. The combined $156.5 million in personal income generated would represent an approximately 94 percent increase in all annual personal income in the local economic study area.

Additional construction activities would be required for augmenting spawning gravel; restoring riparian, floodplain, and side-channel habitat; and creating fish habitat in and along the shoreline of Shasta Lake and along the lower reaches of its tributaries. During the 5-year construction period, more than $782.5 million in personal income is expected to be generated by direct, indirect, and induced employment produced by CP5, and this would be $15.9 million more personal income than generated under CP3. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-5 (CP5): Short-Term Increases in Sales and Profits for Businesses in the Primary Study Area that Support the Construction Industry Most of the construction materials used for CP5 are expected to be purchased within the primary study area. These purchases would provide the local economy with increased sales and profits over the 5-year construction period. This impact would be beneficial.

This impact would be similar to Impact Socio-5 (CP3). During the construction period, implementation of CP5 is expected to generate more than $408.0 million per year in sales and profits for construction-related and service-oriented businesses that support the construction industry, with approximately $256.6 million in direct income and $151.3 in direct and induced income. CP5 would generate an overall total of $8.3 million more per year in sales and profits than CP3 for construction-related and service-oriented businesses. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-6 (CP5): Short-Term Increase in State and Local Sales Tax Revenues in the Primary Study Area from Construction-Related Personal Income and Purchases As stated above, implementation of CP5 is expected to result in a substantial increase in total personal income (direct, indirect, and induced) over the 5-year construction period. This additional income, in combination with construction-related purchases in the primary study area, would result in a substantial increase in local sales tax revenues from increased consumer spending in nearby cities and counties. Construction-related activities under CP5 also would be likely to result in a temporary increase in State sales and income tax revenues received from businesses and residents of the primary study area. The exact amount of State and local sales tax revenue increases would be speculative; however, this impact would be beneficial.

This impact would be similar to but more beneficial than Impact Socio-6 (CP3). CP5 would generate more direct, indirect, and induced personal income and more sales and profits for businesses over the construction period than CP3 (see Impacts Socio-4 (CP5) and Socio-5 (CP5), above). This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-7 (CP5): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Primary Study Area As a result of the added reservoir

capacity created by CP5, the overall risk of flooding and its related consequences below Shasta Dam would be reduced. Although heavy rain events would continue to occur in the region and locally, and potentially increase with global climate change, the project is intended to provide greater flexibility in flood control downstream because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents of the primary study area, as well as would reduce business and personal income losses from such damage. Therefore, this impact would be beneficial.

This impact would be the same as Impact Socio-7 (CP3) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-8 (CP5): Long-Term Increases in Direct Employment in the Primary Study Area Related to Project Operations In the long term, implementation of CP5 would create at least two new maintenance-related positions at the Shasta Dam facilities. These two positions would be permanent and would continue once the 5-year construction period is completed. This impact would be minor but beneficial.

This impact would be the same as Impact Socio-8 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact Socio-9 (CP5): Potential Temporary Increase in Indirect Employment in Construction-Related Businesses of the Lower Sacramento River and Delta Construction activities associated with CP5 would have the potential to result in a short-term increase in indirect employment within the lower Sacramento River and Delta portion of the extended study area. Depending on the location of construction materials sourced outside of the primary study area, indirect increases in employment within construction-related businesses may result in the lower Sacramento River and Delta area. This impact would be minor but beneficial.

This impact would be similar to Impact Socio-9 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-10 (CP5): Short-Term Increases in Sales and Profits for Businesses in the Lower Sacramento River and Delta Area that Support the Construction Industry A small amount of the construction materials used for CP5 would be purchased within the extended study area. These purchases are predicted to increase sales and profits of some businesses within the lower Sacramento River and Delta area over the 5-year construction period of CP5. This impact would be minor but beneficial.

This impact would be similar to Impact Socio-10 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-11 (CP5): Short-Term Increase in State Sales and Income Tax Revenues in the Lower Sacramento River and Delta Area from Construction-Related Personal Income and Purchases In addition to local tax revenues, CP5 is expected to increase short-term construction-related State sales and income tax revenues received from businesses and residents of the lower Sacramento River and Delta portion of the extended study area. These additional revenues are expected to be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial.

This impact would be similar to Impact Socio-11 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-12 (CP5): Long-Term Reduction in the Adverse Economic Effects of Flooding in the Lower Sacramento River and Delta Area As a result of the added reservoir capacity under CP5, the overall risk of flooding and its related consequences below Shasta Dam would be reduced. Although heavy rain events would continue to occur in the region, and potentially increase with global climate change, CP5 is intended to provide greater flexibility in flood control in the lower Sacramento River and Delta area because of the increased capacity of the reservoir. As a result, less damage to existing structures and a smaller loss of potential future development would occur; this, in turn, would reduce salary and wage losses for residents in and near the lower Sacramento River floodplain and the Delta resulting from these catastrophic events, as well as would reduce business and personal income losses from such damage. Therefore, this impact would be beneficial.

This impact would be similar to Impact Socio-12 (CP3) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact Socio-13 (CP5): Short-Term Increases in Sales and Profits for Businesses in the CVP and SWP Service Areas that Support the Construction Industry A small amount of the construction materials used during construction under CP5 would be purchased within the extended study area, including the CVP and SWP service areas. These purchases are predicted to increase sales and profits of some businesses within the CVP and SWP service areas over the 5-year construction period of CP5. This impact would be minor but beneficial.

This impact would be similar to Impact Socio-13 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-14 (CP5): Potential Temporary Reduction in Shasta Project Water or Hydropower Supplied to the CVP and SWP Service Areas During

Construction Implementation of CP5 may require temporarily reducing the reservoir level at critical times during the construction period. This reduction in the reservoir level could temporarily reduce the amount of water or hydropower available from the dam and related hydropower infrastructure. Should this occur, sources of replacement water or hydropower would need to be secured. If these replacement resources were substantially more expensive, a minor negative effect on water or power customers may result. This impact would be potentially significant.

This impact would be similar to Impact Socio-14 (CP3) and would be potentially significant. Mitigation for this impact is proposed in Section 16.3.5, "Mitigation Measures."

Impact Socio-15 (CP5): Short-Term Increase in State Sales and Income Tax Revenues in the CVP and SWP Service Areas from Construction-Related Personal Income and Purchases In addition to local tax revenue, CP5 is expected to increase short-term construction-related State sales and income tax revenues received from some businesses and residents of the CVP and SWP service areas. These additional revenues are expected to be cycled back to local government coffers through statewide programs and policies. This impact would be minor but beneficial.

This impact would be similar to Impact Socio-15 (CP3) and would be minor but beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-16 (CP5): Long-Term Increase in Agricultural Income and Jobs in the CVP and SWP Service Areas as a Result of Improved Water Availability and Reliability Based on SWAP modeling, improved water availability and reliability expected to result from implementation of CP5 would substantially increase agricultural net income in the CVP and SWP service areas. This increase in production would contribute substantially to the continuation of this already strong industry in California. This impact would be beneficial.

This impact would be similar to Impact Socio-16 (CP3). The increase in the availability and reliability of water associated with implementation of CP5 would result in the long-term increase in indirect employment within the agricultural sector; however, this indirect increase is expected to be slightly less than under CP3. Based on the outputs of SWAP modeling, CP5 would generate an additional $2.6 million in net income during normal years and up to $5.7 million during dry years, when compared to existing conditions. In wet years, net income under CP5 is projected to increase to $3.4 million. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Socio-17 (CP5): Reduction in Risk of Potential Water and Power Shortages (and Related Economic Activity) in the CVP and SWP Service Areas as a Result of Long-Term Improvements to Water and Power Supply Reliability

Implementation of CP5 would substantially increase Shasta Dam's storage capacity. As stated in Impact Socio-16 (CP5), this additional storage capacity would improve long-term water availability and reliability in the CVP and SWP service areas. Beyond increasing agricultural production, this improved availability and reliability would reduce the long-term risk of urban water and power shortages, and their related adverse economic consequences. This impact would be beneficial.

This impact would be the similar to the other CPs and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

16.3.5 Mitigation Measures

Table 16-1 presents a summary of mitigation measures for socioeconomics, population, and housing.

Table 16-1. Summary of Mitigation Measures for Socioeconomics, Population, and Housing

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Socio-1 (No-Action): Potential for Reduced Employment Opportunities for Lower Sacramento River and Delta Area Residents	LOS before Mitigation	PS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
Impact Socio-1 (CP1–CP5): Short-Term Increase in Population and Housing Demand in the Primary Study Area Resulting from Construction-Related Activities	LOS after Mitigation	PS	LTS	LTS	LTS	LTS	LTS
Impact Socio-2 (No-Action): Potential for Temporary Disruptions in Business and Industrial Activity in the Lower Sacramento River and Delta Area	LOS before Mitigation	PS	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
Impact Socio-2 (CP1–CP5): Short-Term Increases in Direct, Indirect, and Induced Employment in the Primary Study Area Related to Construction Activities	LOS after Mitigation	PS	B	B	B	B	B
Impact Socio-3 (No-Action): Potential for Reduced Employment Opportunities for Residents Within the CVP and SWP Service Areas	LOS before Mitigation	PS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
Impact Socio-3 (CP1–CP5): Potential for Temporary Reduction in the Labor Force of Related Industrial Sectors in the Primary Study Area as a Result of Direct Construction-Related Employment	LOS after Mitigation	PS	LTS	LTS	LTS	LTS	LTS
Impact Socio-4 (No-Action): Potential for Temporary Disruptions in Business and Industrial Activity in the CVP and SWP Service Areas	LOS before Mitigation	PS	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
Impact Socio-4 (CP1–CP5): Short-Term Increases in Direct, Indirect, and Induced Personal Income Paid to Employees in the Primary Study Area Hired for Construction-Related Activities	LOS after Mitigation	PS	B	B	B	B	B

Table 16-1. Summary of Mitigation Measures for Socioeconomics, Population, and Housing (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CVP 4A	CP5
Impact Socio-5: Short-Term Increases in Sales and Profits for Businesses in the Primary Study Area that Support the Construction Industry	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-6: Short-Term Increase in State and Local Sales Tax Revenues in the Primary Study Area from Construction-Related Personal Income and Purchases	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-7: Long-Term Reduction in the Adverse Economic Effects of Flooding in the Primary Study Area	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-8: Long-Term Increases in Direct Employment in the Primary Study Area Related to Project Operations	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-9: Potential Temporary Increase in Indirect Employment in Construction-Related Businesses of the Lower Sacramento River and Delta	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-10: Short-Term Increases in Sales and Profits for Businesses in the Lower Sacramento River and Delta Area that Support the Construction Industry	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-11: Short-Term Increase in State Sales and Income Tax Revenues in the Lower Sacramento River and Delta Area from Construction-Related Personal Income and Purchases	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-12: Long-Term Reduction in the Adverse Economic Effects of Flooding in the Lower Sacramento River and Delta Area	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B

Table 16-1. Summary of Mitigation Measures for Socioeconomics, Population, and Housing (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Socio-13: Short-Term Increases in Sales and Profits for Businesses in the CVP and SWP Service Areas that Support the Construction Industry	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-14: Potential Temporary Reduction in Shasta Project Water or Hydropower Supplied to the CVP and SWP Service Areas during Construction	LOS before Mitigation	NA	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Socio-14: Secure Replacement Water or Hydropower During Project Construction.				
	LOS after Mitigation	NA	LTS	LTS	LTS	LTS	LTS
Impact Socio-15: Short-Term Increase in State Sales and Income Tax Revenues in the CVP and SWP Service Areas from Construction-Related Personal Income and Purchases	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-16: Long-Term Increase in Agricultural Income and Jobs in the CVP and SWP Service Areas as a Result of Improved Water Availability and Reliability	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B
Impact Socio-17: Reduction in Risk of Potential Water and Power Shortages (and Related Economic Activity) in the CVP and SWP Service Areas as a Result of Long-Term Improvements to Water and Power Supply Reliability	LOS before Mitigation	NA	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NA	B	B	B	B	B

Key:
B = beneficial
CP = Comprehensive Plan
CVP = Central Valley Project
LOS = level of significance
LTS = less than significant
NA = not applicable
PS = potentially significant
SWP = State Water Project

No-Action Alternative

No mitigation measures are needed for this alternative.

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

No mitigation is needed for Impacts Socio-1 (CP1) through Socio-13 (CP1) and Impacts Socio-15 (CP1) through Socio-17 (CP1). Mitigation is provided below for the other impact of CP1.

Mitigation Measure Socio-14 (CP1): Secure Replacement Water or Hydropower During Project Construction To address potential temporary shortages in water or hydropower caused by reduced availability at Shasta Dam during construction, replacement water or hydropower supplies would need to be sourced elsewhere to maintain current service needs. Depending on the conditions of the water or energy markets at the time of need, these replacement resources could be more expensive than water or hydropower obtained from Shasta Dam. The additional expense of obtaining water or hydropower resources could potentially produce a minor negative effect on water and power customers, if replacement of these resources is substantially more expensive.

To eliminate the potential impact of project construction on water and/or hydropower purchases, Reclamation will identify the need for replacement water or hydropower early in project implementation and will secure such resources at the lowest cost possible. Replacement water or hydropower would be available from a number of sources within or external to the CVP. Reclamation will provide these replacement resources to business and industry in the CVP and SWP service areas at costs comparable to water or hydropower obtained from Shasta Dam. Reclamation will provide replacement water or hydropower at levels equal to the loss of water or hydropower caused by project construction.

Implementation of this mitigation measure would reduce Impact Socio-14 (CP1) to a less-than-significant level.

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

No mitigation is needed for Impacts Socio-1 (CP2) through Socio-13 (CP2) and Impacts Socio-15 (CP2) through Socio-17 (CP2). Mitigation is provided below for the other impact of CP2.

Mitigation Measure Socio-14 (CP2): Secure Replacement Water or Hydropower during Project Construction This mitigation measure is identical to Mitigation Measure Socio-14 (CP1). Implementation of this mitigation measure would reduce Impact Socio-14 (CP2) to a less-than-significant level.

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

No mitigation is needed for Impacts Socio-1 (CP3) through Socio-13 (CP3) and Impacts Socio-15 (CP3) through Socio-17 (CP3). Mitigation is provided below for the other impact of CP3.

Mitigation Measure Socio-14 (CP3): Secure Replacement Water or Hydropower During Project Construction This mitigation measure is identical to Mitigation Measure Socio-14 (CP1). Implementation of this mitigation measure would reduce Impact Socio-14 (CP3) to a less-than-significant level.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation is needed for Impacts Socio-1 (CP4 and CP4A) through Socio-13 (CP4 and CP4A) and Impacts Socio-15 (CP4 and CP4A) through Socio-17 (CP4 and CP4A). Mitigation is provided below for the other impact of CP4 or CP4A.

Mitigation Measure Socio-14 (CP4 and CP4A): Secure Replacement Water or Hydropower During Project Construction This mitigation measure is identical to Mitigation Measure Socio-14 (CP1). Implementation of this mitigation measure would reduce Impact Socio-14 (CP4 and CP4A) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is needed for Impacts Socio-1 (CP5) through Socio-13 (CP5) and Impacts Socio-15 (CP5) through Socio-17 (CP5). Mitigation is provided below for the other impact of CP5.

Mitigation Measure Socio-14 (CP5): Secure Replacement Water or Hydropower During Project Construction This mitigation measure is identical to Mitigation Measure Socio-14 (CP1). Implementation of this mitigation measure would reduce Impact Socio-14 (CP5) to a less-than-significant level.

16.3.6 Cumulative Effects

Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences,” gives an overview of the cumulative effects analysis, including the relationship to the CALFED Bay-Delta Program Programmatic EIS/EIR cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria. Table 3-1, “Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area,” in Chapter 3, lists the present and reasonably foreseeable future projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of

existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. Projects listed in Table 3-1 that could contribute to cumulative impacts on socioeconomics, population and housing in the primary and extended study area include, but are not limited to, projects listed under Quantitative Analysis and those projects under Qualitative Analysis that include Los Vaqueros Reservoir Expansion, Bay-Delta Conservation Plan, Upper San Joaquin River Basin Storage Investigation, and Mountain Gate at Shasta Mixed Use Area Plan.

Water reliability and electrical demand are expected to become increasingly important issues as demand for water and electricity increases to meet the needs of California's growing population. Over time, water conservation and reuse efforts will increase and water provision is expected to shift from such areas as agricultural production to urban uses. Environmental restoration, flood control, and hydropower generation are expected to continue in a manner similar to existing conditions.

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

Primary Study Area In the primary study area, effects related to increases in population and housing during construction under CP1 would be less than significant. In combination with past, present, and reasonably foreseeable future projects, this incremental contribution to overall increases in population and housing demand would not be significant or cumulatively considerable. The combined effect of these projects and the SLWRI would not induce substantial growth in population, produce a substantial burden on the existing housing stock within the local community, or require sizeable numbers of workers from outside the local area. Implementing CP1 would result in beneficial effects on employment and the labor force, business and industrial activity, and government and finance. Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

Extended Study Area Without mitigation, CP1 could cause a potentially significant adverse effect on business and industrial activity in the CVP and SWP service areas. This adverse effect would be a potential temporary reduction in Shasta project water or hydropower supplied to CVP and SWP service areas during construction. With implementation of Mitigation Measure Socio-14 (CP1), adverse effects from CP1 would be fully mitigated because Reclamation would secure replacement water or hydropower during project construction. Therefore, the project would not make a cumulatively considerable incremental contribution to a significant cumulative impact related to the temporary construction-related reduction in water or hydropower supplies to the CVP and SWP service areas.

Implementing CP1 also would result in beneficial effects on employment and the labor force, business and industrial activity, and government and finance.

Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

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

Primary Study Area In the primary study area, effects related to increases in population and housing during construction under CP2 would be less than significant. In combination with past, present, and reasonably foreseeable future projects, this incremental contribution to overall increases in population and housing demand would not be significant or cumulatively considerable. The combined effect of these projects and the SLWRI would not induce substantial growth in population, produce a substantial burden on the existing housing stock within the local community, or require sizeable numbers of workers from outside the local area. Implementing CP2 would cause beneficial effects on employment and the labor force, business and industrial activity, and government and finance. Overall, the beneficial effects of CP2 in the primary study area would be greater than those of CP1. Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

Extended Study Area The adverse effects of CP2 would be the same as those of CP1. With implementation of Mitigation Measure Socio-14 (CP2), adverse effects from CP2 would be fully mitigated because Reclamation would secure replacement water or hydropower during project construction. Therefore, the project would not make a cumulatively considerable incremental contribution to significant cumulative impacts related to the temporary reduction in water or hydropower supplies to the CVP and SWP service areas.

Implementing CP2 would result in less-than-significant impacts on population and housing and also would have beneficial impacts on employment and the labor force, business and industrial activity, and government and finance. Overall, the beneficial effects of CP2 in the extended study area would be greater than those of CP1. Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

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

Primary Study Area In the primary study area, effects related to increases in population and housing during construction under CP3 would be less than significant. In combination with past, present, and reasonably foreseeable future projects, this incremental contribution to increases in population and housing demand would not be significant or cumulatively considerable. The combined effect of these projects and the SLWRI would not induce substantial growth in population, produce a substantial burden on the existing housing stock within the local community, or require sizeable numbers of workers from outside the local area. CP3 would have beneficial impacts on employment and the labor

force, business and industrial activity, and government and finance. Overall, the beneficial effects of CP3 in the primary study area would be greater than those of CP1 and CP2. Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

Extended Study Area The adverse effects of CP3 would be the same as those of CP1. With implementation of Mitigation Measure Socio-14 (CP3), adverse impacts from CP3 would be fully mitigated because Reclamation would secure replacement water or hydropower during project construction. Therefore, the project would not make a cumulatively considerable incremental contribution to significant cumulative impacts related to the temporary reduction during construction in water or hydropower supplies to the CVP and SWP service areas.

Implementing CP3 would result in less-than-significant impacts on population and housing and also would have beneficial effects on employment and the labor force, business and industrial activity, and government and finance. Overall, the beneficial effects of CP3 in the extended study area would be greater than those of CP1 and CP2. Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

Primary Study Area In the primary study area, effects related to increases in population and housing during the construction of CP4 or CP4A would be less than significant. In combination with past, present, and reasonably foreseeable future projects, this incremental contribution to increases in population and housing demand would not be significant or cumulatively considerable. The combined effect of these projects and the SLWRI would not induce substantial growth in population, produce a substantial burden on the existing housing stock within the local community, or require sizeable numbers of workers from outside the local area. CP4 or CP4A would have beneficial impacts on employment and the labor force, business and industrial activity, and government and finance. Overall, in the primary study area, the beneficial impacts of CP4 or CP4A would be the same as those of CP3. Thus, the project would not result in a cumulatively considerable incremental contribution to cumulative significant impacts on socioeconomic resources.

Extended Study Area The adverse impacts of CP4 would be the same as those of CP1. The adverse impacts of CP4A would be the same as those of CP2.With implementation of Mitigation Measure Socio-14 (CP4 and CP4A), adverse effects from CP4 or CP4A would be fully mitigated because Reclamation would secure replacement water or hydropower during project construction. Therefore, the project would not make a cumulatively considerable incremental contribution to significant cumulative impacts related

to the temporary reduction in water or hydropower supplies to the CVP and SWP service areas.

The implementation of CP4 or CP4A would result in less-than-significant impacts on population and housing and also would have beneficial impacts on employment and the labor force, business and industrial activity, and government and finance. In the extended study area, the beneficial impacts of CP4 or CP4A for population and housing, employment, and the labor force would be the same as those of CP3. For business and industrial activity, CP4 or CP4A would be more beneficial than CP3. Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Primary Study Area In the primary study area, effects related to increases in population and housing during construction under CP5 would be less than significant. In combination with past, present, and reasonably foreseeable future projects, this incremental contribution to increases in population and housing demand would not be significant or cumulatively considerable. The combined effects of these projects and the SLWRI would not induce substantial growth in population, produce a substantial burden on the existing housing stock within the local community, or require sizeable numbers of workers from outside the local area. CP5 would cause beneficial impacts on employment and the labor force, business and industrial activity, and government and finance. Overall, in the primary study area, the beneficial effects of CP5 would be the similar to those of CP3. Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

Extended Study Area The adverse effects of CP5 would be the same as those of CP1. With implementation of Mitigation Measure Socio-14 (CP5), adverse effects from CP5 would be fully mitigated because Reclamation would secure replacement water or hydropower during project construction. Therefore, the project would not make a cumulatively considerable incremental contribution to significant cumulative impacts related to the temporary reduction during construction in water or hydropower supplies to the CVP and SWP service areas.

Implementing CP5 would result in less-than-significant impacts on population and housing and also would have beneficial impacts on employment and the labor force, business and industrial activity, and government and finance. Overall, in the extended study area, the beneficial effects of CP5 would be similar to those of CP3. Thus, the project would not result in a cumulatively considerable incremental contribution to significant cumulative impacts on socioeconomic resources.

Chapter 17
Land Use and Planning

17.1 Affected Environment

This chapter describes the affected environment related to land uses and planning for the dam and reservoir modifications proposed under SLWRI action alternatives.

Because of the potential influence of the proposed modification of Shasta Dam and water deliveries over a large geographic area, the SLWRI includes both a primary study area and an extended study area. The primary study area has been further divided into Shasta Lake and vicinity and the upper Sacramento River (Shasta Dam to Red Bluff). The extended study area has been further divided into the lower Sacramento River and Delta and the CVP/SWP service areas (Figure 1-3).

The setting for land uses and planning in the Shasta Lake and vicinity portion of the primary study area consists of the portion of Shasta County north of Shasta Dam. This area encompasses Shasta Lake, lands surrounding the lake, and parts of the Pit River, Squaw Creek, McCloud River, and Sacramento River watersheds. Land use and planning in this area are influenced by land ownership, the presence of rural lakeside communities, and topography.

The setting for land uses and planning in the upper Sacramento River portion of the primary study area consists of the portion of Shasta County south of Shasta Dam and Tehama County. The incorporated cities of Shasta Lake, Redding, Anderson, and Red Bluff, all located along the Interstate 5 (I-5) corridor, establish urban settings in the otherwise rural upper Sacramento Valley. The upper Sacramento Valley is characterized by rolling hills with mountains to the north, east, and west. Land use and planning in this area are influenced by land ownership, historic land use patterns, topography, and population densities.

The land use and planning setting for the extended study area consists of 24 counties downstream from the Red Bluff Pumping Plant and encompasses all areas served by the CVP and the SWP. Land use and planning in the extended study area are influenced by the same factors identified for the upper Sacramento River study area. The type and focus of land use and planning may vary, however, in the large urban areas located in the extended study area.

17.1.1 Land Use

Shasta Lake and Vicinity

Land uses in the Shasta Lake and vicinity portion of the primary study area consist primarily of open space and other land uses that support recreational activities in the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). The Shasta-Trinity National Forest (STNF) manages the Shasta Unit of the NRA. Federally managed lands in the NRA total 235,740 acres, including Shasta Lake; lands held in private ownership total 10,347 acres. The U.S. Department of the Interior, Bureau of Land Management (BLM) manages the Shasta-Chappie Off-Highway Vehicle (OHV) area and other public lands immediately west of Shasta Lake; this area extends south towards Keswick Dam on both sides of the Sacramento River. The Federal lands immediately surrounding Shasta Dam and related facilities are managed by Reclamation. In addition, the California Department of Transportation (Caltrans) manages the I-5 corridor and the Union Pacific Railroad (UPRR) manages the rail corridor that crosses the primary study area (Figure 17-1).

The *Shasta-Trinity National Forest Land and Resource Management Plan* (LRMP) (USFS 1995) specifies several land allocations for National Forest System (NFS) lands managed by the Shasta Lake Ranger District within and adjacent to the Shasta Unit of the NRA. NFS lands in the primary study area are allocated as Late-Successional Reserves (LSR), Managed Late-Successional Areas, and other Threatened, Endangered, or Sensitive Species, Riparian Reserves, Administratively Withdrawn Areas, and Matrix.

LSRs and Administratively Withdrawn Areas each account for 20 percent of the land use designations in the NRA. Riparian Reserves, the largest land use designation in the NRA, are located in areas along rivers, streams, lakes, and wetlands, including the area inundated by Shasta Lake. Riparian Reserves were established to provide connectivity between LSRs and the Matrix throughout the NRA.

Approximately 25 percent of the land managed by the STNF within the boundary of the NRA is designated as either Administratively Withdrawn Areas or Matrix. Lands allocated as withdrawn were identified in the STNF LRMP as management emphasis areas where scheduled timber harvest is precluded. The Matrix consists of other Federal lands outside the categories described above that may be managed for timber or other resource purposes and are not subject to certain standards and guidelines.

STNF LRMP direction for the Shasta Unit of the NRA is to: (1) provide public outdoor recreation opportunities; (2) conserve scenic, scientific, historic, and other values that contribute to public enjoyment; and (3) manage, use, and dispose of renewable natural resources, which will promote, but not significantly impair, public recreation or conservation of scenic, scientific, historic or other values contributing to public enjoyment (36CFR292.11).

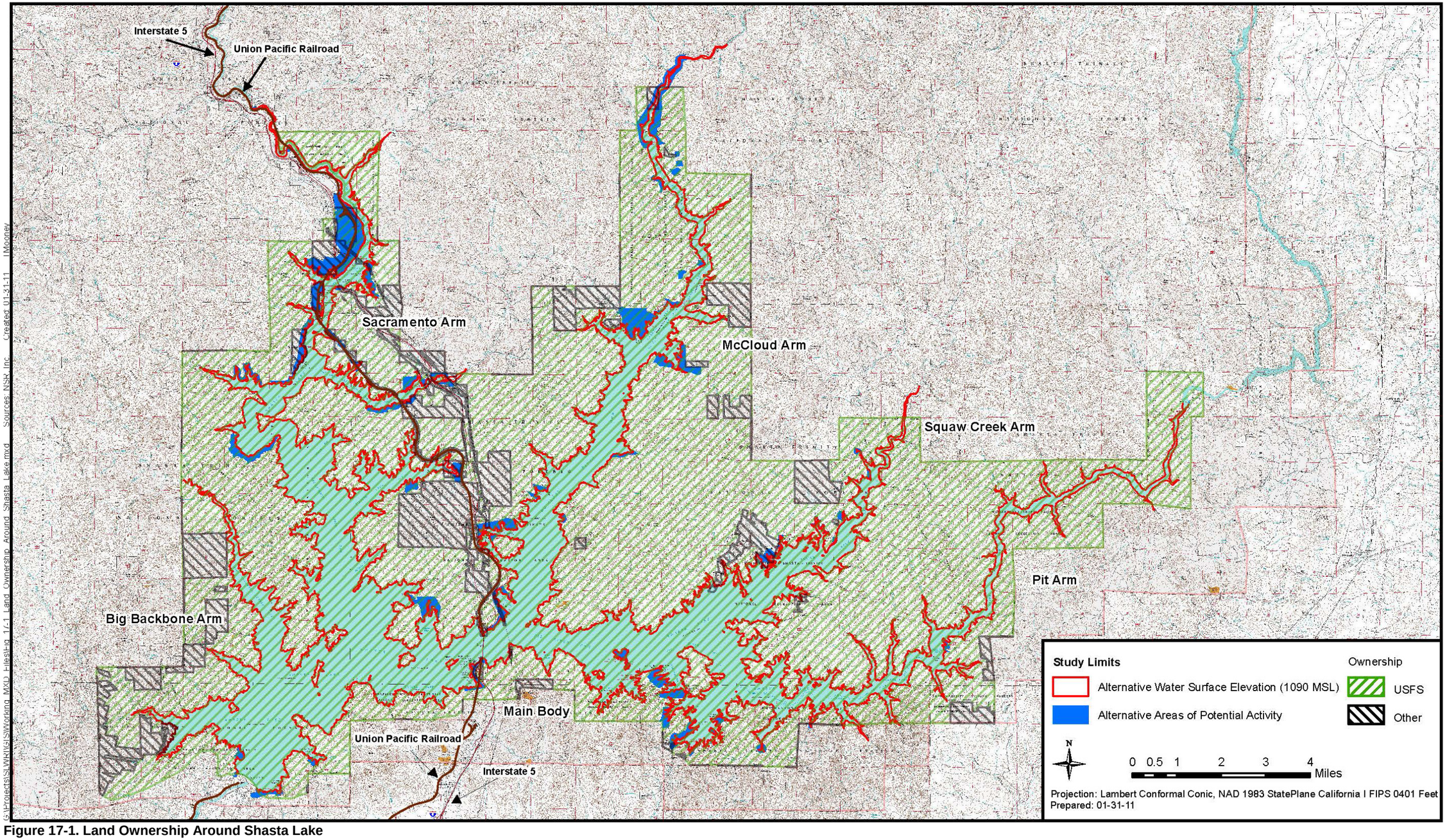

Figure 17-1. Land Ownership Around Shasta Lake

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Developed recreational and commercial land uses occupy 2 percent of the land managed by the STNF within the Shasta Unit of the NRA. Recreational use in the NRA exceeds 2 million visitor days annually. Water-oriented activities, such as boating, fishing, waterskiing, and houseboating, are the main attractions. Marinas that currently operate on Shasta Lake include Antlers, Sugarloaf, Shasta, Holiday Harbor, Packers Bay, Bridge Bay, Silverthorn, Jones Valley, and Digger Bay. Other recreational land uses include hiking, camping, picnicking, and OHV activities. A planning permit was issued by the STNF to decommission Digger Bay and construct a new marina at Turntable Bay, but the permit was not exercised and has since been revoked.

Commercial land uses in the NRA include resorts, marinas, campgrounds, restaurants, motels, grocery stores, and service stations. Resorts are sometimes operated as stand-alone entities, but are more typically operated in conjunction with a marina. Some resorts on Shasta Lake must move their docks substantial distances from their land-based facilities during periods of low water levels.

USFS manages recreation residence tracts at Salt Creek, Silverthorn, Campbell Creek, and Didallis Creek; these tracts combined contain 160 privately owned cabins on NFS lands. USFS policy is to manage these tracts and residences for individual recreational use and to keep the areas as close as possible to their natural state. Only minimal improvements are permitted, and structures must blend into the natural environment.

Mining and grazing do not take place in the NRA. There are no grazing permits authorized for the Shasta Unit of the NRA, primarily because of a lack of suitable range. Federal lands in the NRA, except those with valid existing rights, were withdrawn from mineral entry by the legislation that created the NRA. Reclamation and USFS conducted validity determinations on most of the claims existing at that time and contested the majority of them based on the absence of a valid discovery. There were five claims in the Shasta Unit of the NRA (See Page II-12 of the NRA Guide, STNF 1996) that predate the withdrawal; these claims have not been developed and are considered closed by the USFS. The lands covered by these claims remain open to mineral leasing. Hard rock minerals in the NRA are available for prospecting, exploration, and development under solid mineral leasing regulations (43 Code of Federal Regulations (CFR) Subpart 3583). Authorization for this land use requires permits and leases subject to approval by the Secretary of Agriculture and terms and conditions of the USFS to protect the values of the NRA.

There are two Inventoried Roadless Areas (IRA) that are managed by the STNF within and adjacent to the NRA boundary. Geographic information system (GIS) information provided by the USFS indicates that the boundaries of these IRAs coincide with the current full-pool elevation of Shasta Lake. The Backbone IRA encompasses 11,464 acres and is adjacent to the shoreline of Shasta Lake at two locations; 1.9 miles along the Big Backbone Arm and 5.8 miles along the Sacramento Arm. The Devils Rock IRA encompasses 16,207

acres on the STNF; 12.9 miles of this IRA are adjacent to the Pit Arm of Shasta Lake.

Land uses on privately owned lands in the NRA generally consist of commercial, recreational, and residential land uses associated with the NRA. Approximately 20 percent of the privately held lands in the NRA are developed. Commercial development consists primarily of service industries supporting residents and recreational visitors.

Residential land uses are typically characterized as low density and rural. Established small communities along Shasta Lake include Lamoine, Lakehead, Lakeshore, and Sugarloaf, which are located on the Sacramento Arm of Shasta Lake. Farther south is the residential community of O'Brien, which is located between the Sacramento and McCloud arms near I-5.

The McCloud River, which flows into Shasta Lake in the primary study area, is eligible for listing as wild and scenic under the Federal Wild and Scenic Rivers Act (Federal WSRA). In addition, although it is not State of California (State)-listed as wild and scenic, the McCloud River receives certain protections under the California Public Resources Code (PRC), Section 5093.542, established through enactment of the California Wild and Scenic Rivers Act, as amended (Sections 5093.50–5093.70). The effects of the proposed enlargement of Shasta Lake on the McCloud River are discussed in Chapter 25, "Wild and Scenic River Considerations for McCloud River," of this EIS.

The Sacramento River above Shasta Dam was also identified as eligible for listing as wild and scenic under the Federal WSRA in Appendix E to the Final EIS for the STNF LRMP. The USFS acknowledged this segment was eligible (Recreation) based on the presence of four outstandingly remarkable values (ORV); Cultural/Historical, Fisheries, Geology, Visual Quality/Scenery. The limited amount of land managed by the STNF along this segment (14 percent of the segment corridor) precluded the USFS decision to move the eligibility process forward; the agency determined it did not have the ability to manage these ORVs.

Upper Sacramento River (Shasta Dam to Red Bluff)

Land uses in the upper Sacramento River area consist of urban, residential, municipal and industrial, and agricultural uses. Urban development is located in the valley and is concentrated along the transportation corridors provided by I-5, State Route 273, and the UPRR. Incorporated cities located in the valley along I-5 in the upper Sacramento River study area are the cities of Shasta Lake, Redding, Anderson, and Red Bluff. Cottonwood, an unincorporated community located along the I-5 corridor, also has residential and commercial development.

Small rural communities characterize development patterns between Cottonwood and Lakehead on either side of the I-5 corridor. Many of these communities have their origins in the early settlement of Shasta County and

Tehama County, as evidenced by the agriculture, grazing, and timber operations typical of the upland areas. These communities usually consist of small community centers surrounded by vast tracts of fields and forest that are dotted with home sites (Shasta County 2004).

The northern, western, and eastern portions of Shasta County are relatively uninhabited because the lands in these areas are managed by USFS for timber, wildlife, and wilderness uses. Lands managed by USFS in the western and southeastern portions of Tehama County are also relatively uninhabited.

The National Park Service manages lands in the upper Sacramento River study area, including the Whiskeytown Unit of the NRA, west of Keswick, and Lassen Volcanic National Park, in the northeastern corner of Tehama County. The BLM manages the 12,194-acre Sacramento River Bend Management Area on the east side of the Sacramento River northeast of Red Bluff.

The National Rivers Inventory (NRI) identified three segments of the Sacramento River that are eligible for inclusion in the national Wild and Scenic River System that could be affected by the proposal to raise Shasta Dam. No segments of river have been designated as a wild and scenic river under Federal law in either the Sacramento or McCloud River systems.

Three segments lie on the Sacramento River below the Shasta Dam. These were evaluated in the BLM's Redding Resource Management Plan (RMP: A-16) and are briefly described in Table 17-1.

Table 17-1. Sacramento River – Eligible Segments From NRI and BLM RMP

River	Potentially Affected Eligible Segment	ORVs	Responsible Federal Agency
Sacramento	Below Shasta Dam, Arnold Bend above Colusa to Red Bluff Diversion Dam.	Recreation and Fishing	Bureau of Land Management; US Fish and Wildlife Service (Corning to Colusa)
Sacramento	Below Shasta Dam, Interstate Highway 5 bridge crossing immediately north of Red Bluff to Interstate Highway 5 bridge crossing at Anderson.	Scenery, Recreation, Fishing, Wildlife and Other Values.	Bureau of Land Management
Sacramento	Below Shasta Dam, Balls Ferry Bridge to gaging station below Sevenmile Creek	Scenery, Recreation, Fishing, Heritage	Bureau of Land Management

Key:
BLM = Bureau of Land Management
NRI = National Rivers Inventory
ORV = outstandingly remarkable value
RMP = Resource Management Plan

Lower Sacramento River and Delta

Land uses in the extended study area vary greatly because of differences in population, economy, and environment. Land uses in the Sacramento Valley are principally agricultural and open space, with urban development focused around the State capital in the Sacramento metropolitan area. The primary private land use in the region is agriculture. Urban development has occurred along major highway corridors, primarily in Sacramento, Placer, El Dorado, Yolo, Solano, and Sutter counties, and has caused some agricultural land to be taken out of production. For those lands that remain agricultural, soil conditions allow a wide variation in the types of crops grown.

The American River flows into the Sacramento River downstream from Nimbus Dam; its watershed is included in the lower Sacramento River and Delta portion of the extended study area. Two sections of the American River, the North Fork American River from its source in the Sierra Nevada to the Iowa Hill Bridge near Colfax and the lower American River from Nimbus Dam to the river's confluence with the Sacramento River in the City of Sacramento, are listed as wild and scenic under the Federal WSRA and the State PRC.

The listed segment of the North Fork American River is designated as a wild river under the Federal WSRA and the State PRC. The listed segment is above any regulated reaches and is not under the control of the CVP or SWP. The downstream end of the listed segment is more than 70 river miles and 50 air miles upstream from the confluence with the Sacramento River and is thus too far away to be affected by any hydraulic changes in the Sacramento River.

The lower American River is regulated by Folsom Dam, which is approximately seven miles upstream from Nimbus Dam. Both Shasta Dam and Folsom Dam release water in accordance with their operational requirements, including releases to maintain water quality for fisheries, municipal use, and agricultural use, and for exports to the San Joaquin Valley. Both dams have operational requirements for the sections of the Sacramento and lower American rivers above their confluence, and they also have shared operational requirements for the Sacramento River and Delta below the confluence. Therefore, operational changes at one dam could require operational changes at the other. For example, reduced releases from Shasta Dam could require increased releases from Folsom Dam to meet flow requirements in the lower Sacramento River and Delta.

The lower American River is designated as a recreational river under the Federal WSRA and the PRC. Fishing and boating, including rafting and canoeing, are the primary recreational activities on the river. In addition, much of the lower American River's south shore is part of the American River Parkway. Joggers, bicyclists, walkers, and other users take advantage of the riverside trails and beaches of this extensive park system.

As shown on Table 17-1, one segment of the Sacramento River is listed as eligible for consideration under the Federal WSRA. The USFWS manages several wildlife refuges adjacent to this segment of the river between Corning and Colusa, California.

CVP/SWP Service Areas

The CVP, operated by Reclamation, is the largest water storage and delivery system in California, covering 29 of the State's 58 counties. Most of the CVP service area is in the Central Valley, and about 90 percent of the south-of-Delta contractual delivery is for agricultural uses (Reclamation 2007).

Most of the population of the CVP service area is concentrated within urban areas. The CVP service area includes various municipal and industrial water contractors and water districts that serve portions of the Sacramento and Stockton metropolitan areas and the San Francisco Bay Area. Outside these population centers, most of the CVP service area is rural, with irrigated agriculture the predominant land use and economic driver (Reclamation 2007).

SWP water is delivered to contracting agencies in Northern California, the San Francisco Bay Area, the Central Coast, San Joaquin Valley, and Southern California.

Land uses in the CVP/SWP service areas vary and include agricultural, municipal and industrial, commercial, open space, grazing, and timber production.

17.1.2 Planning

Shasta Lake and Vicinity

Federal Land Use Planning Federal lands are not subject to county or city general plans. Land use planning direction for the NRA is guided by Public Law 89-336 and associated regulations (including 36 CFR Part 292, Subpart B), USFS Directives, and management direction found in the STNF LRMP. As a result of more recent Congressional action, BLM manages all public lands west of the NRA including the Chappie-Shasta OHV Area. BLM also manages public lands along the Sacramento River corridor downstream from Shasta Dam to Red Bluff.

Shasta-Trinity National Forest Land and Resource Management Plan The STNF LRMP is based on three broad management strategies: preservation, biodiversity, and sustainable development for people. The objectives of the STNF LRMP are to:

- describe the desired conditions of NFS lands and resources;
- identify strategies to maintain or achieve those conditions;
- identify land areas as generally suitable or unsuitable for various uses;

- identify the guidelines for projects and activities; and
- identify areas with special or unique characteristics.

Projects and activities must be consistent with the applicable plan components. The STNF LRMP provides management direction at four integrated levels: (1) forest-wide direction, (2) land allocations and standards and guidelines, (3) management prescription direction, and (4) management area direction.

In addition to the land allocations described in the preceding section (LSRs, Riparian Reserves, Administratively Withdrawn Areas, and Matrix), there are a number of goals and associated standards and guidelines applicable to the SLWRI project with respect to NFS lands in the primary study area. Goals and associated standards and guidelines that describe the desired future condition of the STNF include:

- Lands
  - Plan for long-range land ownership adjustments that support resource objectives. Within and adjacent to the NRA, acquire available, undeveloped private lands needed to fulfill the management goals and objectives of the recreation resource program. Acquire those parcels of land that are specifically needed: (a) for public development; (b) to protect major visual resource values; (c) to protect prime wildlife habitat; and (d) to preserve important cultural values and make them available for public enjoyment.
  - Provide for continued use and new development of hydroelectric facilities.
  - During the project planning phase, consider the need for construction of trails, roads, and/or recreational facilities.

Seven land allocations apply to the STNF: Congressionally Reserved Areas (Wilderness Areas), LSRs, Managed Late-Successional Areas Administratively Withdrawn Areas, Riparian Reserves, Matrix, and Adaptive Management Areas (USFS 1995). There are no Congressionally Reserved Areas and Adaptive Management Areas in the primary study area so these allocations are not considered in this analysis.

The STNF LRMP requires each type of land use to be managed in accordance with applicable management prescriptions and the respective standards and guidelines pertaining to both land allocations and unique management areas. Lands allocated as LSRs, for example, have specific management objectives and standards and guidelines for air quality, biological diversity, fire and fuels,

etc. The applicable management prescriptions for the four land allocations in the primary study are discussed below.

- **Late-Successional Reserves, Managed Late-Successional Areas, and other Threatened, Endangered, or Sensitive Species** – LSRs have been established to protect and enhance conditions of late-successional and old-growth forest ecosystems and to ensure the support of related species, including the northern spotted owl. The applicable management prescription is:

  - Provide special management for Late Successional Reserves and Threatened, Endangered and Selected Sensitive Species that are primarily dependent on late seral stage conditions.

- **Administratively Withdrawn Areas** – These areas are identified in the STNF LRMP and include recreation and visual areas, backcountry, and other areas where management emphasis precludes scheduled timber harvesting. The applicable management prescriptions are:

  - **Unroaded Non-Motorized Recreation** – Provide for semi-primitive non-motorized recreation opportunities in unroaded areas outside existing wilderness areas while maintaining predominantly natural-appearing areas with only subtle modifications.

  - **Limited Roaded Motorized Recreation** – Provide for semi-primitive motorized recreation opportunities while maintaining predominantly natural-appearing areas with some modifications.

  - **Roaded, High Density Recreation** – Provide areas that are characterized by a substantially modified natural environment.

  - **Special Area Management** – Provide for protection and management of special interest areas and research natural areas.

  - **Heritage Resource Management** – The primary theme of this prescription is to protect designated cultural resource values, interpret significant archaeological and historical values for the public, and encourage scientific research of these selected properties.

- **Riparian Reserves** – Provide an area along streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. The applicable management prescription is:

  - **Riparian Management** – Maintain or enhance riparian areas, wildlife and fisheries habitat, and water quality by emphasizing streamside and wetland management.

- **Matrix** – Includes Federal lands outside the categories of the designated areas listed above. There are no Matrix lands in the NRA. Matrix lands are where most timber harvest would occur and where standards and guidelines are in place to ensure appropriate conservation of ecosystems as well as provide habitat for rare and lesser known species. The applicable management prescriptions are:

  - **Roaded Recreation** – Provide for an area where there are moderate evidences of the sights and sounds of humans.

  - **Wildlife Habitat Management** – The primary purpose of this prescription is to maintain and enhance big game, small game, upland game bird, and nongame habitat to provide adequate hunting and viewing opportunities.

The STNF LRMP provides another more specific layer of land use planning guidance for the NRA: the *Management Guide: Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity NRA* (USFS 2014). The Land Use and Ownership section of this document provides the following guidance for NRA lands managed by the STNF:

- Those private lands that would enhance outdoor recreation opportunities and/or the conservation of scenic, scientific, historic, and other values contributing to the public enjoyment of the NRA should be acquired as opportunities arise.

- Land exchanges will be pursued in accordance with the Forest Land Adjustment Guide. Lands directly adjacent to the shoreline will have the highest priority.

- Lands with significant known pollution sources arising from a history of mining discharge will not be acquired.

- Coordination will take place with Shasta County to allow those private land developments and resource production proposals that will maintain or enhance NRA values, and to disallow or phase out private land uses that detract from those values.

- Coordination will take place with county, State, and other Federal agencies on development, management, and regulatory oversight of recreation opportunities and facilities to ensure consistency with NRA objectives.

- Planning will take place with owners and managers of travel and utility corridors through the NRA (railroad, highway, and major power lines) to minimize the visual impacts of these corridors on the aesthetic value of the NRA.

On January 12, 2001, the Department of Agriculture adopted the rule that established prohibitions on road construction, reconstruction, and timber harvest in IRAs because they have the greatest likelihood of altering and fragmenting landscapes, resulting in immediate, long-term loss of IRA values and characteristics. Subsequently, the STNF finalized the boundaries of IRAs, including two areas adjacent to the Shasta Unit of the NRA; Backbone and Devils Rock.

The STNF coordinates with Shasta County to ensure that private development in the NRA maintains or enhances NRA values through local zoning regulations.

Mendocino National Forest Land and Resource Management Plan The management direction, objectives, and standards and guidelines of the Mendocino National Forest LRMP are applicable to an isolated 488-acre parcel of land managed by the Mendocino National Forest along the east bank of the Sacramento River in the general vicinity of the decommissioned Red Bluff Diversion Dam. In addition to a developed recreation area (Sycamore Campground), this parcel provides river access, habitat for special-status species and undeveloped open space used by the public for hiking, biking, and other recreational activities.

U.S. Bureau of Land Management Resource Management Plan As a result of Congressional action, BLM manages all public lands west of the NRA including the Chappie-Shasta OHV Area. BLM also manages public lands along the Sacramento River corridor downstream from Shasta Dam to Red Bluff. The primary study area is within the boundary of the Northern California District; the Central California District manages public lands throughout most of the extended study area. The resource management plans (RMP) of three BLM field offices: Redding, Ukiah, and Mother Lode (BLM 2006) are applicable to most of the public lands within both the primary and extended study areas. The purpose of BLM's RMPs is to provide an overall direction for managing and allocating public resources in each planning area. Planning issues addressed in the RMPs include land tenure adjustments, such as land acquisition, exchange, and sale; recreation management; access; and forest management, including harvesting, herbicide use, and special-status species.

BLM's Redding RMP (BLM 1993) provides guidance for the management of cultural resources, fire, grazing, minerals, vegetation, water quality, wildlife and fish habitats, and other resources and issues in Shasta County. The RMP was amended by the 1994 Record of Decision for the *Northwest Forest Plan* (Final Supplemental EIS for Amendments to USFS and BLM Planning Documents within the Range of the Northern Spotted Owl). This amendment required preparation of a Watershed Analysis before initiating BLM activities. Under the respective RMPs, as amended by the *Northwest Forest Plan*, BLM, like USFS, is also required to ensure that projects are consistent with the Aquatic

Conservation Strategy and other management direction specified in the 1994 Record of Decision for the *Northwest Forest Plan*.

The Redding RMP governs land use on BLM lands, including lands in the Sacramento River Management Area. The goal of the lands program of the Redding Field Office is to transform the scattered land base of the Redding Resource Area into consolidated resource management units to meet the needs of public land users. The RMP includes the following management guidance for its land program:

- All lands identified for transfer to another agency or qualified organization are for long-term stewardship by the receiving entity.
- All land acquisitions will be through exchange, purchase, or donation. Acquisitions will be from willing sellers for available unimproved property. In all acquisitions, BLM will strive to gain the local support and understanding for the action.
- All land identified for disposal through exchange, Recreation and Public Purposes Act transfer, or sale meets the criteria set forth in the Federal Land Policy and Management Act of 1976.
- Land use authorizations (rights-of-way, leases, permits) will continue to be issued on a case-by-case basis and in accordance with decisions established in the RMP. Applications for land use authorizations which reduce the marketability of an exchange parcel will not be authorized.
- Rights-of-way will be issued to promote the maximum utilization of existing rights-of-way routes, including joint use whenever possible.

County Land Use Planning Land-use planning on non-Federal land is under the jurisdiction of local governments in California. All cities and counties in California are required by the State to adopt a general plan establishing goals and policies for long-term development, protection from environmental hazards, and conservation of identified natural resources (California Government Code Section 65300). General plans lay out the pattern of future residential, commercial, industrial, agricultural, open-space, and recreational land uses on non-Federal land within a community. To facilitate implementation of planned growth patterns, general plans identify goals and/or policies to establish land use patterns.

Local governments implement general plans by adopting zoning, subdivision, grading, and other ordinances. Zoning ordinances identify specific types of land uses that may be allowed on a given site and establish specific development standards. Zoning regulations vary from jurisdiction to jurisdiction. However, typical standards promulgated in zoning ordinances include the siting of structures relative to parcel boundaries, architectural design (including height

limitations), and the percentage of building coverage allowed relative to the overall square footage of a parcel.

The *Shasta County General Plan* (Shasta County 2004) provides planning guidance for privately owned land in Shasta County. Land use directives are provided in the form of goals, policies, objectives, standards, and guidelines. The following land uses described in the general plan are present in the Shasta Lake and vicinity portion of the primary study area:

- **Rural Residential** – Encompasses areas that receive minimal urban services, usually in or near a rural community center and areas with no urban services that are located in areas of the county characterized by one or more of the following conditions:
  - Severe limitations on septic tank use
  - Uncertain long-term availability of water
  - Proximity to lands categorized as timber, grazing, or crop lands
  - Remoteness from urban, town, and rural community centers
  - Extreme wildland fire hazard
  - Inaccessibility via county-maintained roads
- **Existing Residential** – This designation may be applied to residential areas that existed before 1984 and that do not fit the land use designation or density applied to surrounding properties.
- **Mixed Use** – This category recognizes that in a rural setting the strict segregation of different land use types, which is typically found in urban environments, is neither necessary nor practical. At this scale, conflicts that may result from the intermixing of land uses may be addressed by Shasta County zoning and development standards related to screening setbacks and architectural design.
- **Commercial Recreational** – This designation provides opportunities for the development of privately owned lands characterized by the natural environment for the purpose of providing commercial recreation activities that use and provide for the enjoyment of the natural environment. Examples of commercial recreation include campgrounds, fishing and hunting clubs, dude ranches, boating facilities, and recreational vehicle parks. Other uses such as a restaurant or small grocery store may be permitted when accessory to, supportive of, and compatible with the recreation activity.
- **Natural Resources Protection**

- **Community Parks** – Provides for large-scale community recreation facilities

- **Habitat** – Provides for protection of significant wildlife habitat resources

Shasta County land use actions and decisions on non-Federal land in the NRA are subject to STNF review and approval pursuant to 36 CFR Part 292, Subpart B.

Upper Sacramento River (Shasta Dam to Red Bluff)

Land use planning in the upper Sacramento River area consists of general plans adopted by Shasta and Tehama counties and the cities of Shasta Lake, Redding, Anderson, and Red Bluff. BLM lands in this area are managed in accordance with the Redding RMP, discussed in Section 17.2, "Regulatory Framework."

Local Land Use Planning

Shasta County The *Shasta County General Plan* (2004) designates the following land uses along the Sacramento River from Shasta Dam south to the Tehama County line:

- Rural residential
- Greenway
- Habitat resource
- Natural habitat
- Agricultural – cropland
- Agricultural – small-scale crops, grazing
- Mineral resources

Tehama County The *Tehama County General Plan Update 2009–2029* (2009) designates the following land uses along the Sacramento River from the Shasta County line in the north to Red Bluff:

- Habitat Resources
- Valley Floor Agriculture
- Public Facility
- Rural Residential–Small Lot
- Suburban Residential

City of Shasta Lake The *City of Shasta Lake General Plan* was adopted in 1999. The general plan designates the following land uses along Shasta Dam Boulevard, the primary roadway leading up to Shasta Dam:

- Community park
- 100-year floodplain
- Public facilities
- Commercial
- Mixed use
- Rural residential (1 unit/2 acres, 1 unit/5 acres)
- Suburban residential (3 units/acre)
- Urban residential (10 units/acre)
- Urban residential – High (20 units/acre)

City of Redding The City of Redding adopted an updated general plan in 2000 (City of Redding 2000). The general plan designates the following land uses along the Sacramento River within the city limits and sphere of influence:

- Greenway
- Park, Park-Golf
- Public Facility; Public Facility-School
- Recreational
- General Office
- General Commercial
- Neighborhood Commercial
- Residential (2–3.5, 3.5–6, 6–10 units/acre)
- Critical Mineral Resource Overlay
- Mixed Use Neighborhood Overlay

City of Anderson The City of Anderson released its updated general plan in May 2007 (City of Anderson 2007). The general plan designates the following land uses along the Sacramento River within the city limits and sphere of influence:

- Commercial
- Industrial
- Public/Quasi-Public
- Medium-Density Residential
- Rural Residential/Rural Estate

City of Red Bluff The City of Red Bluff most recently amended its General Plan Land Use Element in 1993; the city is currently updating this plan. The general plan designates the following land uses along the Sacramento River within the city limits and sphere of influence:

- Primary Floodplain
- Exclusive Agriculture
- General Commercial
- Central Business Districts
- Single-Family Residential
- General and Neighborhood Apartment Districts
- General Industrial
- Public Agency District
- Park

Lower Sacramento River and Delta

The lower Sacramento River and Delta are within the planning jurisdiction of Butte, Colusa, Contra Costa, Glenn, Sacramento, Solano, Sutter, Yolo, and Yuba counties. The largest cities in this region are Antioch, Chico, Davis, Fairfield, Martinez, Marysville, Pittsburg, Sacramento, Vacaville, Vallejo, West Sacramento, and Woodland. Each of these entities currently has adopted general plans and zoning ordinances. Land use planning documents are adopted by Federal agencies for federally managed lands in the lower Sacramento River and Delta areas.

CVP/SWP Service Areas

The CVP extends from the Cascade Range near Redding in the north to the Tehachapi Mountains near Bakersfield in the south. The CVP serves farms, homes, and industry in California's Central Valley as well as major urban centers in the San Francisco Bay Area. SWP contractors are in the southern San Joaquin Valley, Central Coastal area, and Southern California. The CVP and SWP service areas include portions of the primary and extended study areas. CVP water irrigates more than 3 million acres of farmland and provides drinking water to nearly 2 million consumers. SWP deliveries are 70 percent urban and 30 percent agriculture, serving 20 million Californians and more than 600,000 irrigated acres, respectively. Each of the counties and incorporated cities in the CVP and SWP service areas has adopted general plans and zoning ordinances. Federally managed lands in the service areas are managed in accordance with land use and planning documents similar to the STNF LRMP and BLM's RMP, and military installations located in the service areas have their own planning processes.

17.2 Regulatory Framework

17.2.1 Federal

Federal land use policies apply only to actions on, or affecting the uses of, Federal lands. Federal lands in the primary study area consist of the following:

- National Forest lands managed by STNF around Shasta Lake
- Lands along the Sacramento River just south of Shasta Dam managed by Reclamation
- Lands managed by BLM along the Sacramento River south of Shasta Dam as far downstream as Red Bluff

Entry upon or use of these Federally administered lands would require approval from the appropriate Federal entity(ies).

Federal Land Policy and Management Act

The Federal Land Policy and Management Act was enacted to change the Federal public lands policy from disposal to retention. The act directs Federal agencies to apply land use principles that emphasize conservation; these include the principles of multiple use and sustained yield land management policies. The Federal Land Policy and Management Act consolidated and articulated BLM's management responsibilities and applies primarily to this Federal land management agency. Title V of the Federal Land Policy and Management Act also granted the Secretary of the Interior and the Secretary of Agriculture the authority to issue rights-of-way for various uses, including reservoirs.

Code of Federal Regulations

USFS personnel administer their responsibilities for regulating use and protecting National Forest lands under Title 36 of the CFR and sections of titles 16, 18, and 21. Public services directives from the code are integrated into the STNF LRMP and include the following topics: fire and fuels management, facilities management, law enforcement, and land management.

Shasta-Trinity National Forest Land and Resource Management Plan

The STNF LRMP is a forest-wide land use plan developed to guide resource management on STNF lands. Six broad categories are used to define management strategies. The management strategies (known as land allocations) are implemented through management prescriptions that provide specific standards and guidelines for forest resource management (USFS 1995).

Management Guide for the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area

The 2014 NRA *Management Guide: Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity NRA* (USFS 2014) contains management guidance intended to achieve or maintain desired conditions for the NRA. The document

provides specific information about current conditions in the NRA, desired future conditions for the NRA, and management recommendations for the NRA. STNF is responsible for administering the Shasta and Trinity units of the NRA.

Mendocino National Forest Land and Resource Management Plan

The Mendocino LRMP is a forest-wide land use plan developed to guide resource management on NFS lands. Six broad categories are used to define management strategies. The management strategies (known as land allocations) are implemented through management prescriptions that provide specific standards and guidelines for forest resource management (USFS 1995).

U.S. Bureau of Land Management Resource Management Plans

BLM manages a number of public lands adjacent to the Sacramento River corridor downstream from Shasta Dam. The study area falls under two BLM districts (Northern California and Central California) and the RMPs of three BLM field offices: Redding, Ukiah, and Mother Lode (BLM 2006). The purpose of BLM's RMPs is to provide overall direction for managing and allocating public resources in each planning area.

BLM's Redding RMP (BLM 1993) provides guidance for the management of cultural resources, fire, grazing, minerals, vegetation, water quality, wildlife and fish habitats, and other resources and issues in Shasta County. The RMP governs land use on BLM lands, including lands in the Sacramento River Management Area. Planning issues addressed in the RMP include land tenure adjustments, such as land acquisition, exchange, and sale; recreation management; access; and forest management, including harvesting, herbicide use, and special-status species.

The RMP was amended by the 1994 Record of Decision for the *Northwest Forest Plan* (Final Supplemental EIS for Amendments to USFS and BLM Planning Documents within the Range of the Northern Spotted Owl). This amendment required preparation of a Watershed Analysis before initiating BLM activities. As a party to the *Northwest Forest Plan*, BLM, like USFS, is also required to ensure that projects are consistent with the Aquatic Conservation Strategy.

Federal Wild and Scenic Rivers Act

The Federal WSRA, enacted in 1968, established the National Wild and Scenic Rivers System "to preserve rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations." To be eligible for inclusion in the system, a river must be free-flowing and exhibit ORVs. Free-flowing means "existing or flowing in a natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway" (16 USC Section 1286). ORVs are scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (16 USC Section 1271). Depending on the specific attributes of a river, it may be designated as "wild," "scenic," or "recreation." Different segments of a

single river can receive different designations; in other words, some segments can be designated wild, some scenic, and some recreation or combinations of these designations. Recreation rivers are defined as "rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past" (16 USC Section 1286).

State-designated rivers may be added to the Federal system upon the request of the state's governor and the approval of the Secretary of the Interior (16 USC Section 1286). Two sections of the American River were added to the Federal system in 1981 under this method. These sections are the lower American River from Nimbus Dam to the river's confluence with the Sacramento River and the North Fork American River from its source to the Iowa Hill Bridge. The North Fork section is located above Nimbus, Folsom, and Lake Clementine dams many miles upstream from the confluence with Sacramento River. The North Fork is not regulated by Folsom Dam and would not be affected by hydraulic changes in the Sacramento River. The lower American River is designated as a recreational river.

Adding state rivers to the Federal system under (16 USC Section 1286) does not require the approval of the Legislature or Congress. State rivers added to the Federal system under this section are to be managed by the state.

17.2.2 State

California Public Resources Code, Division 6

PRC Division 6 grants the State Lands Commission (SLC) jurisdiction over 4.5 million acres of land held in trust for Californians. SLC's jurisdiction includes a 3-mile-wide section of tidal and submerged land adjacent to the coast and offshore islands, including bays, estuaries, and lagoons. It also includes the waters and beds of more than 120 rivers, lakes, streams, and sloughs. The State holds these lands for the public trust purposes of water-related commerce, navigation, fisheries, recreation, and open space. SLC may grant dredging permits and issue land use leases for activities within its jurisdiction. SLC does not have a comprehensive use plan for these lands but manages them according to State and Federal laws and regulations. In the primary study area, SLC's jurisdiction includes areas along the Sacramento River north of Red Bluff.

California Fire Plan

The *California Fire Plan* was prepared by the State Board of Forestry and the California Department of Forestry and Fire Protection to provide a comprehensive strategy for wildland fire protection and prevention in California. The plan provides recommendations for fire-safe land use planning. Preventive measures include using fire-resistant building materials, maintaining a defensible space around structures, vegetation management, and infrastructure planning.

Water Quality Control Plan

The *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* provides water quality objectives to protect beneficial uses of designated rivers and streams. *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* objectives are incorporated into county and city general plans, zoning ordinances, and subdivision ordinances.

California Public Resources Code, Sections 5093.50–5093.70

PRC Sections 5093.50–5093.70 were established through 1972 enactment of the State Wild and Scenic Rivers Act, which was subsequently amended on several occasions, to preserve certain rivers that possess extraordinary scenic, recreational, fishery, or wildlife values in their free-flowing state. The PRC identifies, classifies, and provides protection for specific rivers or river segments, as approved by the Legislature. Rivers or river segments that are specifically identified and classified in the PRC compose the State Wild and Scenic Rivers System. As described in PRC Section 5093.50, rivers or river segments included in the State system must possess "extraordinary scenic, recreational, fishery, or wildlife values"; however, the PRC does not define what constitutes "extraordinary."

Depending on the specific conditions of a river, it may be designated as "wild," "scenic," or "recreation." Different segments of a single river can receive different designations; in other words, some segments can be designated wild, some scenic, and some recreation or combinations of these designations. Recreation river segments are readily accessible by road or railroad, may have some development along their shorelines, and may have been impounded or diverted in the past (PRC Section 5093.53).

With its initial passage, the State system protected segments of eight rivers, including two sections of the American River. These sections include the lower American from Nimbus Dam to its confluence with the Sacramento River and the North Fork from its source to the Iowa Hill Bridge. The North Fork section is located above Nimbus, Folsom, and Lake Clementine dams many miles upstream from the confluence with Sacramento River. The North Fork is not regulated by Folsom Dam and would not be affected by hydraulic changes in the Sacramento River. The lower American is designated as a recreational river.

17.2.3 Regional and Local

Shasta County General Plan

The *Shasta County General Plan* (2004) guides land use planning on non-Federal land for Shasta County through 2025. The Community Organization and Development Pattern element of the *Shasta County General Plan* establishes policies related to the organization and relationships of the community types present in Shasta County, the living environments these communities offer, and the locations of development in relation to these communities. These policies were developed to maintain and enhance the

quality of their environments. The Community Organization and Development Pattern element includes several objectives that influence land use decisions in the project study area:

- To promote a development pattern that will accommodate, consistent with the other objectives of the plan, the growth that will be experienced by Shasta County
- To guide development in a pattern that will provide opportunities for present and future county residents to enjoy the variety of living environments that currently exist within the county
- To guide development in a pattern that will respect the natural resource values of county lands and their contributions to the county's economic base
- To guide development in a pattern that will minimize land use conflicts between adjacent land users
- To recognize that the major economic resources for achieving the development pattern will come from the private sector, rather than government, and that the general plan, as the expression of community values, will guide the use of these resources

Tehama County General Plan

The *Tehama County General Plan Update 2009–2029* is used to guide future development in unincorporated areas of the county. The Land Use element of the General Plan Update establishes the goals, policies, and implementation measures that will help guide the growth and development of Tehama County for the next 20 years. This element also contains the General Plan Land Use Map, which delineates those areas of the county where future residential development of varying densities and nonresidential growth is anticipated or will be directed (Tehama County 2009).

City of Shasta Lake General Plan

The planning boundaries for the *City of Shasta Lake General Plan* are within the Shasta Lake and vicinity study area, north of Keswick Dam, east of the Sacramento River, and west of I-5. This general plan was adopted in 1999 and is intended to guide land use planning within the city through the Year 2020 (City of Shasta Lake 1999). The following statement from the Land Use element of the general plan identifies some of the concerns surrounding land use decisions within the City of Shasta Lake:

> *The Land Use Element and the Land Use and Circulation Map constitute the physical framework for the general plan, which designates the proposed location, distribution, and extent of land uses. Land use was a specific area of concern identified as*

> *being key to the development of the City of Shasta Lake. Some of the major issues identified included an evaluation and establishment of urban, rural, and urban reserve boundaries. This was accomplished by identifying areas that currently lack infrastructure that would be required to develop in an orderly manner through the development of Area Plans.*

City of Redding General Plan

The planning boundaries for the *City of Redding General Plan* encompass areas within the city limits and the urban growth boundary. This plan was adopted in 2000 and is intended to guide land use planning through the year 2020 (City of Redding 2000). The Community Development and Design element of the general plan states the following about the role and effects of land use policies:

> *Land use policies and the General Plan Diagram affect every property in the City. They determine how people can use/develop their land and what they can reasonably expect to develop next door, down the street, or across town. They provide for overall consistency and compatibility between land uses and can be a determining factor in quality of life. The policies … also have a direct bearing on traffic, the feasibility of public transportation, and the quality of the air.*

City of Anderson General Plan

The planning boundaries of the *City of Anderson General Pla*n encompass areas within the city limits and the urban growth boundary. The City of Anderson released its updated general plan in May 2007 (City of Anderson 2007). The general plan is intended to guide land use planning within the city through the Year 2027. The following statement from the Land Use element of the general plan identifies some of the concerns surrounding land use decisions within the City of Anderson:

> *The Land Use Element describes the pattern of land development within the City of Anderson and the proposed expansion area and provides direction for the future development envisioned for the City. Also included in this Element are descriptions of geographic areas that are anticipated to be developed over the term of this General Plan and goals and policies to guide the City's decision makers in their review of development proposals. This Element also defines land use categories and provides supporting detail for the uses depicted upon the Anderson General Plan Land Use Diagram.*

Red Bluff General Plan

The planning boundaries for the *City of Red Bluff General Plan* encompass areas within the city limits and the urban growth boundary. The adopted

General Plan elements are as follows: Circulation element (1991), Housing element (2004), and Land Use, Natural Environment, Noise, and Safety elements (1993). The following statement from the Land Use element summarizes concerns relative to land use decisions in Red Bluff (City of Red Bluff 1993):

> *The land use element identifies the spatial arrangement of existing and proposed uses of land including public lands and facilities. It lays out the distribution of classes of land use, the intensity of those uses, and proposes a strategy of goals, objectives, policies and implementation measures to promote a wise use of land to promote the welfare of the community.*

17.3 Environmental Consequences and Mitigation Measures

17.3.1 Methods and Assumptions

To characterize existing land uses in the primary study area, pertinent planning documents were reviewed to identify objectives for the level, type, location, density, and intensity of development and to determine whether the alternatives would be in conflict with current plans and policies. Planning documents that were reviewed include the STNF LRMP (USFS 1995), the Management Guide for the NRA, the BLM RMPs and the general plans for the cities of Shasta Lake, Redding, Anderson, and Red Bluff and Shasta and Tehama counties. Land use maps and zoning maps were consulted to identify planned land uses. The analysis also included a review of aerial photography to determine existing land uses in the primary study area.

The impacts of each alternative are analyzed separately, starting with the analysis of the No-Action Alternative, followed by each of the action alternatives. The impact analysis includes a discussion of both direct and indirect impacts associated with each alternative.

17.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with 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 EIS 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 and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative related to land use and planning would be significant if project implementation would do any of the following:

- Create land uses that are incompatible with existing and planned land uses adjacent to actions described as part of the project
- Introduce substantial nuisance effects on sensitive land uses that would disrupt use over an extended time period
- Conflict with any applicable land use plan, policy, ordinance, or regulation of an agency with jurisdiction over the project (including general plans, specific plans, and zoning ordinances) adopted for the purpose of avoiding or mitigating an environmental effect
- Disrupt or divide the physical arrangement of an established community
- Conflict with any applicable habitat conservation or natural community conservation plan

17.3.3 Topics Eliminated from Further Consideration

Effects of the proposed enlargement of Shasta Lake on the listed segments of the American River have been eliminated from further consideration in this EIS. The listed segment of the North Fork American River has been eliminated because it is above any regulated reaches and is many miles from the confluence of the American and Sacramento rivers. The lower American River has been eliminated because none of the alternatives would adversely affect its designation as a recreational river under the Federal WSRA or the PRC. Under each of the action alternatives, releases from Shasta Dam would increase from late spring through early autumn. Increased releases from Shasta Dam during this period would reduce the volume of water released from Folsom Dam during the primary recreation season on the lower American River (late spring through early autumn). Flow volumes and water levels within the lower American River would, however, remain substantially similar to existing conditions and would remain within the river's typical range of variation during the primary recreation season. During the secondary recreation season (autumn through spring), precipitation is greater, flows in the Sacramento River and Delta are higher, and releases from Shasta Dam would be reduced to increase storage in Shasta Lake. Reclamation may need to occasionally increase releases from Folsom Dam to accommodate demand and offset decreased releases from Shasta Dam. Flow volumes and water levels in the lower American River would, however, remain substantially similar to existing conditions and within the river's typical range of variation during the secondary recreation season.

The effects of the proposed enlargement on two IRAs, Backbone and Devils Rock, have been eliminated from further consideration in this EIS. Under the 18.5 foot increase, 0.3 percent of the Backbone IRA (39.2 acres) would be subject to inundation; Big Backbone Arm – 16.9 acres, Sacramento Arm – 22.3 acres. There would be no new road construction or timber harvest. There would be some vegetation removed in conjunction with the relocation of the Gooseneck Campground (boat-in), as well as removal of hazard trees at select locations identified by the STNF at coves known for high houseboat use. Under the 18.5 foot increase, 0.3 percent of the Devils Rock IRA would be subject to inundation; Pit Arm – 41.9 acres, Sacramento Arm – 22.3 acres. There would be no new road construction or timber harvest. There would be some vegetation removed in conjunction with removal of hazard trees at select locations identified by the STNF at high use houseboat coves. Collectively, approximately 20.6 miles of shoreline within the boundaries of these IRAs will be subject to effects similar to those described elsewhere in this EIS under the No-Action alternative, none of which are precluded in the 2001 Roadless Rule.

17.3.4 Direct and Indirect Effects

No-Action Alternative

Shasta Lake and Vicinity, Upper Sacramento River (Shasta Dam to Red Bluff), Lower Sacramento River and Delta, and CVP/SWP Service Areas
The impact discussion for the No-Action Alternative addresses all of both the primary and extended study areas together, because this alternative would not affect land use in either the primary or extended study area.

Impact LU-1 (No-Action): Disruption of Existing Land Uses No new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

Impact LU-2 (No-Action): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions No new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

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

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP1 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact LU-1 (CP1): Disruption of Existing Land Uses Project construction activities associated with enlarging Shasta Dam and relocating utilities, infrastructure, and public service and recreational facilities could result in short-term and long-term disruptions to land uses by interfering with the ability to use

certain lands and interfering with access to certain lands. Construction activities that could disrupt land uses include the transport of project materials to and from project construction sites and the demolition and relocation of some utilities. This impact would be potentially significant.

It is anticipated that construction activities would be limited to the Shasta Lake and Vicinity portion of the primary study area; therefore, no impacts associated with disruption of existing land uses would be expected to occur downstream from Shasta Dam.

Construction activities specific to enlarging Shasta Dam would be limited to the existing footprint of the Shasta Dam facilities and areas immediately adjacent. The project construction site would be accessed by existing roadways (I-5, Shasta Dam Boulevard, and Lake Boulevard). The access roads allow commercial truck use and are capable of supporting project-generated traffic. Road modifications would be necessary to accommodate project traffic en route to the construction sites and access restrictions would occur. Noise, air quality, and traffic impacts along these local roadways are evaluated in separate sections of the EIS. Equipment staging areas would be sited to avoid affecting or conflicting with existing land uses.

Project construction activities associated with relocating utilities, infrastructure, and public service and recreational facilities could result in temporary and localized disruptions of existing land uses. Lake inundation resulting from future dam operations could result in long-term disruptions of land uses in the primary study area. The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum provides descriptions and detailed maps of the utilities and infrastructure (e.g., roads, bridges, campgrounds, boat ramps) that would be demolished or relocated in the ancillary areas near Shasta Lake (Reclamation 2007). Chapter 18, “Recreation and Public Access,” evaluates the project’s impacts on recreational use, including short-term disruption of recreational use and/or change in the type and location of recreational use. Chapter 21, “Utilities and Service Systems,” of this EIS evaluates the project’s impacts on utilities and service systems, and the environmental impacts of utilities demolition and relocation are evaluated in the pertinent technical chapters of the EIS (e.g., Water Quality, Air Quality and Climate, and Noise and Vibration).

Construction activities would affect major features around Shasta Lake and vicinity and would require demolition, relocation, modification, or reconstruction to prevent inundation of the features caused by an increased reservoir elevation. The major features affected would include:

- Major roads and road segments (Lakeshore Drive realignment)
- Vehicle bridges (Charlie Creek, Doney Creek, McCloud River, Didallas Creek, and Second Creek)

- Railroad bridge
- Utilities and service systems infrastructure
- Campgrounds and picnic areas
- Boat ramps and associated parking areas
- Buildings (resort/marina, residential, USFS facilities)

The communities of Lakeshore and Sugarloaf would be affected the most by transportation infrastructure relocation activities. Seventy-five small road segments (both paved and unpaved) would need to be modified. CP1 would result in the inundation of Lakeshore Drive at numerous locations south of Charlie Creek Bridge and in two locations between the Charlie Creek and Doney Creek bridges. Relocation of Lakeshore Drive and the UPRR would occur near existing residences and businesses. Road construction activity could result in temporary and localized increases in dust, noise, and construction truck traffic and potential disruption of access.

Seven bridges would need to be replaced. Construction activities associated with bridge modifications and relocations, particularly in areas with existing development such as Bridge Bay Marina and the communities of Lakeshore and Sugarloaf, could result in short-term disruptions of nearby residential, commercial, and industrial land uses. Bridge construction activity could result in temporary and localized increases in dust, noise, and construction truck traffic and potential disruption of access.

Approximately 67,000 feet of power and telecommunications lines would need to be demolished and reconstructed at a number of locations, including powerlines that cross Shasta Lake. Utilities infrastructure relocation activities could result in short-term disruptions of land uses in communities and recreation areas around Shasta Lake. Relocation activities could require partial or full road closures and other access restrictions to ensure public safety. Utilities relocation activities could also result in temporary and localized increases in dust, noise, heavy equipment traffic, and other project traffic.

An estimated 50 buildings would be affected under a 6.5-foot dam raise. The buildings have been categorized as residential (cottages, homes, etc.), commercial (resorts, marinas, stores, etc.), and USFS sites (work stations, campground buildings, recreation site restrooms, etc.). Buildings within the inundation area would be removed, and some would be relocated. Utilities associated with the removed buildings (water systems, septic systems, telecommunications and power facilities) would also require demolition or abandonment. Construction activity related to removal and/or relocation of buildings would result in temporary and localized increases in dust, noise, and construction truck traffic and potential disruption of access. Some existing

marinas would need to be modified or relocated, which would disrupt existing commercial and recreational land uses. See the Engineering Summary Appendix for additional details.

Reservoir dikes would be required in the areas of Antlers/Lakeshore and railroad embankments would be required at the UPRR track at the south end of Bridge Bay for protection of existing infrastructure from increased full pool elevations. Additional sites for dike and embankment construction could be added in the future. Dike and embankment construction could serve to lessen long-term land use impacts resulting from the project by eliminating the need to remove and relocate a number of structures. Construction activities associated with dike and embankment construction would result in temporary and localized increases in dust, noise, and construction truck traffic and potential disruption of access.

Project implementation could result in short-term disruptions of land uses of parcels around Shasta Lake and vicinity during construction and relocation activities; long-term disruptions of land use could also result from project operations. This impact would be potentially significant. Mitigation for this impact is proposed in Section 17.3.5, “Mitigation Measures.”

Impact LU-2 (CP1): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Project implementation would result in inundating land around Shasta Lake, which could conflict with land use goals and policies of affected jurisdictions. Relocation of utilities and service systems resulting from project implementation could also conflict with existing land use goals and policies. This impact would be potentially significant.

It is anticipated that construction activities would be limited to the Shasta Lake and vicinity portion of the primary study area; therefore, no conflicts with existing land use goals and policies would be expected to occur in planning jurisdictions downstream from Shasta Dam.

Project implementation would result in an increase in reservoir pool elevation during extreme storm events, which could result in the flooding of approximately 1,110 acres in the lower elevations around Shasta Lake. To prevent utilities and infrastructure damage, Reclamation would relocate roads, utilities and service systems, marinas, and other structures and would modify a number of bridges. Relocation plans are based on broad assumptions regarding optimum construction, operation, and environmental conditions. Areas planned for relocation activities could have land use designations that conflict with the land use proposed by the project. It is anticipated that some relocation activities would conflict with land use designations. Although refinements have been made to a number of relocation sites subsequent to the DEIS, additional engineering information will be required for some sites before a detailed analysis can be made. Once relocation sites are finalized, the proposed land use would be compared to the existing land uses and land use designations to

determine consistency with the STNF LRMP, BLM RMP, the Shasta County General Plan, and the Shasta County Zoning Ordinance as applicable.

Areas that would be most affected by project implementation are located on the Sacramento Arm of Shasta Lake and include the communities of Sugarloaf and Lakeshore. A number of existing residential land uses would be inundated by a higher full pool elevation in Shasta Lake.

Most recreation facilities that could be inundated by project implementation would be relocated; some recreation facilities would be relocated adjacent to existing recreation facilities. Sites proposed for the relocation of recreational facilities could be inconsistent with the current land use designations. Reclamation would cooperate with USFS and/or BLM to find the most suitable relocation sites that would be consistent with the STNF LRMP, the NRA Management Guide, and the BLM RMP.

The proposed use of Turntable Bay as a developed recreation area would require an amendment to the USFS STNF LRMP (USFS 1995) to change the land management prescription from Roaded Recreation (Prescription III) to Roaded, High Density Recreation (Prescription IV). Under the USFS Planning Regulations, this would be considered a nonsignificant amendment to the STNF LRMP.

Open space lands would be inundated. STNF LRMP land allocations that would be inundated include Riparian Reserve allocations. Loss of the use of NRA lands would be inconsistent with STNF LRMP and NRA goals and policies. Reclamation would coordinate mitigation measures with USFS to minimize the impacts from losing the ability to use lands around Shasta Lake.

The STNF LRMP identified several segments of the Sacramento River upstream from the NRA boundary as eligible for consideration under the Federal WSRA. One of these segments extends from the NRA boundary upstream to Box Canyon Dam. Only 6.7 miles of this 37 mile segment is on NFS lands managed by the STNF; none of these lands are within the segment affected by CP1. Under CP1, approximately 1,100 feet of this segment would be inundated.

Vegetation clearing required for the relocation of structures, marinas, recreation facilities, and utilities could be inconsistent with the STNF LRMP, BLM RMP, the *Shasta County General Plan*, and the Shasta County Zoning Ordinance. Many relocation activities would require vegetation clearing before construction. Specific clearing sites would be dependent on the sites chosen for utilities, building, and infrastructure relocation. The sites have not been determined at this time. Once specific relocation sites are known and the areas requiring vegetation clearance are determined, an analysis would be performed to determine whether the proposed action would be inconsistent with the STNF LRMP, the NRA Management Guide, the *Shasta County General Plan*, and the

Shasta County Zoning Ordinance. Reclamation would obtain authorization and/or use permits, or other suitable instruments, from USFS for actions within the jurisdiction of USFS; Reclamation would also obtain authorization and/or use permits from Shasta County and the California Department of Forestry and Fire Protection for vegetation clearing activities within the jurisdiction of Shasta County.

The overall project actions, as authorized by Congress, may not be consistent with the STNF LRMP (USFS 1995) as amended. Project-specific STNF LRMP amendment(s) may be required for standards and guidelines pertaining to the following LRMP elements: caves, visual quality, late successional reserves, riparian reserves, survey and manage species, and special-status species (e.g., Shasta snow-wreath). Scoping efforts to date indicate that amendments to the STNF LRMP are likely to be nonsignificant. The USFS decision would include a project-specific exception to these standards.

The STNF LRMP includes several resource-specific goals and objectives that enable the USFS to balance resource conflicts that could occur as a result of project authorization. One example is the goal to "provide for continued use and new development of hydroelectric facilities." The USFS understands that Congressional authorization may result in amendments or exemptions to land allocations and/or specific LRMP standards and guidelines in a manner that would enable an authorized project to be consistent with the STNF LRMP. If required, Reclamation would cooperate with USFS in support of any efforts to amend the STNF LRMP; this could require additional effort to fully comply with the National Forest Management Act and NEPA.

Site-specific information is needed for all infrastructure, building, and utilities relocation plans to review completely for consistency with existing land use planning documents, primarily the STNF LRMP and the *Shasta County General Plan*. Given the magnitude of facilities that might be relocated, including existing marinas and utilities, it is anticipated that there would be some inconsistencies with existing planning policies. This impact would be potentially significant. Mitigation for this impact is proposed in Section 17.3.5, "Mitigation Measures."

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact LU-3 (CP1): Disruption of Existing Land Uses Construction activities would be limited to the primary study area; therefore, there would be no disruption of existing land uses in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact LU-4 (CP1): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Construction activities would be limited to the primary study area; therefore, no conflicts with existing land use goals and policies would occur in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

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

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP2 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact LU-1 (CP2): Disruption of Existing Land Uses Project construction activities associated with enlarging Shasta Dam and relocating utilities, infrastructure, and public service and recreational facilities could result in short-term and long-term disruptions to land uses by interfering with the ability to use certain lands and interfering with access to certain lands. Construction activities that could disrupt land uses include the transport of project materials to and from project construction sites. Limitations on site use associated with construction at a particular site or facility would also occur. This impact would be potentially significant.

This impact would be similar to Impact LU-1 (CP1). A dam raise of 12.5 feet would result in a larger area of inundation than under CP1, which would, in turn, result in additional relocation of existing structures, infrastructure, and utilities and a longer duration for the impact. Reclamation estimates the construction of CP2 would take 5 years, which would be 6 months longer than for CP1. CP2 would, therefore, result in longer-term disruptions of land use than would CP1. Approximately 500 additional acres would be inundated by CP2, totaling 1,750 acres of land that would be inundated by Shasta Dam operations. Specific information regarding the location and number of structures that would be permanently lost will be incorporated into the land use impact analysis.

Project implementation could result in short-term and long-term disruptions of existing land uses. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 17.3.5, “Mitigation Measures.”

Impact LU-2 (CP2): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Project implementation could result in a permanent loss of inundated land around Shasta Lake, which could conflict with land use goals and policies of affected jurisdictions. Relocation of utilities and service systems resulting from project implementation could also conflict with existing land use goals and policies. This impact would be potentially significant.

This impact would be similar to Impact LU-2 (CP1). A dam raise of 12.5 feet would create a larger area of inundation than under CP1, which, compared to CP1, would result in additional relocation of structures and infrastructure that would be subject to USFS and Shasta County land use goals and policies.

Under CP2, approximately 1,800 feet of the eligible segment of the Sacramento River would be inundated. The portion of this segment subject to inundation is on private lands, not subject to the STNF LRMP.

A site-specific analysis would be conducted to determine where relocation activities and permanent land base losses resulting from project implementation would be inconsistent with the STNF LRMP, the NRA Management Guide, the *Shasta County General Plan*, and the Shasta County Zoning Ordinance.

Project implementation could result in short-term and long-term impacts that could conflict with existing land use goals and policies. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 17.3.5, "Mitigation Measures."

Lower Sacramento River and Delta and CVP/SWP Service Areas
Impact LU-3 (CP2): Disruption of Existing Land Uses Construction activities would be limited to the primary study area; therefore, there would be no disruption of existing land uses in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact LU-4 (CP2): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Construction activities would be limited to the primary study area; therefore, no conflicts with existing land use goals and policies would occur in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival
Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP3 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact LU-1 (CP3): Disruption of Existing Land Uses Project construction activities associated with enlarging Shasta Dam and relocating utilities, infrastructure, and public service and recreational facilities could result in short-term and long-term disruptions to land uses by interfering with the ability to use certain lands and interfering with access to certain lands. Construction activities that could disrupt land uses include the transport of project materials to and from project construction sites. Limitations on site use associated with construction at a particular site or facility would also occur. This impact would be potentially significant.

This impact would be similar to Impact LU-1 (CP1). A dam raise of 18.5 feet would result in a larger area of inundation than under CP1, which would result in additional relocation of existing structures and infrastructure compared to CP1 and a longer duration for the impact. Reclamation estimates that

construction of CP3 would take 60 months, which would be 6 months longer than for CP1. Approximately 2,500 acres of land would be inundated by CP3 and, according to the 2003 infrastructure inventory at Shasta Lake, an estimated 130 buildings would be inundated under an 18.5-foot dam raise (Shasta County 2003). Specific information regarding the location and number of structures that would be permanently lost would be incorporated into the land use impact analysis. CP3 would require a more extensive (longer and wider) system of reservoir dikes than CP1 to accommodate increased Shasta Lake elevations resulting from Shasta Dam operations. A dam raise of 18.5 feet would result in the encroachment of 31 road segments. Lakeshore Drive could be inundated for nearly its entire length between Charlie Creek and Doney Creek.

Project implementation could result in short- and long-term disruptions of existing land uses. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 17.3.5, “Mitigation Measures.”

Impact LU-2 (CP3): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Project implementation could result in a permanent loss of inundated land around Shasta Lake, which could conflict with land use goals and policies of affected jurisdictions. Relocation of utilities and service systems resulting from project implementation could also conflict with existing land use goals and policies. This impact would be potentially significant.

This impact would be similar to Impact LU-2 (CP1). A dam raise of 18.5 feet would result in a larger area of inundation than CP1, which, compared to CP1, would result in additional relocation of existing structures and infrastructure that would be subject to existing USFS and Shasta County land use goals and policies.

Under CP3, approximately 2,200 feet of the eligible segment of the Sacramento River would be inundated. The portion of this segment subject to inundation is on private lands, not subject to the STNF LRMP.

A site-specific analysis would be conducted to determine where relocation activities and permanent land base losses resulting from project implementation would be inconsistent with the STNF LRMP, the NRA Management Guide, the *Shasta County General Plan*, and the Shasta County Zoning Ordinance.

Project implementation could result in short-term and long-term impacts that could conflict with existing land use goals and policies. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 17.3.5, “Mitigation Measures.”

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact LU-3 (CP3): Disruption of Existing Land Uses Construction activities would be limited to the primary study area; therefore, there would be no

disruption of existing land uses in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact LU-4 (CP3): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Construction activities would be limited to the primary study area; therefore, no conflicts with existing land use goals and policies would occur in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP4 and CP4A addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact LU-1 (CP4 and CP4A): Disruption of Existing Land Uses Project construction activities associated with enlarging Shasta Dam and relocating utilities, infrastructure, and public service and recreational facilities could result in short-term and long-term disruptions to land uses by interfering with the ability to use certain lands and interfering with access to certain lands. Gravel augmentation and the habitat restoration activities along the upper Sacramento River could also cause minor disruptions of existing land uses in the primary study area. Construction activities that could disrupt land uses include the transport of project materials and equipment to and from project construction sites. Limitations on site use associated with construction at a particular site or facility would also occur. This impact would be potentially significant for CP4 and CP4A.

This impact would be similar to Impact LU-1 (CP1). Therefore, this impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 17.3.5, “Mitigation Measures.”

This impact would be similar to Impact LU-1 (CP1). Therefore, this impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 17.3.5, “Mitigation Measures.”

Impact LU-2 (CP4 and CP4A): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Project implementation could result in a permanent loss of inundated land around Shasta Lake, which could conflict with land use goals and policies of affected jurisdictions. Relocation of utilities and service systems resulting from project implementation could also conflict with existing land use goals and policies, resulting in a significant impact. The proposed gravel augmentation and the habitat restoration activities along the upper Sacramento River for CP4 and CP4A would not alter land uses and would

not be expected to conflict with existing land use goals and policies. This impact would be potentially significant for CP4 or CP4A.

This impact would be similar to Impact LU-2 (CP3). Therefore, this impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 17.3.5, "Mitigation Measures."

This impact would be similar to Impact LU-2 (CP3). Therefore, this impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 17.3.5, "Mitigation Measures."

Lower Sacramento River and Delta and CVP/SWP Service Areas
Impact LU-3 (CP4 and CP4A): Disruption of Existing Land Uses Construction activities would be limited to the primary study area; therefore, there would be no disruption of existing land uses in the extended study area. No impact would occur for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact LU-4 (CP4 and CP4A): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Construction activities would be limited to the primary study area; therefore, no conflicts with existing land use goals and policies would occur in the extended study area. No impact would occur for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP5 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact LU-1 (CP5): Disruption of Existing Land Uses Project construction activities associated with enlarging Shasta Dam and relocating utilities, infrastructure, and public service and recreational facilities could result in short-term and long-term disruptions to land uses by interfering with the ability to use certain lands and interfering with access to certain lands. Gravel augmentation and the habitat restoration activities along the upper Sacramento River could also cause minor disruptions of existing land uses in the primary study area. Construction activities that could disrupt land uses include the transport of project materials and equipment to and from project construction sites. Limitations on site use associated with construction at a particular site or facility would also occur. This impact would be potentially significant.

This impact would be similar to Impact LU-1 (CP1). Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 17.3.5, "Mitigation Measures."

Impact LU-2 (CP5): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Project implementation could result in a permanent loss

of inundated land around Shasta Lake, which could conflict with land use goals and policies of affected jurisdictions. Relocation of utilities and service systems resulting from project implementation could also conflict with existing land use goals and policies, resulting in a significant impact. Gravel augmentation and the habitat restoration activities along the upper Sacramento River would not alter land uses and would not be expected to conflict with existing land use goals and policies. This impact would be potentially significant.

This impact would be similar to Impact LU-2 (CP-3). Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 17.3.5, "Mitigation Measures."

Lower Sacramento River and Delta and CVP/SWP Service Areas
Impact LU-3 (CP5): Disruption of Existing Land Uses Construction activities would be limited to the primary study area; therefore, there would be no disruption of existing land uses in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact LU-4 (CP5): Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions Construction activities would be limited to the primary study area; therefore, no conflicts with existing land use goals and policies would occur in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

17.3.5 Mitigation Measures

Table 17-2 presents a summary of mitigation measures for land use.

Table 17-2. Summary of Mitigation Measures for Land Use

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact LU-1: Disruption of Existing Land Uses (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	LU-1: Minimize and/or Avoid Temporary Disruptions to Local Communities.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact LU-2: Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	LU-2: Minimize and/or Avoid Conflicts with Land Use Goals and Policies.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact LU-3: Disruption of Existing Land Uses (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact LU-4: Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI

Key:
CP = Comprehensive Plan
CVP = Central Valley Project
LOS = level of significance
LTS = less than significant
NI = no impact
PS = potentially significant
SU = significant and unavoidable
SWP = State Water Project

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 LU-3 (CP1) and LU-4 (CP1). Mitigation is provided below for the impacts of CP1 on land uses in the primary study area.

Mitigation Measure LU-1 (CP1): Minimize and/or Avoid Temporary Disruptions to Local Communities To minimize and/or avoid temporary disruption to local communities, the following measures will be implemented during project construction:

- Before construction, Reclamation and its contractor will develop a construction plan for each affected community (i.e., Lakeshore, Sugarloaf), consisting of the following:

- Alternate access routes will be identified for local residences and businesses affected by project construction activities.
- Construction and staging areas will be fenced, secured, and clearly marked. Security will be provided to ensure public safety.
- Public parking areas outside of the construction staging areas will be kept clear of construction-related equipment of materials at all times.
- Any open trenches will be covered or secured after daily activities to protect worker and public safety.
- Construction activities near noise-sensitive land uses (e.g., near residences, campgrounds) or land uses that experience high levels of public activity (e.g., boat ramps, marinas) will be restricted to days and hours that minimize land use conflicts to the extent feasible.

- The contractor will provide advance notice of the construction activities schedule to the affected community members (e.g., residences, property owners, business owners, and public facilities operators), including posting of signs in the project area.
- The contractor will provide a phone number and community contact for inquiries about the project throughout the construction period.
- Reclamation and its contractor will coordinate with local jurisdictions and obtain all necessary permits (e.g., encroachment permit, utility excavation permit), will comply with permit conditions established to minimize construction impacts, and will assign an inspector to the project to oversee construction activities.

Implementation of this mitigation measure would substantially reduce land use capability impacts generated by short-term construction activities, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-1 (CP1) would be significant and unavoidable.

Mitigation Measure LU-2 (CP1): Minimize and/or Avoid Conflicts with Land Use Goals and Policies To reduce conflicts with land use goals and policies of affected jurisdictions, Reclamation will implement the following measures:

- Reclamation will coordinate with USFS to find the most suitable relocation sites for recreation facilities with respect to consistency with the STNF LRMP and the NRA Management Guide.

- Reclamation will coordinate with USFS to identify measures to minimize the impacts of the loss of use of USFS lands around Shasta Lake (including open space and Riparian Reserve allocations) caused by inundation, and measures to offset inconsistencies with the STNF LRMP and NRA goals and policies related to the loss of use of NRA lands.

- As utility and facility relocation sites are being refined, Reclamation will evaluate consistency of the relocated land uses with the STNF LRMP, the NRA Management Guide, the *Shasta County General Plan*, and the county zoning ordinance. To the degree possible, Reclamation will design the relocated utilities and facilities to comply with these plans and ordinances. If needed, Reclamation will seek permits, easements, and/or plan amendments.

Implementation of this mitigation measure would substantially reduce land use plan consistency impacts, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-2 (CP1) would be significant and unavoidable.

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

No mitigation is required for Impacts LU-3 (CP2) and LU-4 (CP2). Mitigation is provided below for the impacts of CP2 on land uses in the primary study area.

Mitigation Measure LU-1 (CP2): Minimize and/or Avoid Temporary Disruptions to Local Communities This mitigation measure is identical to Mitigation Measure LU-1 (CP1). Implementation of this mitigation measure would substantially reduce land use capability impacts generated by short-term construction activities, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-1 (CP2) would be significant and unavoidable.

Mitigation Measure LU-2 (CP2): Minimize and/or Avoid Conflicts with Land Use Goals and Policies This mitigation measure is identical to Mitigation Measure LU-2 (CP1). Implementation of this mitigation measure would substantially reduce land use plan consistency impacts, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-2 (CP2) would be significant and unavoidable.

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

No mitigation is required for Impacts LU-3 (CP3) and LU-4 (CP3). Mitigation is provided below for the impacts of CP3 on land uses in the primary study area.

Mitigation Measure LU-1 (CP3): Minimize and/or Avoid Temporary Disruptions to Local Communities This mitigation measure is identical to Mitigation Measure LU-1 (CP1). Implementation of this mitigation measure

would substantially reduce land use capability impacts generated by short-term construction activities, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-1 (CP3) would be significant and unavoidable.

Mitigation Measure LU-2 (CP3): Minimize and/or Avoid Conflicts with Land Use Goals and Policies This mitigation measure is identical to Mitigation Measure LU-2 (CP1). Implementation of this mitigation measure would substantially reduce land use plan consistency impacts, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-2 (CP3) would be significant and unavoidable.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation is required for Impacts LU-3 (CP4 and CP4A) and LU-4 (CP4 and CP4A) in the extended study area. Mitigation is provided below for the impacts of CP4 or CP4A on land uses in the primary study area.

Mitigation Measure LU-1 (CP4 and CP4A): Minimize and/or Avoid Temporary Disruptions to Local Communities This mitigation measure is identical to Mitigation Measure LU-1 (CP1). Implementation of this mitigation measure would substantially reduce land use capability impacts generated by short-term construction activities, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-1 (CP4 and CP4A) would be significant and unavoidable.

Mitigation Measure LU-2 (CP4 and CP4A): Minimize and/or Avoid Conflicts with Land Use Goals and Policies This mitigation measure is identical to Mitigation Measure LU-2 (CP1). Implementation of this mitigation measure would substantially reduce land use plan consistency impacts, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-2 (CP4 and CP4A) would be significant and unavoidable.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is required for Impacts LU-3 (CP5) and LU-4 (CP5) for the extended study area. Mitigation is provided below for the impacts of CP5 on land uses in the primary study area.

Mitigation Measure LU-1 (CP5): Minimize and/or Avoid Temporary Disruptions to Local Communities This mitigation measure is identical to Mitigation Measure LU-1 (CP1). Implementation of this mitigation measure would substantially reduce land use capability impacts generated by short-term construction activities, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-1 (CP5) would be significant and unavoidable.

Mitigation Measure LU-2 (CP5): Minimize and/or Avoid Conflicts with Land Use Goals and Policies This mitigation measure is identical to Mitigation Measure LU-2 (CP1). Implementation of this mitigation measure would substantially reduce land use plan consistency impacts, but might not reduce all impacts to a less-than-significant level. As a result, Impact LU-2 (CP5) would be significant and unavoidable.

17.3.6 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," discusses overall cumulative impacts methodology related to the action alternatives, including the relationship to the CALFED Bay-Delta Program Programmatic EIS/EIR cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," lists the present and reasonably foreseeable future projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the programs or projects listed in Table 3-1 under Quantitative Analysis would affect land use or planning in the primary study area. In addition, none of the SLWRI alternatives would affect land uses and planning in the extended study area; therefore, there would be no cumulative impacts in the extended study area. The following analysis is based on the reasonably foreseeable programs and projects listed in the Qualitative Analysis section of Table 3-1.

Current land uses have been impacted in the past by water development projects, land use development, transportation improvements, recreation development, and other construction projects that are inconsistent with land use planning documents.

The action alternatives could temporarily affect land use in the Shasta Lake and vicinity portion of the primary study area during construction, and some components might be inconsistent with the STNF LRMP, the NRA Management Guide, the *Shasta County General Plan*, and the county zoning ordinance. In addition to the projects identified by the City of Shasta Lake (Moody Flats EIR and Mountain Gate at Shasta Mixed-Use Area Plan EIR) in their comments on the DEIS, there are two present or reasonably foreseeable future actions, the Antlers Bridge replacement and the Iron Mountain Restoration Plan, located in the immediate vicinity of Shasta Lake. With respect to projects currently undergoing CEQA review, these projects are still in the planning phase and there is uncertainty as to what, if any, action alternatives may be selected; therefore, they are not considered as reasonably foreseeable. The Antlers Bridge and Iron Mountain project do have the potential to damage or disrupt utilities and public service systems infrastructure. The Antlers Bridge

replacement is currently under construction and is expected to be completed in 2015, which is before any of the action alternatives would begin. With respect to the Iron Mountain Mine Restoration Plan, it is unlikely that this activity would occur simultaneously with the action alternatives, or would considerably and adversely affect use of the same land. Therefore, construction or mitigation activities related to implementation of the proposed SLWRI alternatives would not contribute considerably to significant cumulative impacts related to temporary land use impacts. The cumulative effects of the action alternatives and the two present or reasonably foreseeable future actions on resources managed consistent with the STNF LRMP, the NRA Management Guide, the *Shasta County General Plan*, and the county zoning ordinance are addressed in the other pertinent technical chapters of the EIS.

Chapter 18
Recreation and Public Access

18.1 Affected Environment

This section describes recreational facilities and opportunities and public access in the primary and extended study areas.

18.1.1 Recreation

Shasta Lake and Vicinity

Shasta Lake is the centerpiece of the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). The Shasta Unit has a total area of approximately 123,100 acres, of which 29,500 acres are currently inundated by Shasta Lake at full pool, leaving approximately 93,600 acres of land area (USFS 2014). Figure 18-1 shows the recreation facilities in the Shasta Unit of the NRA.

Recreation Setting and Activities The USFS, headquartered in Redding, manages the Shasta Unit of the NRA to be a showcase recreational area. Environmental factors such as a hot summer season, steep terrain, and sparse forest cover in some areas favor water-oriented recreation as the main attraction. The focal point of recreation in the Shasta Unit is Shasta Lake itself, with its large surface area and approximately 420 miles of shoreline (USFS 2014). The lake has four major arms; three of the arms are more than 12 miles long at full pool, and all are a mile or more wide at their downstream ends. The main basin of the lake near the dam is about 2 miles across.

Because boating is the predominant recreation activity at Shasta Lake, the lake attracts all types and sizes of powerboats, including personal watercraft (jet skis); runabouts, ski boats, and fishing boats; and larger cabin cruisers, pontoon boats, deck boats, and houseboats (Graefe et al. 2005).

Most fishing at Shasta Lake is done by boat rather than from the shoreline. The summer stratification of the lake into an upper warm layer above a deep cold-water pool provides opportunities for anglers to catch both warm-water and cold-water fish species year-round (USFS 1996, 2014).

Because of the steep terrain around the lake, there are no suitable sites for developed beach facilities (USFS 1996, 2014), and most swimming is associated with boating. Shasta Lake is also a very popular camping destination.

The primary recreation season at Shasta Lake is the period of approximately 100 days from Memorial Day weekend to Labor Day weekend, although recreation uses occur year-round. Daytime high temperatures during the summer average in the mid to high 90s and in midwinter average in the mid-50s. Nearly all of the 30 to 70 inches of precipitation received by the lake area, mostly in the form of rain but occasionally as snowfall, occurs during late fall, winter, and spring (USFS 1996, 2014).

The Shasta Unit is bisected by Interstate 5, which provides easy access in 4 hours or less for more than five million residents of southern Oregon and Northern California (USFS 1996). The population of Shasta County was estimated to be about 181,000 in 2009 (U.S. Census Bureau 2011).

This combination of large size and plentiful water-based recreation opportunities, favorable climate, and easy access make Shasta Lake one of the most visited recreation destinations in the State of California (State) and region. The Shasta Unit of the Whiskeytown-Shasta-Trinity NRA received approximately 2.4 million recreation visitor days of use in 1994 (USFS 1996). Use levels are reduced during low-water years. Boating use levels as high as 1,400 boats have been recorded on summer weekends in recent years. Houseboats have been found to compose 30 percent to 40 percent of boat traffic on summer weekends (Graefe et al. 2005).

Recreation Facilities The boating, fishing, camping, and other recreation activities enjoyed at Shasta Lake are supported by a diverse range of public, commercial, and private facilities. Table 18-1 summarizes the major types of recreation facilities present.

Recreational boating on Shasta Lake is dependent on access to the water via shoreline facilities such as boat ramps and marinas. Six USFS public boat ramps are dispersed around the lake (USFS 2010a). Total parking capacity at the six ramps is about 600 vehicles (USFS 2007). The three largest ramps also offer accessible boat loading platforms for use by disabled persons (USFS 2010a).

Several of the public boat ramps close when lake levels are drawn down more than 50 feet, while others are moved to different locations or have low-level ramps available. There are two public boat ramps that are available when lake levels are drawn down between 160 feet and 210 feet (USFS 2010a). Parking is on the lake bed, and vault toilets are provided when these ramp are in use.

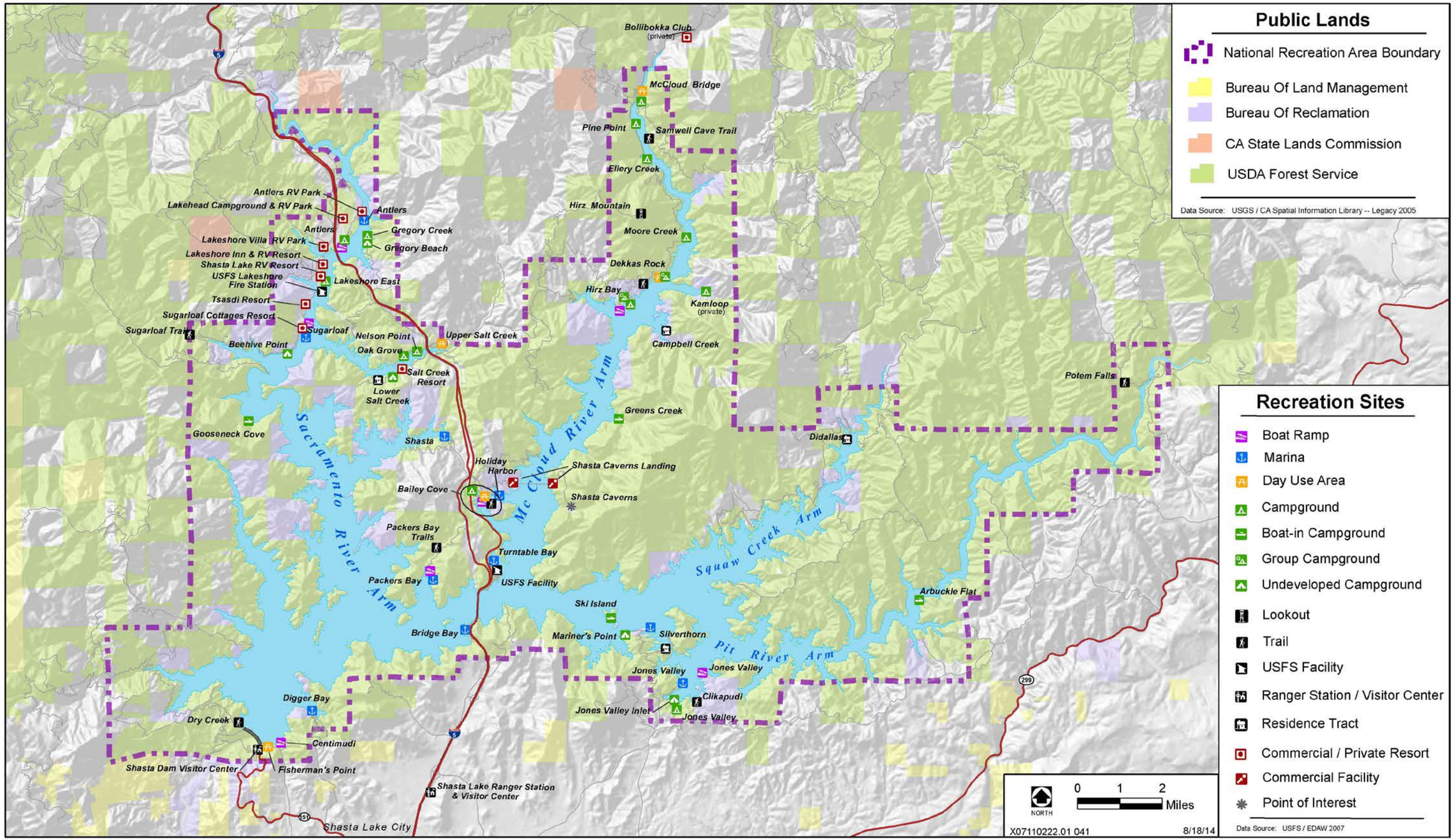

Figure 18-1. Recreation Facilities in the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area

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Table 18-1. Summary of Public, Commercial, and Private Recreation Facilities on Shasta Lake

Type of Facility	Number	Description
Public Facilities		
Boat ramp	6	Each provides parking, restrooms, and two to four paved launch lanes at full pool; some have low level boat ramps with parking on the lake bed when the lake levels are drawn down.
Day-use area	4	Each provides parking, picnic sites with tables and grills, and restrooms.
Family or group campground	15	Twelve family campgrounds with eight to 59 sites per campground; all have flush and/or vault toilets, most have piped water. Three group campgrounds have water and vault toilets.
Shoreline camping area	5	No designated campsites; all are provided with vault toilets, some with piped water.
Boat access campground	4	Eight to 23 sites per campground, accessible only by boat; vault toilets are provided.
Trail/trailhead	12	Twelve trails from one-third mile to 8 miles in length; several trailheads are incorporated into boat ramp or day-use parking areas, while others are stand-alone facilities.
Commercial Facilities		
Marina/marina resort	9	Wide range of sizes and services; most provide boat rentals, gas, groceries, etc.; some provide moorage, and campsites and/or cabins.
Nonmarina resort/ RV park	7	Most provide cabins and/or RV and tent sites, moorage, and groceries/sundries. (Note: Five of these have shoreline infrastructure other than floating docks, two do not; additional resorts are nearby but not on the lake shoreline.)
Organization campground	1	Operated for members and the general public by California Kamloops, Inc.; tent camping, accessible only by boat, and boat dock/moorage provided for campers.
Other commercial facility	2	Shasta Lake Cavern tour; provides ferry and bus transport to caverns, moorage for private boats, and a gift shop.
		Bollibokka Club; offers lodging, meals, and guided trout fishing trips on the McCloud River upstream from the lake. (Note: This facility is not within the Whiskeytown-Shasta-Trinity National Recreation Area, but is accessed via a USFS road.)
Private Facilities		
Recreation Residences	~160	Located in four tracts, managed by USFS for individual recreation use with restrictions on improvements.

Source: USFS 1996

Key:
RV = recreational vehicle
USFS = U.S. Department of Agriculture, Forest Service

Nine commercial marinas and marina resorts, all of which operate under USFS special-use permits, are distributed around Shasta Lake. All of the marinas offer houseboats for rent, providing a combined rental fleet of several hundred

houseboats. Some marinas also rent other types of powerboats, personal watercraft, and nonpowered boats. The other primary service offered by most of the marinas is short- and long-term moorage for private boats. In addition to the rental fleets, several hundred private houseboats are moored at these marinas, along with many other powerboats. Additional commercial services are offered at most marinas/marina resorts, such as boat launching, gas sales, stores, and restaurants. Some have tent and recreational vehicle (RV) campsites and cabin or motel accommodations (ShastaLake.com 2011).

Sixteen nonmarina resorts and RV parks are located on or near Shasta Lake. These typically provide some combination of tent and/or RV campsites and cabins with other ancillary amenities such as stores, game rooms, restaurants, and swimming pools (ShastaLake.com 2011). Some of the resorts have special-use permits from USFS for use of a segment of shoreline land and/or installation of a boat dock. Other resorts are situated a short distance from the shoreline but do not provide direct access to the lake.

Thirteen USFS-constructed and concessionaire-operated and maintained family and group campgrounds are located on the lake. These range in size from 8 to 59 sites and generally provide flush and/or vault restrooms and drinking water. Several of the campgrounds are adjacent to a public boat ramp or are served by a nearby ramp. Also available to campers are five shoreline camping areas with vault toilets but no designated sites; boaters may use one of four boat-access campgrounds ranging in size from 8 to 23 sites, each with fire rings, picnic tables, and vault toilets (USFS 2010b). Four USFS day-use sites with views of the lake provide five to nine picnic sites each, along with restrooms and drinking water (USFS 2011). An additional day-use and swim area is at the upstream end of the Salt Creek inlet, but is not currently operational.

Twelve USFS hiking and mountain biking trails, totaling about 25 miles in length, are located on or near the shoreline of Shasta Lake. Several of these trails are accessed via trailheads located at boat ramp and day-use parking areas, while others are served by stand-alone trailheads (USFS 2010c).

A unique commercial recreation service offered at Shasta Lake is the Shasta Caverns Tour. The tour operator uses a parking area, gift shop, and ferry boarding facility on the west shore of the McCloud Arm, and a similar staging area on the opposite shore, where visitors board buses for the short drive to the caverns.

Four USFS-managed “recreation residence” tracts are located on Shasta Lake, with numerous private cabins near the shoreline. USFS policy is to manage these facilities for the individual recreation use of the cabin owners and to keep the areas in a primarily natural state (USFS 1996, 2014).

Reservoir Operations and Effects on Recreation Reclamation manages Shasta Lake primarily to provide water supply, which results in an annual cycle

of major water level fluctuations at the lake. Such fluctuations affect access to water-based recreation facilities and services. In the typical annual cycle, the reservoir will reach its highest elevation for the year during late spring, then will be gradually drawn down through the summer peak recreation season and into fall. Refilling begins with the arrival of substantial winter rains in the watershed and continues through spring with additional rain and snowmelt. The highest annual reservoir pool level usually occurs between mid-April and mid-May. As the reservoir is drawn down during summer and fall, the lowest elevations are typically reached in November or December (DWR 2011a).

Boating facilities on the lake are generally designed to accommodate these expected and normal fluctuations in reservoir pool levels. All but one of the six primary public boat ramps extend to at least 75 feet below full pool; four extend from 95 feet to more than 200 feet below full pool (USFS 2010a).

Certain boating safety issues are related to pool level fluctuations. Reservoir drawdown places rocks, shoals, and islands just below the water surface where they may be struck by boats. Conversely, rising water levels may put obstacles that were easily seen and avoided one day just beneath the surface the next. Because the lake level varies considerably on a seasonal basis, the pattern of submerged obstacles varies as well.

Rising water levels may also increase the amount of floating debris in the lake, primarily woody debris that may include large tree limbs and logs. The larger debris can present a hazard to boating; even smaller debris can damage props or clog water intake ports in boat-engine cooling systems.

Campers are affected to some degree by falling pool levels because the distance from the campsites to the shoreline increases as the pool level decreases. The sites nearest the shoreline at most public campgrounds will be within a few hundred feet of the water through most summers when the pool level is generally high, but they may be considerably farther from the water during the off-peak seasons or during the latter portion of the peak season in dry years. Because the shoreline terrain is steep in most areas, the drawdown zone is difficult for visitors to use. Drawdown of the reservoir also has aesthetic effects for lake users, with an expanding band of mostly bare earth and rock exposed as the pool level declines.

Upper Sacramento River (Shasta Dam to Red Bluff)

The Sacramento River corridor is an important recreation resource for the northern California region. Access and facilities are found on both public and private land. This section describes existing recreation and public access resources in the primary study area, beginning at and including the downstream side of Shasta Dam and extending to Red Bluff Pumping Plant that could be affected by the project. Figure 18-2 shows the recreation facilities in the upper Sacramento River portion of the primary study area.

Shasta Dam Reclamation controls public access at Shasta Dam. For several years, access was available only by permit for security reasons; since 2010, visitors have been allowed to drive across the dam between 6 a.m. and 10 p.m. after producing a valid driver's license and vehicle registration and subjecting their vehicle and any trailer to inspection (Reclamation 2010).

The area immediately below the dam, where the Shasta Powerplant and associated infrastructure is located and where water is released from Shasta Dam and the powerplant, is closed to public use for safety and security reasons.

Shasta Dam to Keswick Dam Recreation facilities provided along this portion of the Sacramento River include the Chappie-Shasta Off-Highway Vehicle (OHV) Area, Sacramento River Rail Trail and other trails, Shasta Campground, and Keswick Reservoir Boat Ramp.

Keswick Reservoir occupies nearly the full length of the narrow river gorge that stretches 9 miles from Shasta Dam to Keswick Dam. The reservoir has a healthy population of wild trout, including German browns and rainbows, and fish are occasionally planted by CDFW.

The Chappie-Shasta OHV Area, managed by the U.S. Department of the Interior, Bureau of Land Management (BLM), Redding Field Office, provides opportunities for OHV use on 200 miles of roads throughout 52,000 acres of land. Two staging areas provide access to OHV roads and trails that are rated difficult and moderate. Those roads and trails are open to two-wheeled motorcycles, all-terrain vehicles, and four-wheel-drive high-clearance vehicles (BLM 2006). The Shasta staging area and campground are situated close to the river about 1 mile below Shasta Dam. The campground has 30 campsites for tents and RVs. No water or electricity hook-ups are available (USFS 2010b).

The Sacramento River Rail Trail, a nonmotorized-use National Recreation Trail, extends more than 10 miles along an old railroad line and closely follows the west side of the river and of the shoreline of Keswick Reservoir. The wide and generally flat gravel-surface trail is open year-round to equestrians, hikers, and bicyclists. Trailheads are located at the Chappie-Shasta OHV Area, at Keswick Boat Ramp and Rock Creek, at the southern terminus of the trail, and at a location near the midpoint of the trail. The BLM lands above the east side of Keswick Reservoir have more than 20 miles of trails, primarily single-track nonmotorized trails with a dirt surface, connecting at the north end to Shasta Dam (Healthy Shasta 2009).

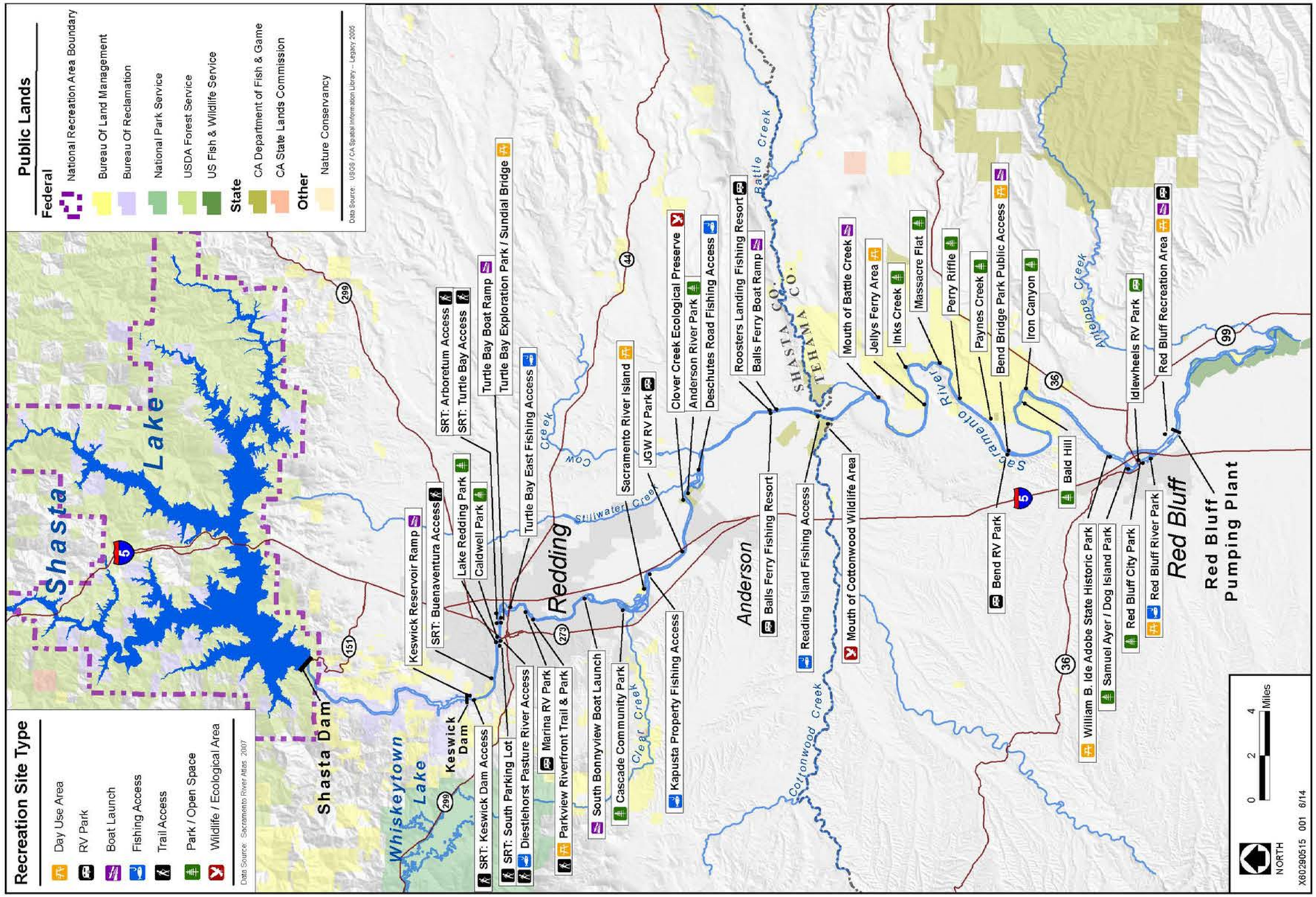

Figure 18-2. Recreation Facilities in the Upper Sacramento River Portion of the Primary Study Area

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Keswick Dam to the Red Bluff Pumping Plant This area encompasses about 60 miles of the Sacramento River and contains the majority of recreation resources and public access sites within the primary study area. Recreational activities are numerous within this area and include fishing, boating, hiking, horseback riding, biking, hunting, camping, picnicking, wildlife viewing/nature observation, viewing historic sites, and enjoying developed urban recreational activities such as soccer and baseball. The discussion below provides a brief overview of the activities supported by the Sacramento River and riverside recreation facilities, followed by additional details about recreation facilities.

Recreational Setting and Activities Between Keswick Dam and the Red Bluff Pumping Plant, the Sacramento River flows past cities and towns and both private and public lands. The riparian forests along the river, the oak woodlands and grasslands on higher ground, and riverside bluffs provide a scenic setting for river users at riverside recreation facilities and for boaters and anglers on the river. The riparian landscape between Redding and Red Bluff is described as the most unspoiled of the entire 375-mile river (DBW 2011a). BLM owns and manages much of the riverside lands between Balls Ferry and Red Bluff (approximately River Mile (RM) 250 to RM 276).

The climate of the northern Sacramento Valley is hot and dry during the summer, with daily high temperatures averaging in the upper 90s Fahrenheit and little or no precipitation. Winter climate can be described as moderate but wet, with average daily high temperatures in the mid-50s during December and January and an average of 4-8 inches of rain per month between November and March.

River use and recreation opportunities available vary throughout the year with the highly variable flow of the river. During the winter and spring, the river may have short-term peak flows of 80,000 to 90,000 cubic feet per second (cfs) and is usually flowing above 20,000 to 30,000 cfs. Flows are less variable during the summer and fall, with typical summer flows of 10,000 to 15,000 cfs and typical fall flows of 5,000 to 10,000 cfs (DWR 2011b). BLM identifies flows of 6,000 to 12,000 cfs as optimal for boating (BLM no date). River temperature is cold year-round because of the release of water from the deep cold-water layers of Keswick Reservoir, and Shasta Lake upstream. Winter water temperatures are in the 40s Fahrenheit and summer water temperatures do not rise above the mid-50s.

The Sacramento River is known for good fishing opportunities. Species such as salmon, steelhead, rainbow trout, sunfish, largemouth bass, and striped bass can be found within the river. Fly fishing is popular, especially when flows are 5,000 to 8,000 cfs, which typically occurs during fall and early winter (Fly Fishing Connection 2003).

Boating opportunities are abundant along the Sacramento River from Keswick Dam to the Red Bluff Pumping Plant. Eight sites along the river provide public boat ramps and two additional sites permit car-top launch and retrieval.

Although the Sacramento River is not generally considered a whitewater river, there are two easy whitewater runs on this section of the river. The first is from Keswick Dam to the Anderson-Cottonwood Irrigation District Diversion Dam in Redding. The second run is from Anderson River Park to William B. Ide Adobe State Historic Park. This run is 22 miles long and rated Class I to Class II. The Class II China Rapid is a few miles upstream from Red Bluff (Tuthill 2005).

Opportunities for trail activities such as walking, jogging, bicycling, and horseback riding are available throughout this stretch of the river. There are 21 sites with trails or access to trails. The most notable trails along this section of river are the Sacramento River Trail and the trails that connect BLM lands below Balls Ferry.

Hunting opportunities are located primarily on BLM land along the Sacramento River. The main hunting areas along the river are Inks Creek, Massacre Flat, Perry Riffle, Paynes Creek, Bald Hill, and Iron Canyon. Hunting is permitted on BLM land unless posted as closed (e.g., along hiking trails and at developed recreation areas). Game species found on BLM lands include quail, dove, waterfowl, deer, pig, bear, and turkey (BLM 1992).

Opportunities for developed camping along or near the river are located mainly at privately operated RV parks and fishing resorts, and are also provided at the public Red Bluff Recreation Area. Most camping opportunities are for RVs, but a few tent and group camping sites are available. Primitive camping is available at five sites within the BLM Sacramento River Area, between about Battle Creek and Payne's Creek, about 10 miles upstream from the Red Bluff Pumping Plant. River visitors may also camp on undeveloped BLM land in the area. The mouth of Inks Creek and 0.75 mile above and below the mouth is closed to camping (BLM 1992).

The Sacramento River corridor provides a beautiful setting for picnickers. A total of 21 sites along this river reach provide picnicking facilities; these sites include municipal parks, RV parks and fishing resorts (private facilities), William B. Ide Adobe State Historic Park, boat ramps, and fishing access sites. Generally, facilities include picnic tables, shade structures (or trees), and barbeque pits.

Another recreation opportunity available along the Sacramento River is viewing historic sites. Historic sites or historical markers exist at a handful of locations.

The Sacramento River meanders through the small cities of Redding, Anderson, and Red Bluff. The municipal parks along this section of the river provide developed urban recreation opportunities such as horseshoes, soccer, and baseball, as well as playgrounds and a swimming pool.

Recreational Facilities More than 40 recreation/public access sites are available along the Sacramento River between Keswick Dam and the Red Bluff Pumping Plant. For this analysis, these sites have been categorized by primary use as

municipal parks, fishing access/day-use areas, boat launches, trail accesses, RV parks, wildlife areas, and undeveloped open space areas. Table 18-2 describes these facilities by type.

Table 18-2. Summary of Recreation Sites along the Sacramento River Between Keswick Dam and the Red Bluff Pumping Plant

Type of Facility	Number	Description
Public Facilities		
Municipal park	6	Managed by the Cities of Redding, Anderson, and Red Bluff. All sites provide parking and picnic sites. Most have restrooms and trails. Several also have boat ramps and two sites have hand launching. Other amenities include horseshoe pits, sports fields, swimming pools, playgrounds, a skateboard park, a fish viewing area, and a bike riding area.
Boat launch	7	Managed by the City of Redding, Shasta County, Tehama County, the State Lands Commission, and the City of Red Bluff. All provide parking and most provide restrooms. One site is a Point of Historical Interest and one site provides raft rentals.
Trail access	6	Managed by Reclamation and the City of Redding. Primarily provide access to Sacramento River Trail. All provide parking, two provide picnic sites, and one provides restrooms. One site has a historical marker and one has a historic powerhouse.
Fishing access/ day-use area	7	Managed by the City of Redding, BLM, and Shasta County. Most provide parking and access to trails. Other amenities include ponds, boat ramps, day-use facilities, group camping, and a community garden.
Wildlife area/ ecological reserve	2	Both managed by CDFW. Mouth of Cottonwood Creek Wildlife Area has parking facilities. Clover Creek Ecological Preserve has no facilities.
Open space area	6	All are managed by BLM. Most have trails, three have parking, and two have restrooms. Other amenities include hand launching, picnic sites, walk-in camping, fishing pond, and beaches. Three are trail or boat access only.
Other public park	2	Red Bluff Recreation Area, administered by USFS, provides river access, day-use, and camping facilities; also includes the Sacramento River Discovery Center. William B. Ide Adobe State Historic Park is a small State Parks unit focused on a historic adobe and related structures.
Subtotal	*35*	
Private/Commercial Facilities		
Educational/nature Park	1	Turtle Bay Exploration Park; includes a museum, butterfly house, live animals, and parking, with access to a scenic pedestrian bridge over the river and the Sacramento River Trail.
RV park	7	The largest facility provides 174 RV sites, four other facilities provide from 44 to 85 RV sites; two “fishing resorts” provide 12 and 20 RV sites. Most provide a boat ramp and showers; other amenities include tent sites, restaurants, swimming pools, a store, a bar, and a group campground.
Subtotal	*8*	
Total – All Facilities	**43**	

Key:
BLM = U.S. Department of the Interior, Bureau of Land Management
CDFW = California Department of Fish and Wildlife
Reclamation = U.S. Department of the Interior, Bureau of Reclamation
RV = recreational vehicle
State Parks = California Department of Parks and Recreation
USFS = U.S. Department of Agriculture, Forest Service

Municipal Parks Municipal parks in this river section consist of Lake Redding Park, Caldwell Park, and Cascade Community Park (City of Redding); Anderson

River Park (City of Anderson); and Samuel Ayer/Dog Island Park and Red Bluff City Park (City of Red Bluff) (CSUC 2006, City of Redding 2004, City of Anderson 2007). Most of the municipal parks provide facilities such as trails or trail access, restrooms, playgrounds, ball fields, swimming pools, horseshoe pits, and picnic sites. Lake Redding Park (Lake Redding is created by the Anderson-Cottonwood Irrigation District Diversion Dam) provides boating facilities, trails, picnic facilities, horseshoe pits, and restrooms. Anderson River Park provides a similar range of amenities, including a boat ramp.

Fishing Access and Day-Use Sites There are four public fishing accesses in this reach of the Sacramento River: the Turtle Bay East, Kapusta Property, Deschutes Road, and Reading Island fishing accesses. All of the fishing accesses provide parking and most provide trails as well. The sites are managed by the City of Redding, Shasta County, and BLM (CSUC 2006). Reading Island provides a cement boat ramp along a slough leading to the river, but sedimentation and dense aquatic vegetation limit use to small car-top boats. Primitive group camping is also available at Reading Island, under a special-use permit issued by BLM (BLM no date).

Three day-use sites are available on this stretch of the Sacramento River. These sites may provide both fishing and trail access, like that found at Diestlehorst Pasture River Access, managed by the City of Redding. Two BLM-managed day-use sites, Jellys Ferry and Sacramento River Island, are also available (CSUC 2006).

Boat Launch Facilities There are seven sites on this river reach that are primarily for boat launching: Turtle Bay Boat Ramp, Caldwell Park Boat Ramp, and South Bonnyview Boat Launch, operated by the City of Redding; Balls Ferry Boat Ramp, operated by Shasta County; Mouth of Battle Creek Boat Launch, owned by the State Lands Commission; Bend Bridge Park Public Access, operated by Tehama County; and Red Bluff River Park, operated by the City of Red Bluff.

Trails and Trail Access Facilities The Sacramento River Trail is a 13-mile paved urban trail system along the riparian corridor on both sides of the river from Keswick Dam to Turtle Bay Park in Redding. Two pedestrian bridges cross the river to create a loop of about 5 miles. At least six sites provide primary access to the trail and a few other sites provide connections to the trail (Healthy Shasta 2008).

Unlike the boating and day-use facilities that occur throughout this river reach, the trail access sites are primarily on the portion of the river that flows through Redding. Six specific Sacramento River Trail access sites and five other sites, all provided by the City of Redding, also provide access to the Sacramento River Trail.

RV Parks There are seven privately operated RV parks along this reach: one in Redding (Marina RV Park), three in the Anderson area (JGW RV Park, Balls

Ferry Fishing Resort, and Roosters Landing Fishing Resort), one near the community of Bend (Bend RV Park), and two in Red Bluff (Idlewheels RV Park and Durango RV Resort). The two largest parks offer 85 and 174 RV sites. Two of the parks also offer tent camping, and two parks offer group camping. All of the RV parks offer picnic facilities and most offer showers. Three of the parks offer boat launches. Two of the parks offer a restaurant and one offers a bar, swimming pool, and store. The largest park, a new facility in Red Bluff, offers a lap pool and spa, a lodge, two clubhouses for meetings, and 45 acres of surrounding land with walking trails (CSUC 2006).

Wildlife Areas There is one CDFW-owned and managed area along this river reach, the Mouth of Cottonwood Creek Wildlife Area. A parking area is the only improvement at the site. The area is excellent habitat for Swainson's hawk, bald eagle, ringtail, and river otter and provides good wildlife viewing, birding, and photography opportunities (CDFG 2011).

Undeveloped Public Lands There are six areas between Inks Creek and Iron Canyon that, for this analysis, are considered undeveloped open space areas: Inks Creek, Massacre Flat, Perry Riffle, Paynes Creek, Bald Hill, and Iron Canyon. All six areas are managed by the BLM Redding Field Office. Other than parking areas, few facilities are available at most of these areas; they are mainly large open areas available for general public use and enjoyment (CSUC 2006).

Other Public and Private Parks Turtle Bay Exploration Park in Redding is a privately operated facility that contains a museum, butterfly house, forest camp replica, arboretum, and gardens. The park provides access to the scenic Sundial pedestrian bridge over the river, and access to the Sacramento River Trail (Turtle Bay Exploration Park 2011). The 3-acre William B. Ide Adobe State Historic Park in Red Bluff focuses on several historical elements and provides parking, trails, picnic facilities, and restrooms (State Parks 1990).

Lower Sacramento River and Delta

Recreation opportunities on the Sacramento River downstream from Red Bluff Pumping Plant include hunting, fishing, boating, RV/tent/group camping, birding, wildlife viewing, picnicking, hiking, and sports activities (softball, soccer, tennis, basketball, and horseshoes). The 100-mile stretch of river down to Colusa includes many parcels of public conservation and recreation lands, as well as a few privately owned commercial recreation sites. There are two primary landowners on the river: the USFWS, with more than two dozen units of the Sacramento River National Wildlife Refuge totaling more than 10,300 acres (many of which are closed to the public) (USFWS 2005); and CDFW, with more than 15 units of the Sacramento River Wildlife Area totaling more than 3,700 acres (most open to the public but accessible only by boat) (CDFG 2004). The California Department of Parks and Recreation (State Parks) operates three park units (one State park and two State recreation areas) on the river between Red Bluff and Colusa–one each near Corning (RM 218), Hamilton City (RM 193 to

RM 200), and Colusa (RM 145) (CSUC 2006). An additional State recreation area is located on the Sacramento River in the Delta.

Recreation facilities are located primarily between Red Bluff and the Bidwell-Sacramento River State Park near Hamilton City, about 50 river miles downstream, because of the availability of the State park facilities and privately owned RV parks and resorts. Downstream from Bidwell-Sacramento River State Park, the variety and density of facilities are reduced. Facilities vary from boat ramps and marinas to campgrounds, picnic sites, and trails (CSUC 2006). Beyond the Red Bluff Pumping Plant, recreation and public access would not likely be affected with implementation of the project; therefore, an in-depth review of recreation activities and facilities south of the Red Bluff Pumping Plant is not presented in this analysis.

CVP/SWP Service Areas

CVP and SWP facilities and service areas are widespread throughout much of California. Facilities include multiple dams, reservoirs, and canals that provide substantial water-based recreational activities. Releases from dams on major tributaries to the Sacramento River provide numerous recreational opportunities, especially boating and fishing. Reservoirs such as Folsom, Oroville, and New Melones provide boating, fishing, camping, and other recreational activities.

18.2 Regulatory Framework

18.2.1 Federal

U.S. Forest Service

Shasta Lake and the surrounding Federal lands compose the Shasta Unit of the Whiskeytown-Shasta-Trinity NRA, established by Congress in November 1965 to provide for public outdoor recreation use and enjoyment, among other purposes. Both the Shasta and Trinity units of the NRA are within the Shasta-Trinity National Forest (STNF) and are administered by USFS. The act establishing the NRA specified that it was to be administered in a manner coordinated with other purposes of the CVP. Reclamation retained management of lands and waters needed for operating the CVP, and controls operation of Shasta Dam and reservoir pool levels. The lake surface and surrounding lands are administered by USFS (an exception is the area in the immediate vicinity of the dam, which is administered by Reclamation).

USFS manages recreation within the Shasta Unit under the authority of the 1987 Master Interagency Agreement between Reclamation and USFS. Administration of the Shasta Unit of the NRA is coordinated with the administration and purposes of the CVP through a memorandum of agreement between Reclamation and USFS established December 31, 1986. The management of Shasta Lake is guided by the 1995 *Shasta-Trinity National Forest Land and Resource*

Management Plan (STNF LRMP) and the *Management Guide: Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity NRA* (USFS 2014).

Shasta-Trinity National Forest Land and Resource Management Plan (1995) The STNF LRMP (USFS 1995a) guides management of both the Shasta and Trinity national forests with the goals of integrating a mixture of management activities that protect forest resources and allow use, fulfill guiding legislation, and address local, regional, and national issues. The project is located within two management units–the Shasta Unit of the Whiskeytown-Shasta-Trinity NRA, which includes Shasta Lake and surrounding lands, and the Front Unit, which includes USFS lands south of the lake. As stated in the STNF LRMP, the Shasta Unit is managed according to the current NRA Management Guide. The portion of the Front Unit located within the primary study area (south of the lake) is managed under Matrix Prescription III, Roaded Recreation. This prescription "emphasizes recreational opportunities associated with developed road systems and dispersed and developed campsites" (USFS 1995a). The STNF LRMP states that this prescription is also the primary prescription for the Shasta Unit of the NRA. The plan provides relevant recreation-related standards and guidelines to ensure road, trail, and facility development and management activities consistent with a Roaded Natural setting.

Shasta-Trinity National Recreation Area Management Guide (2014) The *Shasta-Trinity National Recreation Area Management Guide* (USFS 2014) integrates management of the NRA with and implements the direction in the STNF LRMP. The guide addresses key management concerns related to recreation and other resource management, such as the types and amounts of commercial and USFS recreation facilities to be provided. Desired future conditions for Shasta Lake are described, and management recommendations aimed at implementing the STNF LRMP and achieving desired future conditions are detailed for both lake and land-based recreation and for commercial recreation operations within the NRA.

Mendocino National Forest Land and Resource Management Plan (1995) The *Mendocino National Forest Land and Resource Management Plan* (Mendocino National Forest LRMP) (USFS 1995b) guides management of the Mendocino National Forest with the goals of integrating a mixture of management activities that protect forest resources and allow use, fulfill guiding legislation, and address local, regional, and national issues. Management Area #38, Red Bluff Recreation Area, is at the extreme downstream end of the primary study area. (The Red Bluff Recreation Area was transferred from Reclamation ownership in the late 1980s and is isolated from the rest of the National Forest; all other lands are well to the west of the study area.)

The Mendocino National Forest LRMP states that management and development should conform to the record of decision for the Final EIS for the Red Bluff Recreational Development. Relevant recreation-related major aspects of this decision include a management direction emphasizing supplying quality water-

oriented recreation experiences for the public, maintaining a safe setting for recreational users, and providing educational and interpretive opportunities. The management area is also managed under the Recreation Area prescription, which "provides direction for maintaining attractive landscapes and recreation quality around major lakes and within other areas of concentrated recreation use" (USFS 1995b). The area is to be managed to maintain a Recreation Opportunity Spectrum (ROS) class of "Roaded Natural."

U.S. Bureau of Land Management

Overview BLM administers most of the public lands along the Sacramento River between Shasta Dam and Keswick Dam, and additional lands between Keswick Dam and the City of Redding, as part of the 23,000-acre Interlakes Special Recreation Management Area. BLM administers the Chappie-Shasta OHV Area, which encompasses 52,000 acres and 250 miles of roads and trails between the Sacramento River and Clear Creek. BLM also administers more than 17,000 acres of public lands on both sides of the river within the Sacramento River Management Area, which extends from just downstream from Redding downstream to the Tehama County/Glenn County boundary, about 25 miles south of Red Bluff. Most of the BLM lands are concentrated above Red Bluff, between Jellys Ferry and Iron Canyon. A few hundred additional acres of BLM lands are at two island parcels downstream from Red Bluff.

Proposed Redding Resource Management Plan and Final EIS (1992) The proposed resource management plan (RMP) and Final EIS (BLM 1992) for the Redding Resource Area (BLM 1992) identifies proposed management direction for BLM-administered public lands within the Redding Resource Area, totaling approximately 250,000 acres of land in north-central California. The RMP focuses on resolving four main issues: land tenure adjustment, recreation management, access, and forest management. BLM selected a preferred alternative for each of the seven management areas; collectively these preferred alternatives compose the proposed action of the RMP. The project is located within the Shasta and Sacramento River management areas. The Shasta Management Area includes the lands southwest of Shasta Lake within the Interlakes Special Recreation Management Area. General recreation management direction for the entire Redding Resource Area is also provided within the RMP and focuses on ROS designations and guidelines, camping limits, OHV designations, and wild and scenic rivers.

Recreation-related management direction for the Interlakes Special Recreation Management Area includes objectives to provide a regional opportunity for motorized recreation with a focus within the Gene Chappie-Shasta OHV Area and to enhance nonmotorized recreation opportunities within the area via a greenway connecting Redding to Shasta Dam along the Sacramento River. Motorized vehicle use is limited to designated roads and trails that may be closed between November 15 and April 15 to protect the wintering deer herd. The area is managed as Semi-Primitive, Non-Motorized, Semi-Urban, Semi-Primitive Motorized, and Roaded Natural (ROS classes).

The Sacramento River Management Area includes the Sacramento Island area, between Redding and Anderson, a large block of contiguous parcels along the river between Balls Ferry (RM 276) and Iron Canyon (RM 250), and two islands downstream from Red Bluff. Recreation-related management direction for these areas includes management within the Semi-Primitive Motorized ROS class, closure to motorized vehicles, and an emphasis on boat-in access and use. Because of the special value of the Valley oak riparian forest at Sacramento Island, the area has been designated as a Research Natural Area/Area of Critical Environmental Concern, with special management plans to protect and improve the plant communities and habitat there.

The 25 miles of the Sacramento River between Balls Ferry and Iron Canyon have been determined to be eligible for inclusion in the National Wild and Scenic Rivers System, with recreational, scenic, and wild classifications for various segments. All public lands within one-quarter mile of normal high water will be managed to protect the outstandingly remarkable values and free-flowing character that led to their determination of eligibility.

18.2.2 State

California Department of Fish and Wildlife

CDFW manages the ecological reserve and the wildlife areas within the study area under Title 14 of the California Code of Regulations and the California Fish and Game Code. The regulations provide for various types of public uses in the wildlife areas. However, fish and wildlife protection and enhancement are the primary management purposes of the wildlife areas; recreation and public use is secondary to habitat preservation. Ecological reserves are established to provide rare, threatened, or endangered plants and wildlife and special habitat types; public entry may be restricted to protect wildlife or habitat.

The CDFW-administered wildlife areas on the Sacramento River within the primary and extended study areas are designated by the California Fish and Game Code as “Type C” areas, which generally have no or minimal developed facilities. A “Type C” area designation does not require hunters to have a permit or pass (other than a valid California hunting license and any required stamps) for most areas. General “Type C” area regulations apply to all of the wildlife areas within the study area; special regulations for each area prohibit camping and establish other restrictions on hunting and other uses (see Title 14 of the California Code of Regulations).

CDFW interacts with other management agencies in the study area to ensure that hunting and fishing regulations are enforced on public and private lands and maintains authority over all activities that have the potential to affect wildlife or wildlife habitat. CDFW administers the waterfowl hunting program on a number of Federal wildlife refuges, including the Sacramento River National Wildlife Refuge.

California Department of Parks and Recreation

The California Department of Parks and Recreation (State Parks) manages the State park and recreation areas within the study area under Title 14 of the California Code of Regulations and the California Public Resources Code. Specific management direction and guidance is provided by general plans for individual parks. A preliminary draft general plan was completed for the Bidwell-Sacramento River State Recreation Area in 2003 (a final plan was approved by the California Park and Recreation Commission in 2006 but has not been published). The plan provides specific goals and guidelines for a range of issues related to environmental resources, visitor use and opportunities, and park administration and operations. Additional direction for facility development at each of the park's four subunits is also provided. The management recommendations in the 1990 general plan for William B. Ide Adobe State Historic Park focus on protecting the historic integrity that is the primary value of the 3-acre site, and on protecting the riparian forest in the riverbank area (State Parks 1990). No current park management plans were available for the two other small State Parks units on the river.

18.2.3 Regional and Local

Shasta County

The Open Space and Recreation Element of the *Shasta County General Plan* (Shasta County 2004) is intended to preserve open space for the economy, enjoyment of scenic beauty, recreation, and use of natural resources. The Open Space and Recreation Element addresses recreation as it relates to the tourist industry and recreation at the countywide level. Recreation is considered the active use of open space land. "Recreational areas are essentially open space lands which are designed to accommodate recreational activities such as hiking, picnicking, or camping" (Shasta County 2004). Several sites that fall under the recreation analysis herein are included under Shasta County's Open Space Inventory: the STNF, BLM holdings, Balls Ferry Fishing Access, Anderson River Park and Fishing Access, Lake Redding-Caldwell Memorial Park, Turtle Bay Regional Park, Turtle Bay East, privately owned and operated recreational facilities such as resorts and RV parks, and historic landmarks and points of interest (Shasta County 2004).

The Open Space and Recreation Element describes goals and objectives for protection of open space and recreation resources including the following (Shasta County 2004):

- Protection of open space through certain land-use classifications
- Coordination of parks and recreation systems planning, acquisition, development, and operation among Federal, State, county, and city governments

- Using the National Resource Protection-Recreation Resources land use designation to protect the quality of recreation resource values of national parks and recreation areas, wilderness areas, and State parks

- Permitting commercial recreation uses

- Requirement of public access and easements provided by the Subdivision Map Act along the Sacramento River (Keswick Dam to the county line) and Battle Creek (downstream from Coleman Powerhouse)

- Provision of public access and easements for recreation if riparian habitat is not significantly affected, public access is not available within a reasonable distance, or the corridor is located near urban, town, and rural community centers

The Public Facilities Element contains a discussion of recreation at the community level. The element states that the "community recreation needs of Shasta County residents and the degree to which these needs are met by County government vary with the type of community in which they live" (Shasta County 2004). Recreation needs in urban areas are primarily for publicly owned parklands. The element identifies that "recreation officials in the unincorporated urban areas of the County indicate that a substantial portion of the recreation needs of the residents of these communities is not being met" (Shasta County 2004).

An increase in recreational demand is expected as a result of the growth of urban areas over the 20-year planning period. County policy "will rely upon interagency planning efforts and providing long-term protection of resource and open space lands and features that exhibit future recreation potential" (Shasta County 2004).

The objective in the Public Facilities Element related to recreation describes developing a land use pattern that adequately serves for community recreation. The policy that supports this objective relates to designation of the locations of existing and proposed large-scale community recreation facilities as Natural Resources Protection Parklands (Shasta County 2004).

Tehama County

The Open Space and Conservation Element of the *Tehama County General Plan Update 2009 – 2029* (March 2009) (Tehama County 2009) addresses several resource areas, including Natural Resource Land and Recreation. The element includes a brief description of national forests located within the county, Lassen Volcanic National Park, BLM lands, State parks, Black Butte Lake (USACE), and county parks. The element states one overarching Natural Resource Land and Recreation goal (Goal OS-9): "To protect and enhance resource lands in the County for the continued benefit of agriculture, timber, grazing, recreation, wildlife habitat, and quality of life" (Tehama County 2009). Supporting policies aim to do all of the following:

- Protect and enhance resource lands
- Protect reasonable access to resource lands and not unreasonably deprive users of enjoyment of previously accessible areas through closure
- Coordinate natural resource practices and recreation plans of different jurisdictions and assure cooperation
- Promote recreation opportunities including agritourism, nature tourism, and environmental learning tourism

The Public Services Element of the general plan includes goals and policies related to recreation facilities. The goals and policies aim to develop local services that meet local needs in a cost-effective manner, including supporting enhanced recreation services for existing and future residents, and obtaining dedicated lands for new schools, libraries, and recreational facilities when existing facilities are not adequate.

City of Redding

The Recreation Element of the City of Redding's general plan (City of Redding 2000) contains goals, objectives, and policies addressing natural and scenic open areas, development of a regional river parkway, archaeological and historic resources related to park and recreation sites, park planning and development, compatibility with adjacent land uses, facility funding and management, recreation programs, a citywide trail system, and vandalism and user safety. The plan specifically recognizes the Sacramento River as "the backbone of the City's park system." Policies are established in the plan for a regional river parkway and for trails along the river, including continued development of the Sacramento River Trail.

The *City of Redding Parks, Trails, and Open Space Master Plan* (City of Redding 2004) includes as part of its parks strategy Goal PK4, "The Sacramento River and its major tributary streams will continue to be the focus and the organizing principle of the park, trail, and open space system." In addition, the plan establishes Goal TB1 within the Trails and Bikeway Strategy, "Promote and facilitate the development of a Citywide Trail System." A subgoal is to "continue development of the Sacramento River Trail to establish a common and continuous thread along the river corridor."

City of Anderson

The Recreation Element of the City of Anderson's general plan "addresses parks and recreation facilities throughout the Anderson Planning Area, including both those owned and maintained by the City of Anderson and those under the purview of other agencies or, selectively, private entities" (City of Anderson 2007). The element describes the city's parks, park classifications and standards, park issues, and the recreation trails network. One of the identified additional park needs is to extend, enlarge, and protect Anderson River Park, which is located within the

primary study area. Relevant recreation-related policies contained with the element aim to do all of the following:

- Allow for expanded and diverse recreational programs, areas, and opportunities
- Facilitate community and cultural opportunities
- Formalize and enhance walking trails in existing city parks
- Provide nonmotorized linkages between parks and open spaces
- Develop and promote community trails to provide health benefits for all residents
- Update the Parks and Recreation System Master Plan, incorporating appropriate provisions of the general plan (including the Trails-Sidewalks Network Concept Plan) into the master plan, and establish clear priorities and phasing plans as part of the master plan process

18.3 Environmental Consequences and Mitigation Measures

18.3.1 Methods and Assumptions

The project could affect recreation and public access resources through a variety of impact mechanisms. Primary effects on recreation facilities and recreation activities at Shasta Lake would be tied directly to the increased full pool elevation. Additional impacts could result from changes in reservoir operations that alter the magnitude, rate, or timing of reservoir drawdown; and from construction-related disruption of recreation access and activities at and near Shasta Dam. Primary conflicts with the use of recreation facilities and recreation-related activities on the Sacramento River and tributaries would be tied directly to the changes in flow regime of the rivers and the seasonal timing of those changes.

More specifically, this chapter evaluates the potential impacts on recreation and public access facilities and recreation activities resulting from the following mechanisms:

- Construction-related disruption of recreation access and activities at and near Shasta Dam
- Seasonal inundation of reservoir recreation facilities and shoreline access sites
- Changes in the magnitude, rate, or timing of reservoir drawdown
- Seasonal inundation of river recreation facilities or access sites

- Increased or decreased river flows during particular recreation use periods
- Disruption of recreation access and boating, or changes in river characteristics related to boating, caused by gravel deposition activities

The evaluation of impacts on Shasta Lake recreation facilities was based on several existing information sources. During previous phases of the project, a detailed inventory was prepared and mapping based on high-resolution aerial photographs was completed for all recreation facilities on or near the shoreline of Shasta Lake. The inventory data included descriptions and elevations for the features of each facility–buildings, paved and unpaved roads, paved and unpaved areas, and miscellaneous objects–up to an elevation 30 feet above the current full pool elevation of 1,067 feet above mean sea level. The inventory data included the lowest and highest elevations at which each feature would be affected (buildings excepted; only the lowest elevation was recorded for buildings). The inventory did not include buried infrastructure such as electric and water lines and septic systems. However, nearly all developed facilities on the lake are known to include these types of improvements, and these would also be among the features affected at most locations.

The SLWRI 2012 CalSim-II computer model was used to aid in the evaluation of potential impacts of the project on water-related resources, including recreation resources. This computer modeling used historical California hydrology data to represent the variety of weather and hydrologic patterns, including wet periods and droughts, under which the project would be operated. Each model run represented a constant level of development (2005 for the existing case and 2030 for the future case), so that the performance of the No-Action Alternative and other alternatives could be evaluated under both existing and future conditions.

For statements based on CalSim-II modeling results (e.g., statements regarding project impacts on mean monthly flow), “existing conditions” refers to modeling runs with 2005 facilities and demands; “future conditions” refers to modeling runs with forecasted 2030 demands and reasonably foreseeable future projects and facilities. The existing and future base cases are the without-project conditions in 2005 and 2030, respectively. The No-Action Alternative represents future conditions in 2030, including other reasonably foreseeable future projects and facilities.

The results of the CalSim-II modeling provide information about the seasonal changes in Shasta Lake pool elevation associated with each dam-raise height. This information was used in combination with the inventory data described above to determine impacts of the alternatives on recreation facilities and activities.

The CalSim-II results also describe flow characteristics for the Sacramento River downstream from Shasta Dam, and for other rivers downstream from reservoirs

within the CVP and SWP service areas whose operations may be affected by the project. These data were used to determine potential impacts on recreation and public access on the Sacramento River downstream from Shasta Dam and on tributary rivers and reservoirs within the CVP and SWP service areas. Both average increases and decreases in monthly pool elevation and mean monthly flows were considered with respect to impacts evaluated in this section. Preliminary assessments of impacts on public and commercial recreation facilities at Shasta Lake were reviewed by USFS and revised based on comments received.

A detailed description of the CalSim-II model, the modeling methodology used to evaluate this project, and key assumptions is provided in the Modeling Appendix. Summaries of the analysis and modeling results are provided in Chapter 6, "Hydraulics, Hydrology, and Water Management."

18.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with 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 EIS 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, and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative on recreation and public access would be significant if project implementation would do any of the following:

- Substantially affect the operability or seasonal use of or otherwise affect reservoir and river recreation facilities and access sites as a result of water level changes or flow regime modifications
- Substantially increase recreation use such that existing facilities would be used beyond their capacity and degraded
- Substantially reduce recreational opportunities or substantially degrade recreational experiences
- Create hazardous or unusual conditions for boaters, swimmers, waders, or other water-contact activities as a result of increased or decreased water levels related to flow regime modifications associated with the action alternatives

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

18.3.3 Topics Eliminated from Further Consideration

No topics related to recreation and public access that are included in the significance criteria listed above were eliminated from further consideration. All relevant topics are analyzed below.

18.3.4 Direct and Indirect Effects

No-Action Alternative

Under the No-Action Alternative, the existing Shasta Dam would be operated in the same manner as under current operations. Changes to the reservoir flow regime caused by changes in demand and other factors would be small, with a reduction in Shasta Lake storage of 2 percent to 4 percent during the fall of some years. Relative to existing conditions, the change in Shasta Lake storage under the No-Action Alternative would be minimal, ranging between -2 percent and 1 percent at most times. Also, no new project-related recreation facilities would be constructed and no existing facilities would be altered, expanded, or demolished.

If the project alternatives were not implemented, CVP and SWP operations would likely continue under existing regulatory requirements. Analysis of flow modeling indicates that there would be no significant changes in flows with the potential to affect recreation between existing conditions and future No-Action Alternative conditions.

Under the No-Action Alternative, changes to the flow regime of the upper Sacramento River caused by changes in demand and other factors would be small; mean monthly flows in the Sacramento River would be within ±5 percent of flows under existing conditions at most times. (Flows could increase by a greater amount during late summer and early fall of below-normal, dry, and critical water years[1].) Also, no new recreation facilities would be constructed and no existing facilities would be altered, expanded, or demolished.

Under the No-Action Alternative, the flow regime in the lower Sacramento River and Delta and in the CVP/SWP service areas would not change as a result of Shasta Lake operations.

Shasta Lake and Vicinity

Impact Rec-1 (No-Action): Increased Use of Shasta Lake Recreation Facilities and Demand for Recreation Opportunities on Shasta Lake and in the Vicinity

Demand for recreation facilities at Shasta Lake and in the vicinity is expected to increase, but recreation opportunities would still be extensive and varied. This impact would be less than significant.

[1] Throughout this document, water year types are defined according to the Sacramento Valley Index Water Year Hydrologic Classification unless specified otherwise.

Recreational use at Shasta Lake and in the vicinity is expected to increase in the future simply based on population growth in Northern California and southern Oregon from now until 2030. The resulting increase in demands on all recreational facilities and opportunities could affect the quality of the recreational activity. Recreational opportunities would still be extensive and varied in the area; however, and USFS management of the Shasta Unit of the Whiskeytown-Shasta-Trinity NRA would continue to respond to changing recreation needs. Because no substantial hydrologic changes are anticipated under the No-Action Alternative, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-2 (No-Action): Increased Use and Demand for Recreation Opportunities on the Upper Sacramento River Demand for recreation facilities along the upper Sacramento River is expected to increase, but recreation opportunities would still be extensive and varied. This impact would be less than significant.

Recreational use in the upper Sacramento River portion of the primary study area is expected to increase in the future simply based on population growth in Northern California from now until 2030. The resulting increase in demands on all recreational facilities and opportunities could affect the quality of the recreational activity. Recreational opportunities would still be extensive and varied in the area, however. Because no substantial hydrologic changes are anticipated under the No-Action Alternative, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Lower Sacramento River and Delta

Impact Rec-3 (No-Action): Increased Use and Demand for Recreation Opportunities on the Lower Sacramento River and in the Delta Demand for recreation facilities along the lower Sacramento River and in the Delta is expected to increase, but recreation opportunities would still be extensive and varied. This impact would be less than significant.

Recreational use in the lower Sacramento River and Delta portions of the extended study area is expected to increase in the future simply based on population growth in Northern and Central California from now until 2030. The resulting increase in demands on all recreational facilities and opportunities could affect the quality of the recreational activity. Recreational opportunities would still be extensive and varied in the area, however. Because no substantial hydrologic changes are anticipated under the No-Action Alternative, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

CVP/SWP Service Areas

Impact Rec-4 (No-Action): Increased Use and Demand for Recreation Opportunities in the CVP and SWP Service Areas Demand for recreation

facilities in the CVP/SWP service areas is expected to increase, but recreation opportunities in the CVP/SWP service areas would still be extensive and varied. This impact would be less than significant.

Recreational use in the CVP/SWP service areas within the extended study area is expected to increase in the future simply based on population growth in California from now until 2030. The resulting increase in demands on all recreational facilities and opportunities could affect the quality of the recreational activity. Recreational opportunities would still be extensive and varied in the area, however. Because no substantial hydrologic changes are anticipated under the No-Action Alternative, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

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

By increasing storage at Shasta Lake, this alternative would change the full pool elevation and seasonal pool elevations at Shasta Lake, and the flow regime downstream in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of several types of recreation facilities on Shasta Lake and the downstream reservoirs and waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

The full pool elevation of Shasta Lake would increase by 8.5 feet and the pool elevation would average as much as 6 to 10 feet higher than under existing (2005) and No-Action Alternative (2030) conditions at various times of the year. The greatest change would occur during the wettest years. The surface area of the reservoir at full pool would increase by about 1,100 acres (4 percent) with a 6.5-foot dam raise. The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

At most times, average flows for all year types in the upper Sacramento River within the primary study area (between Shasta Dam and the Red Bluff Pumping Plant) under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions.

Reservoir- and river-based recreation facilities and activities are similar in the primary and extended study areas downstream from Shasta Lake; thus, potential effects on reservoir and river recreation would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of effects downstream.

Shasta Lake and Vicinity

Impact Rec-1 (CP1): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 8.5-foot increase in full pool elevation associated with a 6.5-foot dam raise would cause seasonal inundation of recreation facilities or portions of facilities surrounding Shasta Lake. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,075.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. As described in Chapter 2, "Alternatives," the replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) guidelines. Therefore, this impact would be less than significant.

Within each of the three arms of Shasta Lake with recreation development, effects of implementing CP1 on individual recreation facilities would vary. These effects would range from no effect to effects on several of the facilities' inventoried and mapped features (e.g., roads, parking, and restrooms or other buildings) and on features not specifically inventoried (e.g., campsites and picnic sites). Table 18-3 shows the anticipated effects of CP1 on inventoried and mapped (developed) recreation facilities.

Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Sacramento Arm	
Boat Ramps	
1. Antlers Public Boat Ramp	Boat ramp length reduced but ramp usable; parking lot and restroom unaffected
2. Centimudi Public Boat Ramp	Boat ramp entirely affected, most of lower parking lot affected, access road to ramp and parking partly affected
Campgrounds	
1. Antlers Campground	No effect–all features are above full pool elevation
2. Gregory Creek Campground	One restroom affected and shoreline campsites affected
3. Lakeshore East Campground	One restroom, lower portion of access road, and some campsites affected; access substantially affected
4. Nelson Point Campground	Campground access road and possibly some campsites affected
5. Oak Grove Campground	No effect–all features are above full pool elevation

Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Boat-in Campgrounds	
1. Gooseneck Cove Boat-in Campground	Some shoreline campsites likely affected
Day-Use Areas	
1. Fisherman's Point Day Use Area	Access road, parking, and restroom unaffected, but part of use area affected
2. Salt Creek Swim Area (nonoperational)	Restroom and portion of paved pathway affected
Marinas	
1. Antlers Resort and Marina	One building affected, boat ramp partially affected
2. Digger Bay Marina	Bottom portion of marina road/ramp affected, but effects appear minor
3. Shasta Marina Resort	Office and equipment shed affected, parking and access roads partially affected
4. Sugarloaf Resort and Marina	Electrical service building and associated structures affected, boat ramp and unpaved parking areas partially affected
Resorts (Nonmarina)	
1. Lakeshore Inn and RV Park	Shoreline campsites and walkway may be affected; access substantially affected
2. Lakeshore Villa RV Park	No effect–entire facility is above full pool elevation
3. Salt Creek Resort and RV Park	Resort unaffected; lower part of old road bed used as boat ramp affected, but usable
4. Shasta Lake RV Resort	No effect–entire facility is above full pool elevation; access substantially affected
5. Sugarloaf Cottages Resort	Unpaved shoreline access roads affected but usable
6. Tsasdi Resort	Entrance and exit roads connecting to Lakeshore Drive affected; resort cabins appear to be unaffected
Trails[1]	
1. Dry Fork Creek Trail	Trailhead and portion of trail along shoreline affected
2. Fisherman's Point Trail	Portion of trail along shoreline affected
Other Facilities	
USFS Lakeshore Fire Station	Five buildings affected, entrance road partially affected; access substantially affected
Salt Creek Recreation Residence Tract Cabins	No effect–all cabins are above full pool elevation
McCloud Arm	
Boat Ramps	
1. Bailey Cove Boat Ramp and Day Use Area	Boat ramp entirely affected, parking area, day-use area, and access road partially affected
2. Hirz Bay Public Boat Ramp	Boat ramp entirely affected; some of lower parking area likely to be affected

Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Campgrounds	
1. Bailey Cove Campground	Campsites appear unaffected; access road may be affected
2. Dekkas Rock Campground	Lower part of loop road affected; possibly a portion of group camp affected
3. Ellery Creek Campground	Lower portion of loop road and shoreline campsites affected
4. Hirz Bay Campgrounds	No effect–entire facility is above full pool elevation
5. Kamloop Camp (private organization)	No effect–entire facility is above full pool elevation
6. McCloud Bridge Campground	Portion of access road affected; some campsites likely affected
7. Moore Creek Campground	Lower portion of loop road and shoreline campsites affected
8. Pine Point Campground	No effect–entire facility is above full pool elevation
Boat-in Campgrounds	
1. Greens Creek Boat-in Campground	Some shoreline campsites likely affected
Day-Use Areas	
1. Dekkas Rock Day Use Area	Lower portion of loop road and some parking affected
2. McCloud Bridge Day Use Area	Part of use area affected (no permanent infrastructure present)
Marinas	
1. Holiday Harbor Marina	Two marina buildings and boat ramp affected, overflow parking partially affected; RV park/campground likely to be partially affected
Trails[1]	
1. Bailey Cove Trail	Portion of trail along shoreline affected
2. Hirz Bay Trail	Portion of trail along shoreline affected
3. Samwel Cave Nature Trail	Portion of trail along shoreline affected
Other Facilities	
1. Bollibokka Club	No effect–entire facility is above full pool elevation
2. Campbell Creek Residence Tract cabins	At least four cabins affected, possibly others also affected
3. Shasta Caverns ferry landing	Access roads serving east and west shore landings partially affected; parking and building unaffected
4. USFS Station (Turntable Bay)	Four buildings affected and access road affected
Squaw Arm	
Other Facilities	
1. Didallis Recreation Residence Tract cabins	At least one cabin affected; possibly others also affected

Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Pit Arm	
Boat Ramps	
1. Jones Valley Public Boat Ramp	Boat ramp entirely affected, access road from parking area partially affected
2. Packers Bay Public Boat Ramp	Boat ramp and information shelter affected, parking partially affected
Campgrounds	
1. Lower Jones Valley Campground	Footbridge associated with trail affected; culverts and creek may back up into campground during high-water periods
2. Upper Jones Valley Campground	No effect–entire facility is above full pool elevation
3. Mariners Point Campground	Some shoreline campsites likely affected
Boat-in Campgrounds	
1. Ski Island Boat-in Campground	Some shoreline campsites likely affected
2. Arbuckle Flat Boat-in Campground	Some shoreline campsites likely affected
Marinas	
1. Bridge Bay Resort and Marina	Seven buildings, boat ramp, parking lots, and roads affected
2. Jones Valley Resort	Three buildings and access road affected, parking area and resort roads partially affected
3. Packers Bay Marina	Boat ramp partially affected but usable
4. Silverthorn Resort	Parking and ramp mostly affected, shoreline road partially affected
Trails[1]	
1. Clikapudi Trail	Portion of trail along shoreline affected
2. Packers Bay Trails	Portion of trails (3 out of 4 trails) along shoreline affected
Other Facilities	
1. Silverthorn Recreation Residence Tract cabins	No effect–all cabins are above full pool elevation

Source: Reclamation 2003

Note:
[1] For some trails, trailheads are integrated into other recreation facilities. Alternative effects identified for standalone trailheads only.

Key:
CP = Comprehensive Plan
RV = recreational vehicle
USFS = U.S. Forest Service

On the Sacramento Arm, one of the two boat ramps, two of the five campgrounds, and one of the four marinas would be subjected to effects on several features or a substantial portion of the facility's use area. Access to three resorts in the Lakeshore area would be substantially affected due to accessibility despite minor

direct impacts to facilities. Other facilities that would be subject to major effects are the USFS Lakeshore Fire Station, Dry Fork Creek trail and trailhead, and Fisherman's Point trail. The only operational day-use area, one campground, and one boat-in campground would be subject to a somewhat lesser but still substantial effects, while several additional facilities would be subject to relatively minor effects.

On the McCloud Arm, the one marina and both boat ramps would be subject to major effects, as would the USFS station at Turntable Cove, and Bailey Cove trail. At least four of the cabins in the recreation residence tract at Campbell Creek would be affected. Effects would be less, but still substantial at four of the seven public campgrounds and one of the two day-use areas. The other day-use area, boat-in campground, and other two trails would have less-than-substantial effects.

On the Squaw Creek Arm, one private cabin in the Didallis recreation residence tract would be affected. On the Pit Arm, both of the boat ramps, three of the four marinas, and Clikapudi and Packers Bay trails would be subject to major effects, whereas one campground and two boat-in campgrounds would experience a lesser effect.

Although they are not included in the table because of a lack of permanent infrastructure, shoreline camping areas at Beehive Point (Sacramento Arm), Gregory Beach (Sacramento Arm), Lower Salt Creek (Sacramento Arm), and Jones Valley Inlet (Pit Arm) would also be subject to substantial effects with the inundation of access roads and use areas. Although Mariner's Point (Pit Arm) has no permanent restroom facility, minor infrastructure such as picnic tables and fire pits are provided.

It is important to note that effects on roads and bridges that are outside of the recreation facilities themselves but are used to access the facilities would also affect recreation at Shasta Lake. (Effects on roads and bridges are discussed in more detail in Chapter 20, "Transportation and Traffic.") A prominent example is the effect on a long stretch of Lakeshore Drive, the primary route on the west side of the Sacramento Arm providing visitors access to several commercial recreation facilities (marinas and nonmarina resorts) and a campground. Effects on the road would begin at a small segment near the north end of the Doney Creek Bridge and extend about 2 miles south to the Sugarloaf area. Two major bridges over inlets of the lake would be affected as well. (These roads and bridges are also used to access private homes and nonrecreation businesses.) Numerous segments of Shasta County and USFS roads that provide access to facilities or the shoreline on each of the lake's arms would also be affected.

In summary, the most prominent direct effects on recreation facilities and public access at Shasta Lake and in the vicinity from the 6.5-foot dam raise would be the major effects on five of six boat ramps, six of 15 family and group campgrounds, five of nine commercial marinas, three of six resorts, two of four recreation

residence tracts, and USFS stations on both the Sacramento and McCloud arms. A lesser effect would occur at several day-use areas, campgrounds, and boat-in campgrounds, and minor effects would occur at several additional facilities. Table 18-4 summarizes the number of recreation facilities of specific types substantially affected.

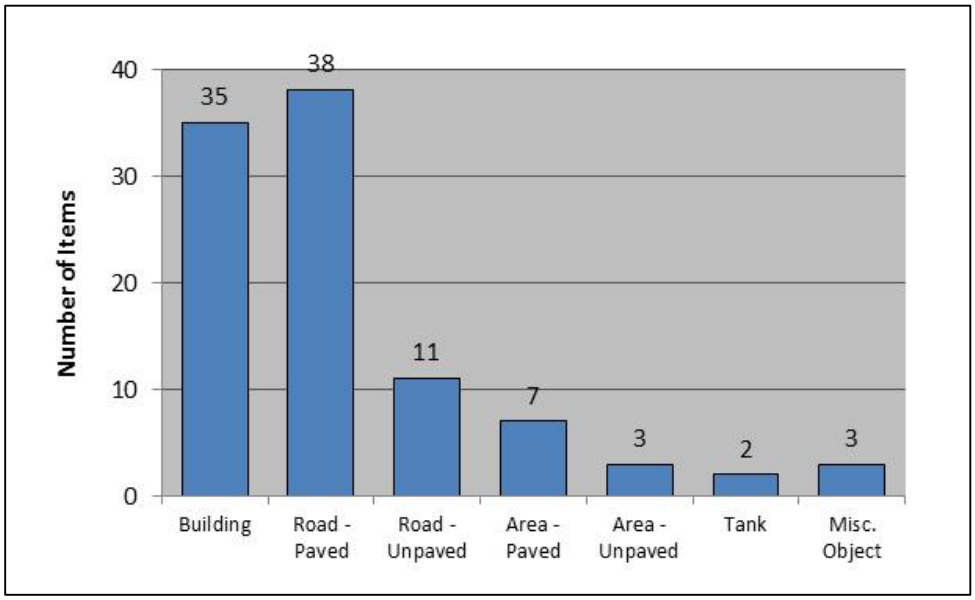
Table 18-4. Summary of Shasta Lake Recreation Facilities Substantially Affected by CP1

Type of Facility	Number of Facilities Affected
Boat ramp	5
Marina	5
Resorts	3
Campground (family and group)	6
Day-use area	1
USFS operations	2
Trailhead/Trails	1/5
Recreation residence tract	2

Source: Reclamation 2003

Key:
USFS = U.S. Department of Agriculture, Forest Service

Figure 18-3 depicts the total number of inventoried Shasta Lake recreation facility items, at all recreation facilities combined, that would be affected by inundation under CP1. A total of 99 facility and infrastructure elements would be affected, with nearly three-fourths of those being buildings and segments of paved roads. A lesser number of unpaved road segments, paved and unpaved areas (usually parking areas), tanks, and miscellaneous objects would also be affected.



Source: Reclamation 2003

Figure 18-3. Number of Recreation Facility Infrastructure Items Affected by a 6.5-Foot Dam Raise Under CP1

As described in Chapter 2, “Alternatives,” Section 2.3.8, “Comprehensive Plan Construction Activities,” affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. While the preference will be to replace all recreation facilities in the immediate vicinity of the existing facilities, consolidation is possible due to institutional requirements and limitations. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP1): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and thus could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

One of the primary routes used by recreation visitors to the Chappie-Shasta OHV Area, situated below Shasta Dam on the west side of Keswick Reservoir, crosses Shasta Dam. It is assumed that public access to the road crossing the dam would be temporarily suspended during the construction phase of the project. An alternative route to the Chappie-Shasta OHV Area from the south exists; however, that route requires several more miles of travel on unpaved roads than the route across the dam, and it may not be suitable for some visitors to the OHV area who bring OHVs to the area on trailers.

The road across the dam is also the primary access route to the Dry Fork Creek trailhead near the west end of Shasta Dam, used by hikers and anglers to access the Dry Fork Creek Trail, which follows the shoreline of Shasta Lake. Access to this trailhead and trail would be disrupted during the project construction period. (As noted under Impact Rec-1 (CP1) above, the trailhead itself would be destroyed by modifications to the dam and portions of the trail would be affected by the increased reservoir elevation.)

Construction at Shasta Dam would also result in a temporary cessation of Reclamation’s public tours of the dam and powerhouse. In addition, noise, dust, and aesthetic changes would disturb recreation visits to the Shasta Dam Visitor Center (situated just below the east end of the dam).

For the reasons described above, this impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

Impact Rec-3 (CP1): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP1, reservoir operations would be similar to existing operations, except during dry and critical water years. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown associated with any water year type. Therefore, this impact would be less than significant.

Over the past decade, Shasta Lake has had an average drawdown of about 67 feet from the annual high pool. (The annual high pool is typically reached in April or May; the reservoir is drawn down during summer and fall, before the winter rains arrive.) During most of those years, the drawdown has been in the range of 50 to 85 feet, but it has been as much as 108 feet and as little as 38 feet. Total drawdown, as compared to the full pool elevation of 1,067 feet (which the reservoir does not reach every year), has averaged about 77 feet and has been as great as 130 feet.

Both public launch ramps and commercial recreation facilities such as marinas and shoreline resorts on the lake are designed and operated to remain functional at a wide range of pool elevations, although some facilities are closed or have restricted use below certain pool elevations. Table 18-5 shows simulated exceedences for public boat ramp availability for selected months. Boaters familiar with the lake generally know to expect a substantial annual drawdown and are aware of the effects of drawdown on facilities and navigation on the lake. Signs at boat ramps and marinas warn boaters of the potential for rapidly changing conditions on the lake as a result of regular seasonal drawdowns.

Table 18-5. Simulated Percent Exceedence of Shasta Lake Boat Ramp Availability for Future Conditions

May								
Boat Ramp	**Minimum Ramp Elevation (feet)**	**No-Action**	**CP1**	**CP2**	**CP3**	**CP4**	**CP4A**	**CP5**
Antlers	991	90%	90%	90%	90%	93%	90%	90%
Bailey Cove	1013	86%	87%	87%	88%	90%	89%	87%
Centimudi	844	100%	100%	100%	100%	100%	100%	100%
Hirz Bay	920	99%	99%	99%	99%	99%	99%	99%
Jones Valley	852	100%	100%	100%	100%	100%	100%	100%
Packers Bay	947	96%	98%	98%	98%	99%	98%	98%
Sugarloaf	914	99%	99%	99%	99%	99%	99%	99%

Table 18-5. Simulated Percent Exceedence of Shasta Lake Boat Ramp Availability for Future Conditions (contd.)

July								
Boat Ramp	**Minimum Ramp Elevation (feet)**	**No-Action**	**CP1**	**CP2**	**CP3**	**CP4**	**CP4A**	**CP5**
Antlers	991	81%	81%	82%	82%	88%	86%	83%
Bailey Cove	1013	63%	66%	68%	73%	79%	76%	73%
Centimudi	844	99%	99%	100%	99%	100%	100%	100%
Hirz Bay	920	94%	94%	94%	94%	96%	95%	94%
Jones Valley	852	98%	99%	99%	99%	100%	100%	99%
Packers Bay	947	91%	90%	90%	91%	93%	91%	90%
Sugarloaf	914	95%	95%	94%	95%	97%	95%	94%
September								
Boat Ramp	**Minimum Ramp Elevation (feet)**	**No-Action**	**CP1**	**CP2**	**CP3**	**CP4**	**CP4A**	**CP5**
Antlers	991	63%	70%	71%	73%	80%	80%	74%
Bailey Cove	1013	32%	46%	55%	60%	64%	64%	60%
Centimudi	844	96%	96%	97%	97%	100%	100%	97%
Hirz Bay	920	91%	91%	91%	91%	92%	92%	90%
Jones Valley	852	96%	96%	95%	96%	100%	100%	95%
Packers Bay	947	86%	87%	88%	88%	91%	91%	88%
Sugarloaf	914	91%	91%	91%	91%	93%	93%	91%

Key:
% = percent
CP = Comprehensive Plan

Potential adverse effects of an increase in the magnitude or rate of drawdown include an increase in seasonally exposed shoals and other boating hazards, and increased navigation challenges compared to what boaters have typically experienced in past years. Other potential adverse effects of such changes in drawdown include a need to more frequently adjust docks and moorings at boat launches and marinas and other locations, and an increase in the distance between developed shoreline campsites and day-use areas and the water's edge. Facilities that operate only above a certain pool level would be usable for a shorter period of time each year. Aesthetically, an increased drawdown would result in a less appealing recreation setting characterized by a wider unvegetated inundation zone.

Conversely, a reduced drawdown or slower drawdown during the primary summer boating season could have beneficial effects by reducing the adverse effects described above, which normally occur to some degree each year under existing conditions and would continue under the No-Action Alternative.

The increase in full pool elevation during the late spring could have adverse effects on houseboat traffic passing underneath the Pit River Bridge due to the possible decrease in clearance height. For the 6.5-foot, 12.5-foot, and 18.5-foot raise, the maximum clearance is 26.5 feet, 20.5 feet, and 14.5 feet respectively. The temporary reduction in clearance underneath the Pit River Bridge would limit houseboat traffic from passing but smaller water craft would still be able to pass underneath the bridge.

Under CP1, storage would increase but reservoir operations would be similar to existing operations, except during dry and critical water years; therefore, the character of the annual reservoir drawdown would not be expected to change greatly in most years. This conclusion is confirmed by CalSim-II modeling results, which indicate that the reservoir elevation would be as much as 10 feet higher at various points in the year, but that the magnitude, rate, and timing of the annual drawdown would be essentially unchanged relative to the existing (2005) and No-Action Alternative (2030) conditions. As a result, no effects related to drawdown changes are expected under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP1): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 730 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps remaining in these areas would increase the number of areas and total acreage where this type of hazard to boaters and other recreation visitors would exist. Therefore, this impact would be significant.

Approximately 730 acres (66 percent) of the 1,100 acres of newly inundated area that would result from the 6.5-foot dam raise at full pool would receive no vegetation treatment (no vegetation removed), to maximize the habitat benefits of inundated and residual vegetation. The remaining 370 acres would be subject to either complete vegetation removal or overstory removal. In areas of overstory removal, all trees greater than 10 inches in diameter at breast height would be removed, with stumps cut to within 24 inches of the ground surface. The intent of these treatments would be to minimize the risk to boaters and other visitors from snags and water hazards. However, stumps would be left in place to reduce shoreline erosion. These treatments would be targeted for areas adjacent to developed recreation sites and houseboat mooring areas, and other areas where snags pose the greatest risk to boaters.

Because no vegetation would be removed from portions of the newly inundated area, the area at Shasta Lake where boaters would be exposed to potential hazards from standing timber and stumps would increase. The hazards may increase as the trees die and decay, leaving stumps that may be at or just below the water surface. The hazard represented by the standing timber and stumps would exist only when

the reservoir surface elevation is above the current full pool elevation, which would occur only during the highest pool elevation period (generally late spring and early summer) of wetter-than-normal years.

Although the number and acreage of areas where this hazard would be present would expand, the hazard already exists on portions of the Pit and Squaw Creek arms of the lake, where vegetation was not cleared when the reservoir was constructed and where numerous inundated trees still exist. The Shasta Lake Boating Safety brochure provided to Shasta Lake boaters by USFS warns that numerous underwater obstacles (as well as floating debris and shallows) are present and not marked, and that responsibility for boating safety rests with each individual vessel operator. Also, the Shasta County ordinance that limits boat speeds on Shasta Lake to 5 miles per hour within 100 feet of the shoreline would serve to reduce the hazard. Finally, the standing timber and other remaining vegetation would provide structural diversity that is attractive to fish; therefore, these areas are likely to be attractive to anglers, who could benefit from the increase in uncleared areas and may consider them a recreation enhancement rather than a hindrance.

Despite these factors, the untreated areas of the new inundation zone would represent an increased hazard to boaters and potentially other types of recreationists. For this reason, this impact would be significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP1): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (6 percent or less); likewise, only a small additional area would be inundated relative to the area inundated under existing conditions or the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

Increased river flows associated with project implementation could temporarily inundate portions of developed recreation facilities used by boaters, anglers, and other recreationists to access the upper Sacramento River between Shasta Dam and Red Bluff. Any of the more than 15 boat ramps at public and privately operated parks on the river would be affected if increased river flows were to cause overtopping of the ramps, which are generally designed to be used at a range of river elevations. These facilities are often associated with picnic areas, shoreline fishing access areas, and similar day-use facilities, as well as campgrounds. The portions of these areas nearest to the riverbank could also be affected. Many of these facilities are used year-round, but the peak period for

boating on the river is late spring through fall (May to November), when river flows are most likely to be in the optimum range of 6,000 to 12,000 cfs. Although existing average monthly flows are within this range year-round, in most winter and spring seasons the river experiences much higher peak flows of 30,000 to 50,000 cfs or more that may last several weeks.

Many of the locations that recreationists use to access the river and to hand-launch watercraft are informal sites, where conditions such as gradually sloping and sandy riverbanks create beaches that are conducive to recreation use. Like developed sites, these undeveloped and informal use areas could be affected by increased river flows if increased flows were to result in temporary inundation of the area.

CalSim-II model simulations indicate that at nearly all times, Sacramento River flows below Keswick Dam under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions. Regarding increases to river stage, the CalSim-II model simulations indicate that mean monthly river stage below Keswick Dam would increase by 0.1 to 0.3 foot during fall months (September through November) relative to existing (2005) and No-Action Alternative (2030) conditions. (River stage during the summer below Keswick Dam is typically 10 to 11 feet under existing conditions.) The modeling results also indicate the potential for lower river levels during winter and spring in some years. Effects of decreased river flows are addressed below under Impact Rec-7 (CP1).

River stage information was not assessed for points within the primary study area downstream from Keswick Dam. However, the effects of the project on river stage at those locations would be expected to be moderated by inflows from tributaries, and would therefore be less than the potential changes below Keswick Dam. As a result, potential effects of the project on recreation facilities would be progressively less as one moves downstream from Keswick Dam.

Because most recreation facilities are designed to be used well above the highest annual river stage elevations that commonly occur during late summer and spring, the stage increases cited above would not affect the functionality of those facilities. Likewise, the small fall increases in river stage would be unlikely to have noticeable adverse effects on informal use sites, because those sites exist at a range of elevations and at many river locations. During periods of very high flows that may occur during winter and spring, boat ramps and other recreation facilities on the river may close, and safety warnings may be issued to boaters to stay off the river until the flow subsides.

It is important to note that for this assessment of environmental consequences, specific information was not available regarding how specific river stages affect specific recreation facilities. The assessment has also not considered the riverbank slope in specific river reaches, which would determine how much increased inundation would result from river stage increases at undeveloped recreation sites.

Additional analysis would be required to provide accurate projections of effects at specific recreation sites or specific stretches of riverbank. Overall, however, the hydrologic changes in the Sacramento River's high flows that would result from CP1 would be relatively small and within the variability of flows that already occur in the river.

For the reasons described above, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-6 (CP1): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP1 would be small (averaging less than 8 percent for any month or water year type), adverse effects on boaters within the primary study area are unlikely. This impact would be less than significant.

Increased river flows associated with project implementation could affect boating conditions on the upper Sacramento River between Shasta Dam and Red Bluff. Increased flows can make boating on the river more difficult, particularly for nonmotorized boats such as canoes and dories or "drift boats." Drift boats are controlled by oars; these boats are commonly used by anglers and commercial angling guide services, primarily during summer, before lower flows during fall make their use more difficult. Canoeing, kayaking, and similar forms of nonmotorized boating are also most common on the river during summer, but are less affected by low flows than drift boating. Boating activity occurs on the river year-round, but the peak period for boating is late spring through fall (May to November), when river flows are most likely to be in the optimum range.

As described above under Impact Rec-5 (CP1), CalSim-II model simulations indicate that at nearly all times, Sacramento River flow below Keswick Dam under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions. The CalSim-II model simulations indicate that mean monthly river stage below Keswick Dam could increase by as much as 0.3 foot relative to existing (2005) and No-Action Alternative (2030) conditions during fall months (September through November) of some years. Changes in flows farther downstream within the primary study area would be expected to be progressively smaller as the influence of tributary streams increases.

The generally small flow increases that would occur as a result of the project in some years would be unlikely to adversely affect boating, which occurs primarily during summer and fall. These flow increases may have small beneficial effects during dry years by reducing exposure of sand bars and shallows and thus

increasing navigability on the river. Although boating activity is lower during winter, particularly during peak-flow periods when facilities may be closed and conditions are hazardous, increased flows during dry years and decreased flows during wet years could have similarly minor beneficial effects during those months.

For the reasons described above, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-7 (CP1): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely, and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP1 would be small (averaging less than 8 percent for any month or water year type), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely. Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

Increased river flows associated with project implementation could affect swimming and wading conditions on the upper Sacramento River between Shasta Dam and Red Bluff. Increased flows can make swimming and wading more difficult. Because of cold-water temperatures (a maximum of less than 60 degrees during summer), swimming is not a major activity on the Sacramento River; however, it does occur, particularly in association with other activities like tubing and nonmotorized boating. Anglers commonly wade in the river; their use is particularly focused on the months of September and October, when flows typically decrease substantially from summer levels and the opportunities for wading correspondingly increase.

As described above under Impact Rec-5 (CP1), CalSim-II model simulations indicate that at nearly all times, Sacramento River flow below Keswick Dam under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions. However, CalSim-II model simulations indicate that mean monthly river stage below Keswick Dam could increase by as much as 0.3 foot relative to existing (2005) and No-Action Alternative (2030) conditions during fall months (September through November). Changes in flows farther downstream within the primary study area would be expected to be progressively smaller as the influence of tributary streams increases.

The small magnitude of river stage increases during the fall peak period for wading by anglers indicates that adverse effects of the project on wading anglers are unlikely. Likewise, the generally small increases in summer flows throughout the primary study area that would occur as a result of the project in some years

(generally smaller than the increases in fall flows described above) would be unlikely to adversely affect the limited amount of swimming that occurs during those months.

For the reasons described above, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP1): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during summer when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with the project would be small (averaging less than 7 percent for any month or water year type), and the timing of the decreases (fall and winter months) would be such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

Decreased river flows associated with project implementation could benefit boating conditions on the Sacramento River in the primary study area, between Shasta Dam and Red Bluff. Decreased flows can make boating on the river easier, particularly for nonmotorized boats such as canoes and dories or “drift boats.” BLM has identified an optimum range of 6,000 to 12,000 cfs for boating on the Sacramento River in the primary study area. Boating may benefit if the decrease in river flows lowers the flows below the high end of the optimum range. Under existing conditions, average monthly flows below Keswick Dam and below Cottonwood Creek are above the optimum level during midsummer most years and during much of the winter and early spring of wet years.

Decreased river flows associated with project implementation could also benefit conditions for swimming and wading, although boating conditions could be adversely affected if flows were to fall below the low end of the optimum range of 6,000 cfs. Decreased flow could make swimming and wading easier and may lengthen the period when these activities are best pursued. For example, wading anglers typically concentrate their activity in the fall months, when flows are lowest, whereas fishing from a boat is more common in summer, when flows are higher. Reduced flows in late summer or early fall may extend the wading season.

As described above under Impact Rec-5 (CP1), CalSim-II model simulations indicate that at nearly all times, Sacramento River flows below Keswick Dam under CP1 would be within about ±5 percent of flows under existing (2005) and No-Action Alternative (2030) conditions. The CalSim-II model simulations indicate that mean monthly river stage below Keswick Dam could decrease by as much as 0.5 foot relative to existing (2005) and No-Action Alternative (2030) conditions during winter (December through February) of wetter-than-normal

years. Again, changes in flows farther downstream within the primary study area would be expected to be progressively smaller as the influence of tributary streams increases.

The reduction in mean monthly flows during winter months of wetter-than-normal years would have minimal effects on boating because the existing mean flows during those months are usually within the optimum range. However, the decreased flow could have a beneficial effect on boating during the winter months of some wet years, when the existing mean flows are above the optimum range.

The small reduction in flows and corresponding decrease in river stage during some spring months during both wetter-than-normal and drier-than-normal years could have a beneficial effect on wading. Flows could be reduced to a level that is similar to existing fall conditions, when wading by anglers is most popular. However, because the spring months are not the period when most wading anglers are present, and because swimming activity is low in the spring months, the effects are likely to be minimal.

For the reasons described above, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-9 (CP1): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

Chinook salmon contribute to the popular sport fishery in the upper Sacramento River. With increased flows and cooler water temperatures resulting from project operation, salmon populations would benefit from reduced mortality. These beneficial effects on Chinook salmon could result in enhanced angling opportunities on the upper Sacramento River, which would have a beneficial effect on recreation. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP1): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program The proposed gravel augmentation program would not be implemented under CP1. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP1): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites The proposed restoration of flow through various sites along the upper Sacramento River, rehabilitation of the Reading Island boat ramp for use by motorized boats, and construction of a handicap fishing access area would not be

implemented under CP1. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP1): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows

Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP1, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with the increases, flows on the Sacramento, American, and Feather rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

Increases in Sacramento River stage (elevation) within the extended study area associated with increased flows under CP1 would be small (averaging less than 0.3 foot). Likewise, only a small additional area would be inundated relative to the area inundated under existing conditions and the No-Action Alternative. On the Feather River below Thermalito Afterbay and on the lower American River (at the H Street Bridge), the increase in flows would be larger during some months of some years, with some increases exceeding 25 percent. However, the largest increases on the lower American River would occur during late summer of critical water years, when flows are generally low, and the largest increases on the Feather River would occur during early fall of dry years, when flows are generally moderate. On both rivers, flows would remain well below winter and spring high flows experienced in most years. Therefore, adverse effects on river recreation facilities and informal use areas appear unlikely.

For the reasons described above, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP1): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, Feather, and American rivers under CP1, and the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant.

CalSim-II modeling results indicate that the magnitude of flow increases in the lower Sacramento River associated with CP1 would be generally small, averaging less than 6 percent in any month in all water year types. Also, the largest changes would occur primarily during fall months (September through November) of dry and critical water years, when flows are normally relatively low. Thus, even with the flow increases, flows would remain moderate (7,500 to 11,000 cfs at Verona and 7,500 to 13,000 cfs below Freeport, on average) during those periods.

CalSim-II modeling results indicate that the magnitude of flow increases in the Feather River below Thermalito Afterbay associated with CP1 may occasionally exceed 100 percent. More typically, however, the largest increases would be in the range of 20 percent to 30 percent and would occur during mid- and late-summer and fall and primarily during drier-than-normal years, when flows are often lower than average. Flows would remain moderate (1,500 to 4,500 cfs) with the increases. CalSim-II modeling results also indicate that flows in the American River at the H Street Bridge (below Folsom Lake) would also substantially increase during some months of some years, but would remain moderate. Although some of the potential flow increases in the Sacramento, Feather, and American rivers would be substantial, adverse effects on boating appear to be unlikely.

Hydrologic changes in more distant areas of the CVP and SWP service areas resulting from CP1 cannot be accurately predicted but would be small. Such slight changes occur on a dynamic and daily basis under existing conditions as water is moved throughout California. Other CVP and SWP reservoir elevations, canal flows, and flows below the reservoirs could be slightly modified, but any resulting effects on recreation would be negligible and speculative.

For the reasons described above, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP1): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous, and thus less attractive to river users. However, given the timing of the likely flow increases under CP1, the conditions under which such increases would occur, and the continuation of moderate flows even with the increase, adverse effects on swimmers and waders in the extended study area are unlikely. This impact would be less than significant.

Even during the lowest flow months of late summer and early fall, average flow in the more downstream portions of the Sacramento River is around 10,000 cfs; average flow is much higher at other times of the year. As a result, swimming and

wading are not common activities on the river in much of the extended study area, where the most common uses are boating and bank angling.

CalSim-II modeling results indicate that the magnitude of flow increases in the lower Sacramento River associated with CP1 would be generally small, averaging less than 6 percent for any month in all water year types. Also, the largest changes would occur primarily during fall months (September through November) of dry and critical water years, when flows are normally relatively low. Thus, even with the flow increases, flows would remain moderate (7,500 to 11,000 cfs at Verona and 7.500 to 13,000 cfs below Freeport, on average) during those periods.

CalSim-II modeling results indicate that the magnitude of flow increases in the Feather River below Thermalito Afterbay associated with CP1 exceeds 100 percent in two Septembers during the simulation period of 1922 to 2003. Flow increases occur sporadically, typically during mid- and late-summer and fall, are usually in the range of 0 to 20 percent, and primarily occur during drier-than-normal years when flows are typically lower than average. Flows would remain moderate (1,500 to 4,500 cfs) with the increases. CalSim-II modeling results also indicate that flows in the American River at the H Street Bridge (below Folsom Lake) would increase by more than 100 percent once during the simulation period, with flow increases more typically in the range of 0 to 30 percent. Even with these increases, flows would remain moderate. While a few of the simulated flow increases in the Sacramento, Feather, and American rivers would be substantial, adverse effects on swimming and wading appear to be unlikely. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP1): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP1 and the timing of the changes, effects on these recreation uses of the Sacramento River in the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

CalSim-II results indicate that the magnitude of mean monthly flow decreases that would occur in some years in the Sacramento River below Wilkins Slough, at Verona, and below Freeport associated with CP1 would be small (averaging less than 2 percent for any month in all water year types) and would equate to elevation (stage) decreases of no more than about 6 inches. The occasional larger decreases would occur during mid- and late fall and early winter (October through

December) rather than in the summer months, when boating activity is highest. Wade angling is not common on most of the river in the extended study area because of the depth and volume of the river, among other factors. As a result of these factors, adverse effects on boating or angling from the flow decreases appear to be unlikely.

CalSim-II results indicate that mean monthly flows in the Feather River below Thermalito Afterbay would be reduced in some years by as much as 32 percent during mid-summer through mid-fall (June through October), particularly during drier-than-normal years. However, the reduction in flow would average 6 percent or less in all months of those years, with the exception of the month of June in dry years, when the reduction would average 10 percent. The boating and angling activity that occurs on the Feather River during summer and fall months could be adversely affected if navigability or angling success were to be hampered by reduced flow and shallower water.

CalSim-II results indicate that mean monthly flows in the American River at the H Street Bridge (below Folsom Lake) would also be reduced by as much as 20 percent to 50 percent in some months of some years, primarily during mid-summer to mid-fall (June through October). Many of these reductions would occur during wetter-than-average years, when flows would typically be high, and the average reduction in flow would be 10 percent or less for any months in all water year types. However, in drier-than-average years, the effect would be to reduce flows during periods when the flows are already below average. This may adversely affect boating and angling on the river if navigability or angling success is hampered by reduced flow and shallower water.

For the reasons described above, this impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

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

Like CP1, CP2 would increase storage at Shasta Lake, thus changing the full pool elevation at Shasta Lake, and the seasonal pool elevations and the flow regime in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of some types of recreation facilities on the lake and downstream waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

The full pool elevation of Shasta Lake would increase by 14.5 feet and the pool elevation would average as much as 12 to 17 feet higher than under existing (2005) and No-Action Alternative (2030) conditions at various times of the year. The greatest change would occur during the wettest years.

Raising the dam by 12.5 feet would increase the surface area of the reservoir at full pool by about 1,750 acres (6 percent). The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

In general, the proposed changes in flow and river stage on the upper Sacramento River associated with CP2 are similar to but slightly greater than the changes associated with CP1, as outlined above.

Reservoir- and river-based recreation facilities and activities in the primary and extended study areas downstream from Shasta Lake are similar; thus, potential reservoir and river recreation impacts would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of impacts.

Shasta Lake and Vicinity

Impact Rec-1 (CP2): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 14.5-foot increase in full pool elevation associated with a 12.5-foot dam raise would cause seasonal inundation of recreation facilities or portions of facilities at Shasta Lake. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,081.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. The replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with ADA and ABA guidelines. Therefore, this impact would be less than significant.

Within each of the three arms of Shasta Lake with recreation development, effects of implementing CP2 on individual recreation facilities would vary. These effects would range from no effect to effects on several of the facilities' inventoried and mapped features (e.g., roads, parking, and restrooms or other buildings) and on features not specifically inventoried (e.g., campsites and picnic sites). Table 18-6 shows the anticipated effects of CP2 on inventoried and mapped (developed) recreation facilities.

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Sacramento Arm	
Boat Ramps	
1. Antlers Public Boat Ramp	Boat ramp length shortened but usable; courtesy dock and rail would also be affected
2. Centimudi Public Boat Ramp	Boat ramp and lower parking entirely affected, part of access road to ramp and lower parking affected
Campgrounds	
1. Antlers Campground	All features are above full pool elevation; shoreline erosion may threaten portions of site
2. Gregory Creek Campground	One restroom, part of campground road, and shoreline campsites affected
3. Lakeshore East Campground	One restroom, lower half of campground road, and several campsites affected; access substantially affected
4. Nelson Point Campground	Campground road and some campsites affected
5. Oak Grove Campground	All features are above full pool elevation; access road affected
Boat-in Campgrounds	
1. Gooseneck Cove Boat-in Campground	Some shoreline campsites likely affected
Day-Use Areas	
1. Fisherman's Point Day Use Area	Parking and restroom unaffected but most picnic sites affected; also loss of access to shoreline trail
2. Salt Creek Swim Area (nonoperational)	Restroom and portion of paved pathway affected
Marinas	
1. Antlers Resort and Marina	Generator/pumphouse building and boat ramp/dock access road affected
2. Digger Bay Marina	Bottom portion of marina access road/ramp affected, but appears to remain usable
3. Shasta Marina Resort	Two buildings (office and equipment shed) affected, most of parking and access roads affected
4. Sugarloaf Resort and Marina	Electrical service building and associated structures affected, boat ramp and unpaved parking areas partially affected
Resorts (Nonmarina)	
1. Lakeshore Inn and RV Park	Shoreline campsites and walkway, and underground septic system may be affected; access substantially affected
2. Lakeshore Villa RV Park	No effect–entire facility is above full pool elevation
3. Salt Creek Resort and RV Park	Resort unaffected; old road bed used as boat ramp (outside resort) affected
4. Shasta Lake RV Resort	Entire facility appears to be unaffected; access substantially affected
5. Sugarloaf Cottages Resort	Four cottages and large portion of unpaved shoreline access roads affected
6. Tsasdi Resort	Three cabins and entrance and exit roads connecting to Lakeshore Drive affected

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Trails[1]	
1. Dry Fork Creek Trail	Trailhead and portion of trail along shoreline affected
2. Fisherman's Point Trail	Portion of trail along shoreline affected
Other Facilities	
1. USFS Lakeshore Fire Station	Five buildings and entrance road affected (entire facility)
2. Salt Creek Recreation Residence Tract cabins	At least one cabin affected; possibly others also affected
McCloud Arm	
Boat Ramps	
1. Bailey Cove Boat Ramp and Day Use Area	Boat ramp entirely affected, parking area, day-use area, and access road partially affected
2. Hirz Bay Public Boat Ramp	Boat ramp and lower parking area, restroom, entirely affected
Campgrounds	
1. Bailey Cove Campground	No effect–entire facility is above full pool elevation
2. Dekkas Rock Campground	Lower part of loop road and portion of group camp affected
3. Ellery Creek Campground	Lower portion of loop road and shoreline campsites affected
4. Hirz Bay Campgrounds	No effect–entire facility is above full pool elevation
5. Kamloop Camp (private organization)	No effect–entire facility is above full pool elevation
6. McCloud Bridge Campground	One restroom, lower part of camp loop and shoreline campsites affected
7. Moore Creek Campground	Lower portion of loop road, shoreline campsites likely affected
8. Pine Point Campground	Possible that some shoreline campsites affected
Boat-in Campgrounds	
1. Greens Creek Boat-in Campground	Some shoreline campsites likely affected
Day-Use Areas	
1. Dekkas Rock Day Use Area	Lower portion of loop road and parking affected
2. McCloud Bridge Day Use Area	Most of picnic sites affected
Marinas	
1. Holiday Harbor Marina	Three buildings, boat ramp, and tank affected, some overflow parking affected; RV park and road to RV park affected
Trails[1]	
Bailey Cove Trail	Portion of trail along shoreline affected
Hirz Bay Trail	Portion of trail along shoreline affected
Samwel Cave Nature Trail	Portion of trail along shoreline affected

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Other Facilities	
1. Bollibokka Club	No effect–entire facility is above the full pool elevation
2. Campbell Creek Residence Tract cabins	At least seven cabins affected; possibly others also affected
3. Shasta Caverns ferry landing	Two buildings at east landing affected, access roads serving east and west shore landings partially affected
4. USFS Station (Turntable Bay)	Four buildings and access road affected
Squaw Arm	
Other Facilities	
1. Didallis Recreation Residence Tract cabins	At least one cabin affected; possible others also affected
Pit Arm	
Boat Ramps	
1. Jones Valley Public Boat Ramp	Boat ramp and turnaround area at top of ramp entirely affected, access road to parking lot partially affected
2. Packers Bay Public Boat Ramp	Boat ramp and restroom, information shelter, and pump house buildings affected, portion of parking affected
3. Mariners Point Campground	Some shoreline campsites likely affected
Campgrounds	
1. Lower Jones Valley Campground	One restroom building and trail footbridge affected, camp loop road and campsites partially affected
2. Upper Jones Valley Campground	No effect–entire facility is above full pool elevation
Boat-in Campgrounds	
1. Ski Island Boat-in Campground	Some shoreline campsites likely affected
2. Arbuckle Flat Boat-in Campground	Some shoreline campsites likely affected
Marinas	
1. Bridge Bay Resort and Marina	Most of facility–including eight buildings, boat ramp, parking lots, and roads–affected
2. Jones Valley Resort	Three buildings, parking area, ramp, and shoreline access roads affected
3. Packers Bay Marina	Access road from public ramp affected, boat ramp partially affected
4. Silverthorn Resort	Parking and ramp affected, shoreline access road partially affected

Table 18-6. Effects of CP2 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Trails[1]	
1. Clikapudi Trail	Trailhead and portion of trail along shoreline affected
2. Packers Bay Trails	Portion of trails (3 out of 4 trails) along shoreline affected
Other Facilities	
1. Silverthorn Recreation Residence Tract cabins	No effect–entire facility is above full pool elevation

Source: Reclamation 2003

Note:
[1] For some trails, trailheads are integrated into other recreation facilities. Alternative effects identified for standalone trailheads only.

Key:
CP = Comprehensive Plan
RV = recreational vehicle
USFS = U.S. Department of Agriculture, Forest Service

Under CP2, the recreation facilities on the Sacramento Arm that would be subject to effects on several features or a substantial portion of the facility's use area are one of the two boat ramps, three of the five campgrounds, two of the four marinas, four of the six nonmarina resorts, and the only operational day-use area. The USFS Lakeshore Fire Station, Dry Fork Creek trail and trailhead, Fisherman's Point trail, and at least one private cabin in the Salt Creek recreation residence tract would also be subject to major effects. One boat-in campground would be subject to a somewhat lesser but still substantial effects, while several additional facilities would be subject to relatively minor effects.

On the McCloud Arm, many of the major facilities would be subject to effects on several features or on a substantial portion of the facility's use area: both public boat ramps, both day-use areas, the one marina, four of seven public campgrounds, and the one boat-in campground. Other facilities affected to a similar degree are the USFS station at Turntable Cove, the Shasta Caverns Tour facilities on the east and west shores, Bailey Cove trail, and several of the cabins within the recreation residence tract on the east shore at Campbell Creek.

On the Squaw Creek Arm, one private cabin within the Didallis recreation residence tract would be affected. All but one of the public and commercial recreation facilities on the Pit Arm would be subject to major effects under CP2–both boat ramps, all four marinas, one of the two campgrounds, and both boat-in campgrounds.

Although they are not included in the table because of a lack of permanent infrastructure, shoreline camping areas at Beehive Point (Sacramento Arm), Gregory Beach (Sacramento Arm), Lower Salt Creek (Sacramento Arm), Jones

Valley Inlet (Pit Arm), and Mariner's Point (Pit Arm) would also be subject to substantial effects with the inundation of access roads and use areas.

Thus, the most prominent direct effects on recreation facilities and public access at Shasta Lake and in the vicinity under CP2 would be the major effects on five of six boat ramps, seven of nine marinas, four of six resorts, eight of 15 family and group campgrounds, all four boat-in campgrounds, and three of four day-use areas. Other facilities subject to major effects are USFS stations on the Sacramento and McCloud arms; trails and trailheads on the Sacramento, McCloud, and Pit arms (most located at day-use areas or boat ramps addressed above); the Shasta Caverns ferry landing; and several private cabins located within recreation residence tracts on the Sacramento, McCloud, and Squaw arms. Table 18-7 summarizes the number of recreation facilities of specific types substantially affected.

Table 18-7. Summary of Shasta Lake Recreation Facilities Substantially Affected by CP2

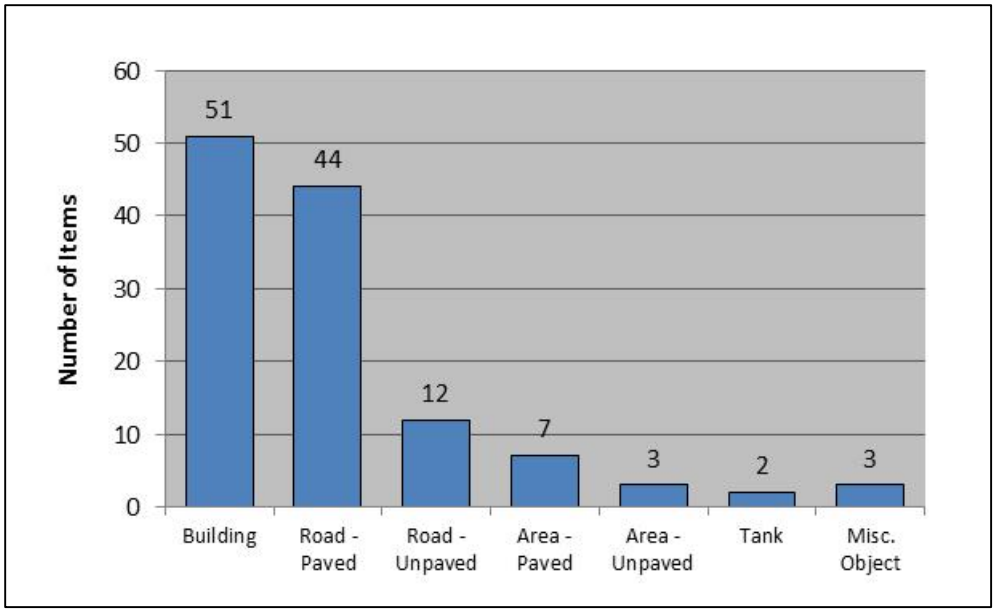
Type of Facility	Number of Facilities Affected
Boat ramp	5
Marina	7
Resort	4
Campground (family and group)	8
Day-use area	3
Boat-in campground	4
USFS operations	2
Trailhead/trail	2/7
Recreation residence tract	3
Commercial tour	1

Source: Reclamation 2003

Key:
CP = Comprehensive Plan
USFS = U.S. Department of the Interior, Forest Service

Somewhat lesser effects would occur at several campgrounds and one marina. Minor effects would occur at additional facilities of several types.

Figure 18-4 depicts the total number of inventoried Shasta Lake recreation facility items, at all recreation facilities combined, that would be affected by inundation under CP2. A total of 122 facility and infrastructure elements would be affected, with more than three-fourths of those being buildings and segments of paved roads. A lesser number of unpaved road segments, paved and unpaved areas (usually parking areas), tanks, and miscellaneous objects would also be affected.



Source: Reclamation 2003

Figure 18-4. Number of Recreation Facility Infrastructure Items Affected by a 12.5-Foot Dam Raise Under CP2

As described in Chapter 2, "Alternatives," Section 2.3.8, "Comprehensive Plan Construction Activities," affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP2): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and thus could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

This impact would be similar to Impact Rec-2 (CP1). If the increased dam-raise height relative to CP1 (12.5 feet versus 6.5 feet under CP1) would substantially lengthen the period during which construction would occur or would otherwise increase construction-related disruption in the dam area, the effects described

under CP1 could be increased. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5, "Mitigation Measures."

Impact Rec-3 (CP2): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP2, reservoir operations would be similar to existing operations, exception during dry and critical water years. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown associated with any water year type. Therefore, this impact would be less than significant.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP2): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 1,167 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps that would remain in these areas would increase the number of areas and total area where this type of hazard to boaters and other recreation visitors would exist. Therefore, this impact would be significant.

Approximately 1,167 acres (67 percent) of the 1,750 acres of newly inundated area that would result from the 12.5-foot dam raise at full pool would receive no vegetation treatment (no vegetation removed), to maximize the habitat benefits of inundated and residual vegetation. In general, this impact would be similar to Impact Rec-4 (CP1), although the total area of potential hazard from remaining trees and stumps would be greater under CP2. Because the untreated areas of the new inundation zone would represent an increased hazard to boaters and potentially other types of recreationists, this impact would be significant. Mitigation for this impact is proposed in Section 18.3.5, "Mitigation Measures."

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP2): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (averaging 14 percent or less for any month in all water year types); likewise, only a small additional area would be inundated relative to the

area inundated under existing conditions and the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-5 (CP1), because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-6 (CP2): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP2 would be small (averaging less than 14 percent for any month or water year type), adverse effects on boaters within the primary study area are unlikely. This impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-6 (CP1), because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-7 (CP2): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP2 would be small (averaging less than 14 percent for any month and water year type), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely. Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-7 (CP1), because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP2): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during summer when boating and swimming activity is most likely and during fall and winter

low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with CP2 would be small (averaging less than 10 percent for any month or water year type), and the timing of the decreases (fall and winter months) would be such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-8 (CP1), because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-9 (CP2): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

This impact would be similar to Impact Rec-9 (CP1) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP2): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program The proposed gravel augmentation program would not be implemented under CP2. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP2): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites The proposed restoration of flow through various sites along the upper Sacramento River, rehabilitation of the Reading Island boat ramp for use by motorized boats, and construction of a handicap fishing access area would not be implemented under CP2. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP2): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP2, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with

the increases, flows on the Sacramento, Feather, and American rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but slightly greater than Impact Rec-12 (CP1), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP2): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, Feather, and American rivers under CP2, and the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant.

Hydrologic changes in more distant areas of the CVP/SWP service areas resulting from CP2 cannot be accurately predicted but would be small. Such slight changes occur on a dynamic and daily basis under existing conditions as water is moved throughout California. Other CVP and SWP reservoir elevations, canal flows, and flows below the reservoirs could be modified slightly, but any resulting impacts on recreation would be negligible and speculative.

This impact would be similar to but slightly greater than Impact Rec-13 (CP1), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP2): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous and thus less attractive to river users. However, given the timing of the likely flow increases under CP2, the flow conditions under which such increases would occur, and the continuation

of moderate flows even with the increase, adverse effects on swimmers and waders within the extended study area are unlikely. This impact would be less than significant for CP2.

This impact would be similar to but slightly greater than Impact Rec-14 (CP1), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP2): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP2 and the timing of the changes, effects on these recreation uses of the Sacramento River within the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

This impact would be similar to but slightly greater than Impact Rec-15 (CP1), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

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

Like each of the alternatives discussed above, CP3 would alter storage and operations at Shasta Lake, thus changing the full pool elevation at Shasta Lake, and the seasonal pool elevations and the flow regime in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of some types of recreation facilities on the lake and downstream waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

The full pool elevation of Shasta Lake would increase by 20.5 feet and the pool elevation would average as much as 18 to 24 feet higher than under existing (2005) and No-Action (2030) conditions at various times of the year. The greatest change would occur during the wettest years. Raising the dam by 18.5 feet would increase the surface area of the reservoir at full pool by about 2,570 acres (9

percent). The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

In general, the proposed changes in flow and river stage on the upper Sacramento River associated with CP3 are more substantial than the changes associated with CP1 and CP2. However, these changes are still within a few percentage points of the changes associated with CP1 and CP2, as outlined above.

Reservoir- and river-based recreation facilities and activities in the primary and extended study areas downstream from Shasta Lake are similar; thus, potential reservoir and river recreation impacts would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of impacts.

Shasta Lake and Vicinity

Impact Rec-1 (CP3): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 20.5-foot increase in full pool elevation associated with an 18.5-foot dam raise would cause seasonal inundation of recreation facilities or portions of facilities at Shasta Lake, such as boat launch ramps, campgrounds, marinas, and day-use areas. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,087.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. The replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with ADA and ABA guidelines. Therefore, this impact would be less than significant.

Within each of the three arms of Shasta Lake with recreation development, effects of implementing CP3 on individual recreation facilities would vary. These effects would range from no effect to effects on several of the facilities' inventoried and mapped features (e.g., roads, parking, and restrooms or other buildings) and on features not specifically inventoried (e.g., campsites and picnic sites). Table 18-8 shows the anticipated effects of CP3 on inventoried and mapped (developed) recreation facilities.

Table 18-8. Effects of CP3 on Developed Recreation Facilities at Shasta Lake

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Sacramento Arm	
Boat Ramps	
1. Antlers Public Boat Ramp	Boat ramp entirely affected; courtesy dock and rail would also be affected; restroom may be affected; parking lot is primarily unaffected
2. Centimudi Public Boat Ramp	Boat ramp and lower parking entirely affected, part of access road to ramp and lower parking affected
Campgrounds	
1. Antlers Campground	Amphitheater may be affected; shoreline erosion may threaten portions of site
2. Gregory Creek Campground	Two restrooms, lower half of campground road, and associated campsites affected
3. Lakeshore East Campground	One restroom and majority of campground road and campsites affected; access substantially affected
4. Nelson Point Campground	Most of campground road and several campsites affected
5. Oak Grove Campground	All features are above full pool elevation; access road affected
Boat-in Campgrounds	
1. Gooseneck Cove Boat-in Campground	Most shoreline campsites likely affected
Day-Use Areas	
1. Fisherman's Point Day Use Area	Parking and restroom unaffected but most picnic sites affected; also loss of access to shoreline trail
2. Salt Creek Swim Area (nonoperational)	Two restrooms, bathhouse, and paved pathways affected
Marinas	
1. Antlers Resort and Marina	Generator/pumphouse building and boat ramp/dock access road affected
2. Digger Bay Marina	One building affected; lower portion of marina access road/ramp affected, but appears to remain usable
3. Shasta Marina Resort	Three buildings (office, equipment shed, residence) affected; most parking and access roads affected
4. Sugarloaf Resort and Marina	Electrical service building and associated structures affected, boat ramp and unpaved parking areas partially affected

Table 18-8. Effects of CP3 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Resorts (Nonmarina)	
1. Lakeshore Inn and RV Park	Shoreline campsites and walkway, storage building, cabin, covered patio area affected; underground septic system may be affected; access substantially affected
2. Lakeshore Villa RV Park	No effect–entire facility is above full pool elevation
3. Salt Creek Resort and RV Park	Resort unaffected; old road bed used as boat ramp (outside resort) affected
4. Shasta Lake RV Resort	Resort office affected; access substantially affected
5. Sugarloaf Cottages Resort	Seven cottages and large portion of unpaved cabin and shoreline access roads affected
6. Tsasdi Resort	Five cabins and entrance and exit roads connecting to Lakeshore Drive affected
Trails[1]	
1. Dry Fork Creek Trail	Trailhead and portion of trail along shoreline affected
2. Fisherman's Point Trail	Portion of trail along shoreline affected
Other Facilities	
1. USFS Lakeshore Fire Station	Five buildings and entrance road affected (entire facility)
2. Salt Creek Recreation Residence Tract cabins	At least one cabin affected; possibly others also affected
McCloud Arm	
Boat Ramps	
1. Bailey Cove Boat Ramp and Day Use Area	Boat ramp, parking area, day-use area, and access road entirely affected
2. Hirz Bay Public Boat Ramp	Boat ramp and lower parking area, restroom entirely affected
Campgrounds	
1. Bailey Cove Campground	Access road from ramp/day-use area affected
2. Dekkas Rock Campground	Loop road and associated portion of group camp affected
3. Ellery Creek Campground	Most of loop road and associated campsites affected
4. Hirz Bay Campgrounds	No effect entire facility is above full pool elevation
5. Kamloop Camp (private organization)	One building affected
6. McCloud Bridge Campground	Entire facility–two restrooms, camp loop road, and associated campsites–affected

Table 18-8. Effects of CP3 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
7. Moore Creek Campground	Lower portion of loop road and shoreline campsites appear to be affected
8. Pine Point Campground	Possible that some shoreline campsites affected
Boat-in Campgrounds	
1. Greens Creek Boat-in Campground	Most shoreline campsites likely affected
Day-Use Areas	
1. Dekkas Rock Day Use Area	Loop road and associated picnic sites and parking affected
2. McCloud Bridge Day Use Area	Entire facility, including picnic sites and restroom, affected
Marinas	
1. Holiday Harbor Marina	Entire facility, including three buildings, boat ramp, and tank affected; most parking, RV park, and road to RV park affected
Trails[1]	
Bailey Cove Trail	Portion of trail along shoreline affected
Hirz Bay Trail	Portion of trail along shoreline affected
Samwel Cave Nature Trail	Portion of trail along shoreline affected
Other Facilities	
1. Bollibokka Club	Facility appears to be unaffected; McCloud Arm would extend near one building and one miscellaneous object, which may be affected
2. Campbell Creek Recreation Residence Tract cabins	At least eight cabins affected; possibly others also affected
3. Shasta Caverns ferry landing	Most of east and west side landings affected; two buildings at east landing, and access roads serving east and west shore landings also affected
4. USFS Station (Turntable Bay)	Entire facility, including four buildings and access road, affected
Squaw Arm	
Other Facilities	
1. Didallis Recreation Residence Tract cabins	At least one cabin affected; possibly others also affected

Table 18-8. Effects of CP3 on Developed Recreation Facilities at Shasta Lake (contd.)

Facility Name	Explanation of Effects on Facility at Full Pool Elevation
Pit Arm	
Boat Ramps	
1. Jones Valley Public Boat Ramp	Boat ramp and turnaround area at top of ramp entirely affected, access road to parking lot partially affected
2. Packers Bay Public Boat Ramp	Boat ramp and restroom, information shelter, and pump house buildings affected; large portion of parking affected
Campgrounds	
1. Lower Jones Valley Campground	ne restroom building, trail footbridge, and large portion of camp loop road and associated campsites affected
2. Upper Jones Valley Campground	No effect–entire facility is above full pool elevation
3. Mariners Point Campground	Some shoreline campsites likely affected
Boat-in Campgrounds	
1. Ski Island Boat-in Campground	Most shoreline campsites likely affected
2. Arbuckle Flat Boat-in Campground	Most shoreline campsites likely affected
Marinas	
1. Bridge Bay Resort and Marina	Nearly entire facility–eight buildings, boat ramp, parking lots, and access roads–affected
2. Jones Valley Resort	Most of facility–five buildings, parking area, ramp, and shoreline access roads – affected
3. Packers Bay Marina	Access road from public ramp and marina ramp affected
4. Silverthorn Resort	Most of facility–resort office and restaurant building, parking, ramp, and shoreline access road – affected
Trails[1]	
1. Clikapudi Trail	Trailhead and portion of trail along shoreline affected
2. Packers Bay Trails	Portion of trails (3 out of 4 trails) along shoreline affected
Other Facilities	
1. Silverthorn Recreation Residence Tract cabins	No effect–entire facility is above full pool elevation

Source: Reclamation 2003

Note:
[1] For some trails, trailheads are integrated into other recreation facilities. Alternative effects identified for standalone trailheads only.

Key:
CP = Comprehensive Plan
RV = recreational vehicle
USFS = U.S. Department of Agriculture, Forest Service

Under CP3, nearly all of the public and commercial recreation facilities on the Sacramento Arm would be subject to effects on several features or a substantial portion of the facility's use area. Both boat ramps, three of the five campgrounds, two of the four marinas, four of the six nonmarina resorts, one boat-in campground, and the one operational day-use area would all be subject to these major effects. The USFS Lakeshore Fire Station and the Dry Fork Creek trail and trailhead, Fisherman's Point trail, and at least one private cabin in the Salt Creek recreation residence tract would also be subject to major effects. Salt Creek Swim Area would also be subject to major effects, which is currently not operational but is used occasionally for overflow camping and as a base camp for firefighting crews. One marina would be subject to lesser but still substantial effects, and several of the remaining facilities would be subject to minor effects.

On the McCloud Arm, both public boat ramps, both day-use areas, the one marina, five of eight campgrounds, and the one boat-in campground would be subject to major effects. Other facilities that would experience major effects are the USFS station at Turntable Cove, the Shasta Caverns Tour facilities on the east and west shores, Bailey Cove trail, and at least eight cabins on the east shore within the Campbell Creek recreation residence tract.

On the Squaw Creek Arm, one cabin within the Didallis recreation residence tract would be affected. Anticipated effects on recreation facilities on the Pit Arm under CP3 are similar to those that would occur under CP2. All but one of the public and commercial recreation facilities–both boat ramps, all four marinas, one of the two campgrounds, and both boat-in campground–would be subject to major effects.

Shoreline camping areas at Beehive Point (Sacramento Arm), Gregory Beach (Sacramento Arm), Lower Salt Creek (Sacramento Arm), Jones Valley Inlet (Pit Arm), and Mariner's Point (Pit Arm) would also be subject to substantial effects, with the unpaved access roads and use areas mostly inundated.

The most prominent direct effects on recreation facilities and public access at Shasta Lake and in the vicinity under CP3 would be the major effects on all six boat ramps, eight of nine marinas, four of six nonmarina resorts, nine of 15 family and group campgrounds, all four boat-in campgrounds, and all four day-use areas. Other facilities subject to major effects are USFS stations on the Sacramento and McCloud arms; trails and trailheads on the Sacramento, McCloud, and Pit arms (most located at day-use areas or boat ramps addressed above); the Shasta Caverns ferry landing; and several private cabins located within recreation residence tracts on the Sacramento, McCloud, and Squaw arms. Many of these facilities would be entirely or nearly inundated at the new full pool elevation associated with CP3. Table 18-9 summarizes the number of recreation facilities of specific types affected.

Table 18-9. Tally of Shasta Lake Recreation Facilities Substantially Affected by CP3

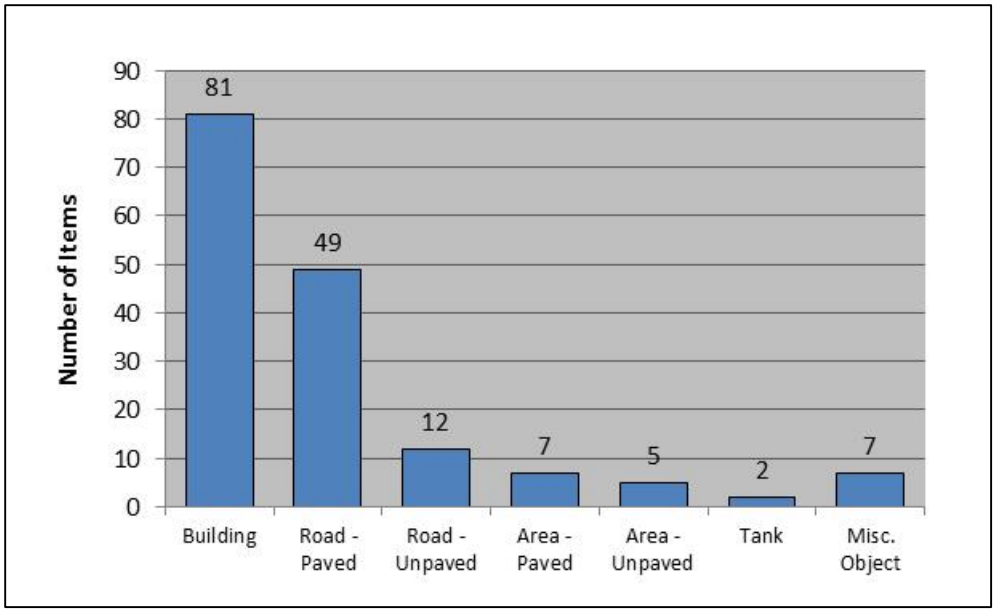
Type of Facility	Number of Facilities Affected
Boat ramp	6
Marina	8
Resort	4
Campground (family and group)	8
Private campground	1
Day-use area	4
Boat-in campground	4
USFS operations	2
Trailhead/trail	2/7
Recreation residence tract	3
Commercial tour	1

Source: Reclamation 2003

Key:
CP = Comprehensive Plan
USFS = U.S. Department of Agriculture, Forest Service

Somewhat lesser but still considerable effects would occur at one campground and one marina, while relatively minor effects would occur at additional facilities of several types.

Figure 18-5 depicts the total number of inventoried Shasta Lake recreation facility items, at all recreation facilities combined, that would be affected by inundation under CP3. A total of 163 facility and infrastructure elements would be affected, with more than three-fourths of those being buildings and segments of paved roads. A lesser number of unpaved road segments, paved and unpaved areas (usually parking areas), tanks, and miscellaneous objects would also be affected.



Source: Reclamation 2003

Figure 18-5. Number of Recreation Facility Infrastructure Items Affected by an 18.5-Foot Dam Raise Under CP3

As described in Chapter 2, "Alternatives," Section 2.3.8, "Comprehensive Plan Construction Activities," affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP3): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and thus could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

This impact would be similar to Impact Rec-2 (CP1). If the increased dam raise height relative to CP1 (18.5 feet versus 6.5 feet under CP1) would substantially lengthen the period during which construction would occur or would otherwise increase construction-related disruption in the dam area, the effects described

under CP1 could be increased. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5, "Mitigation Measures."

Impact Rec-3 (CP3): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP3, reservoir operations would be similar to existing operations. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown. Therefore, this impact would be less than significant.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP3): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 1,738 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps that would remain in these areas would increase the number of areas and total area where this type of hazard to boaters and other types of recreation visitors would exist. Therefore, this impact would be significant.

Approximately 1,738 acres (68 percent) of the 2,570 acres of newly inundated area that would result from the 18.5-foot dam raise at full pool would receive no vegetation treatment (no vegetation removed), to maximize the habitat benefits of inundated and residual vegetation. In general, this impact would be similar to Impacts Rec-4 (CP1) and Rec-4 (CP2), although the total area of potential hazard resulting from remaining trees and stumps would be greater under CP3 than under CP1 or CP2. Because the untreated areas of the new inundation zone would represent an increased hazard to boaters and potentially other types of recreationists, this impact would be significant. Mitigation for this impact is proposed in Section 18.3.5, "Mitigation Measures."

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP3): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (averaging 15 percent or less for any month in all water year types); likewise, only a small additional area would be inundated relative to the

area inundated under existing conditions or the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-5 (CP1) and Rec-5 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-6 (CP3): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP3 would be small (averaging less than 15 percent for any month or water year type), adverse effects on boaters within the primary study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-6 (CP1) and Rec-6 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-7 (CP3): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP3 would be small (averaging less than 15 percent for any month or water year type), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely. Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-7 (CP1) and Rec-7 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP3): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during summer when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with CP3 would be small (averaging less than 12 percent for any month or water year type), and the timing of the decreases (fall and winter months) would be such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-8 (CP1) and Rec-8 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-9 (CP3): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

This impact would be similar to Impact Rec-9 (CP1) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP3): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program The proposed gravel augmentation program would not be implemented under CP3. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP3): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites The proposed restoration of flow through various sites along the upper Sacramento River, rehabilitation of the Reading Island boat ramp for use by motorized boats, and construction of a handicap fishing access area would not be implemented under CP3. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP3): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows

Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP3, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with the increases, flows on the Sacramento and Feather rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-12 (CP1) and Rec-12 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP3): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult boating launching and boating conditions on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, Feather, and American rivers under CP3, and the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant.

Hydrologic changes in more distant areas of the CVP and SWP service areas resulting from CP3 cannot be accurately predicted but would be small. Such slight changes occur on a dynamic and daily basis under existing conditions as water is moved throughout California. Other CVP and SWP reservoir elevations, canal flows, and flows below the reservoirs could be modified slightly, but any resulting effects on recreation would be negligible and speculative.

This impact would be similar to but greater than Impacts Rec-13 (CP1) and Rec-13 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP3): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when

swimming activity is most likely and during nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous and thus less attractive to river users. However, given the timing of the likely flow increases under CP3, the conditions under which such increases would occur, and the continuation of moderate flows even with the increase, adverse effects on swimmers and waders in the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-14 (CP1) and Rec-14 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP3): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP3 and the timing of the changes, effects on these recreation uses of the Sacramento River in the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

This impact would be similar to but greater than Impacts Rec-15 (CP1) and Rec-15 (CP2), because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP3 than under CP1 or CP2. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

Like each of the alternatives discussed above, CP4 or CP4A would increase storage at Shasta Lake, thus changing the full pool elevation at Shasta Lake, and the seasonal pool elevations and the flow regime in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of some types of recreation facilities on the lake and downstream waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

As under CP3, under CP4 or CP4A, the full pool elevation of Shasta Lake would increase by 20.5 feet and the pool elevation would average as much as 18 to 24 feet higher than under existing (2005) and No-Action Alternative (2030) conditions at various times of the year. The greatest change would occur during the driest years. However, the dedicated Shasta Lake cold water storage for fisheries benefit of 378,000 acre-feet for CP4, and dedicated storage of 191,000 acre-feet for CP4A, is unique to CP4 and CP4A and would result in different drawdown scenarios than under CP3.

Raising the dam by 18.5 feet would increase the surface area of the reservoir at full pool by about 2,570 acres (9 percent). In general, the effect of this increase would be slight, given that the reservoir would exceed the current full pool elevation only during wetter-than-normal years. Also, the increase in acreage would be distributed around the several hundred miles of the reservoir's rim. The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

The changes in flow and river stage on the upper Sacramento River associated with CP4 would be the same as the changes associated with CP1, as outlined above, in that the operated storage of 256,000 acre-feet would be the same for CP1 and CP4.

The changes in flow and river stage on the upper Sacramento River associated with CP4A would be the same as the changes associated with CP2, as outlined above, in that the operated storage of 443,000 acre-feet would be the same for CP2 and CP4A.

Reservoir- and river-based recreation facilities and activities are similar in the primary and extended study areas downstream from Shasta Lake; thus, potential reservoir and river recreation impacts would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of effects.

Shasta Lake and Vicinity

Impact Rec-1 (CP4 and CP4A): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 20.5-foot increase in full pool elevation associated with an 18.5-foot dam raise would cause inundation of recreation facilities or portions of facilities at Shasta Lake. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,087.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. The

replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with ADA and ABA guidelines. Therefore, this impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Rec-1 (CP3) because the full pool elevation would increase by the same amount under CP4 or CP4A as under CP3. The same developed recreation facilities would be inundated under CP4 or CP4A as under CP3 (see Tables 18-8 and 18-9 and Figure 18-5).

As described in Chapter 2, "Alternatives," Section 2.3.8, "Comprehensive Plan Construction Activities," affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP4 and CP4A): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

This impact would be similar to Impact Rec-2 (CP1). If the increased dam-raise height relative to CP1 (18.5 feet versus 6.5 feet under CP1) would substantially lengthen the period during which construction would occur or otherwise increase construction-related disruption in the dam area, the effects described under CP1 could be increased.

This impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 18.3.5, "Mitigation Measures."

This impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 18.3.5, "Mitigation Measures."

Impact Rec-3 (CP4 and CP4A): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown

could have beneficial effects. However, under CP4 or CP4A, reservoir operations would be similar to existing operations, except during dry and critical water years. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown associated with any water year type. Therefore, this impact would be less than significant for CP4 or CP4A.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP4 and CP4A): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 1,738 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps that would remain in these areas would increase the number of areas and total area where this type of hazard to boaters and other types of recreation visitors would exist. Therefore, this impact would be significant for CP4 or CP4A.

This impact would be the same as Impact Rec-4 (CP3) and would be significant for CP4. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

This impact would be the same as Impact Rec-4 (CP3) and would be significant for CP4A. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP4 and CP4A): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows

Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (8 percent or less for any month in all water year types for CP4 and 14 percent or less for any month in all water year types for CP4A); likewise, only a small additional area would be inundated relative to the area inundated under existing conditions and the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Rec-5 (CP1) for CP4 and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to but slightly greater than Impact Rec-5 (CP1) for CP4A because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-6 (CP4 and CP4A): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP4 or CP4A would be small (averaging less than 8 percent for any month in all water year types for CP4 and 14 percent of less for any month in all water year types for CP4A), adverse effects on boaters within the primary study area are unlikely. As a result, this impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Rec-6 (CP1) and would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to but slightly greater than Impact Rec-6 (CP1) for CP4A, because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-7 (CP4 and CP4A): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP4 or CP4A would be small (averaging less than 8 percent for any month in any water year type for CP4 and 14 percent of less for any month in all water year types for CP4A), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely. Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Rec-7 (CP1) for CP4 and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to but slightly greater than Impact Rec-7 (CP1) for CP4A, because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP4 and CP4A): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during the summer months when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with CP4 or CP4A is small (averaging less than 7 percent for any month or water year type for CP4 and 10 percent of less for any month in all water year types for CP4A), and the timing of the decreases (fall and winter months) is such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Rec-8 (CP1) for CP4 and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to but slightly greater than Impact Rec-8 (CP1) for CP4A because the alteration of the flow regime of the Sacramento River would be more substantial under CP2 than under CP1. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-9 (CP4 and CP4A): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations, as well as steelhead, American shad, and striped bass. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial for CP4 or CP4A.

Chinook salmon, steelhead, American shad, and striped bass all contribute to the popular sport fishery in the upper Sacramento River. With increased flows and cooler water temperature resulting from project operation, salmon populations would benefit from reduced mortality. Cooler water temperatures would also create more suitable conditions in the river for steelhead, American shad, and striped bass. These beneficial effects on game fish species could result in

enhanced angling opportunities on the upper Sacramento River, which would have a beneficial effect on recreation for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP4 and CP4A): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program Access to and boating on the upper Sacramento River may be affected temporarily while gravel is placed in the river under the proposed gravel augmentation program. However, gravel placement would occur during only a 1-month period and most augmentation sites would not be adjacent to public river access sites; further, the method of gravel deposition would have little effect on boating. The program could increase the number of shallows encountered by boaters, but shallows are normal characteristics of the targeted river reaches. Therefore, this impact would be less than significant for CP4 or CP4A.

The proposed gravel augmentation program could affect boating on the upper Sacramento River by increasing the number of shallow riffles where boating could be made more difficult or hazardous, or where boats may drag the bottom during low-water periods. In the short term, river access and boating may be affected while the gravel is being placed in the river. However, the program would affect only a few sites between Keswick Dam and Clear Creek each year, and the sites under consideration are well distributed along more than 10 miles of the river. Gravel placement would most likely occur only during an approximately 1-month period of late summer (late August to late September), limiting the time during which access or boating could be disrupted. Only a few of the gravel augmentation sites under consideration are adjacent to public river access sites, where access could be disrupted for 1 or 2 days during gravel placement. Deposition of gravel at most sites would occur using a talus cone or lateral berm method, which would use dump trucks or conveyors to place gravel near the riverbank, and would have little effect on boating. Only a few sites would use a direct placement method, which would use front-end loaders to deposit gravel directly in the river channel, and which could conflict with boating during the 1 or 2 days of gravel deposition.

The gravel augmentation program would increase the number of shallows that boaters on the river could encounter. However, shallows as well as rocks and other obstructions are normal characteristics of the targeted reaches of the river (Tuthill 2005). As a result, the boats most commonly used on the upper river (e.g., shallow-draft prop and jet-driven power boats, canoes, kayaks, and rafts) are able to navigate shallow waters, and published boating guides warn boaters of depth changes caused by shifting sands and silts, shallowness, snags, and other obstructions they may encounter (DBW 2011b). For these reasons, both short- and long-term effects on river access and boating are likely to be minimal. As a result, this impact would be less than significant for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP4 and CP4A): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites Restoring flow through various sites along the upper Sacramento River would increase boating and fishing access and opportunities for day-use visitors to the park. This impact would be beneficial for CP4 or CP4A.

Several options for restoring the upper Sacramento River to enhance habitat for anadromous salmonid fish species exist, including restoring flow through Anderson Slough at Reading Island. The restoration at Anderson Slough would deepen the slough and flush out the aquatic vegetation that now clogs the waterway and renders the Reading Island boat ramp on the slough nearly unusable. Also under consideration are rehabilitation of the boat ramp for motorized boat use and construction of a handicap fishing access area. These actions to restore habitat and rehabilitate and enhance recreation facilities would increase boating and fishing access and opportunities for day-use visitors to the park. They would also make the park more functional and attractive for river float trip groups that occasionally camp at the island under BLM special-use permits. This impact would be beneficial for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP4 and CP4A): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP4 or CP4A, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with the increases, flows on the Sacramento, Feather, and American rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Rec-12 (CP1) for CP4 and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to but slightly greater than Impact Rec-12 (CP1) for CP4A because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP4 and CP4A): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result

of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, Feather, and American rivers under CP4 or CP4A, and the continuation of moderate flows even with the increase, suggest that adverse effects on boaters within the extended study area are unlikely. This impact would be less than significant for CP4 or CP4A.

Hydrologic changes in more distant areas of the CVP/SWP service areas resulting from CP4 or CP4A cannot be accurately predicted but would be small. Such slight changes occur on a dynamic and daily basis under existing conditions as water is moved throughout California. Other CVP and SWP reservoir elevations, canal flows, and flows below the reservoirs could be slightly modified, but any resulting impacts on recreation would be negligible and speculative.

This impact would be the same as Impact Rec-13 (CP1) for CP4 and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to but slightly greater than Impact Rec-13 (CP1) for CP4A because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP4 and CP4A): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and during nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous and thus less attractive to river users. However, given the timing of the likely flow increases under CP4 or CP4A, the conditions under which such increases would occur, and the continuation of moderate flows even with the increase, adverse effects on swimmers and waders within the extended study area are unlikely. This impact would be less than significant for CP4 or CP4A.

This impact would be the same as Impact Rec-14 (CP1) for CP4 and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to but slightly greater than Impact Rec-14 (CP1) for CP4A because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP4 and CP4A): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP4 or CP4A, and the timing of the changes, effects on these recreation uses of the Sacramento River in the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant for CP4 or CP4A.

This impact would be the same as Impact Rec-15 (CP1) for CP4 and would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

This impact would be similar to but slightly greater than Impact Rec-15 (CP1) for CP4A because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be more substantial under CP2 than under CP1. This impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

CP5 – 18.5-Foot Dam Raise, Combination Plan

Like each of the alternatives discussed above, CP5 would increase storage at Shasta Lake, thus increasing the full pool elevation at Shasta Lake, and the seasonal pool elevations and the flow regime in the Sacramento River and potentially several other reservoirs and downstream waterways. In turn, these alterations to reservoir pool elevations and river flows could affect the usability of some types of recreation facilities on the lake and downstream waterways, particularly marinas, boat ramps, and nearshore campgrounds and day-use areas. These alterations could also affect the ability of recreationists to use the reservoirs and waterways for boating, camping, fishing, and similar activities.

The full pool elevation of Shasta Lake would increase by 20.5 feet and the pool elevation would average as much as 18 to 24 feet higher than under existing (2005) and No-Action Alternative (2030) conditions at various times of the year. The greatest change would occur during the wettest years. Raising the dam by 18.5 feet would increase the surface area of the reservoir at full pool by about 2,570 acres (9 percent). In general, the effect of this increase would be slight,

given that the reservoir would exceed the current full pool elevation only during wetter-than-normal years. Also, the increase in acreage would be distributed around the several hundred miles of the reservoir's rim. The width of the water body would not increase substantially in most areas, and much of the increase would occur during spring rather than during the high-traffic summer boating period.

Changes in flow and river stage on the upper Sacramento River associated with CP5 would be similar to those associated with CP3, as outlined above.

Reservoir- and river-based recreation facilities and activities in the primary and extended study areas downstream from Shasta Lake are similar; thus potential reservoir and river recreation impacts would be similar. However, changes to the flow regime affecting reservoirs and rivers in the extended study area would be increasingly attenuated by flows from tributary waterways and other water sources and diversions that are unaffected by the project, reducing the level of impacts.

Shasta Lake and Vicinity

Impact Rec-1 (CP5): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation The 20.5-foot increase in full pool elevation associated with an 18.5-foot dam raise would cause seasonal inundation of recreation facilities or portions of facilities at Shasta Lake. In many years, the reservoir would fill to an elevation greater than the current full pool elevation of 1,067 feet; in some years, it would fill to the new full pool elevation of 1,087.5 feet. In each case, portions of existing recreation facilities on the shoreline would be inundated, resulting in substantial effects. However, the affected recreation facilities would be relocated during construction and before inundation. The replacement facilities would be of equivalent overall capacity and quality to the affected facilities; would provide comparable shoreline access, where applicable; and would comply with ADA and ABA guidelines. Therefore, this impact would be less than significant.

This impact would be the same as Impact Rec-1 (CP3) because the full pool elevation would increase by the same amount under CP5 as under CP3. The same developed recreation facilities would be inundated under CP5 as under CP3 (see Tables 18-8 and 18-8 and Figure 18-5).

As described in Chapter 2, "Alternatives," Section 2.3.8, "Comprehensive Plan Construction Activities," affected recreation facilities would be relocated as part of the construction activities for all action alternatives. This could include relocation of affected portions of facilities within existing use areas, in adjacent undeveloped areas, or at new sites in the general vicinity of the lake. Because of the possible consolidation of facilities, the total number of facilities of specific types may be reduced. However, all affected recreation capacity would be replaced. Replacement facilities would be of equivalent overall capacity and

quality to affected facilities and would provide comparable shoreline access, where applicable. With the relocation of affected facilities, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-2 (CP5): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam Construction activity that would be necessary to raise Shasta Dam and complete related modifications would prevent recreation visitors from crossing the dam, and could affect other recreation activities in the area. These effects are expected only during the construction period. However, this impact would be potentially significant.

This impact would be similar to Impact Rec-2 (CP1). If the increased dam-raise height relative to CP1 (18.5 feet versus 6.5 feet under CP1) would substantially lengthen the period during which construction would occur or otherwise increase construction-related disruption in the dam area, the effects described under CP1 could be increased. This impact would be potentially significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

Impact Rec-3 (CP5): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir An increase in the magnitude or rate or changes in the timing of the annual summer and fall drawdown of Shasta Lake could adversely affect boating enjoyment and safety on the reservoir. Conversely, a reduced or slower drawdown could have beneficial effects. However, under CP5, reservoir operations would be similar to existing operations, except during dry and critical water years. Little change would occur in the annual magnitude, rate, or timing of reservoir drawdown associated with any water year type. Therefore, the impact would be less than significant.

This impact would be similar to Impact Rec-3 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-4 (CP5): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone At full pool, the increased pool elevation would result in approximately 1,738 acres of newly inundated area where the existing trees and other vegetation would not be removed. Anglers would generally benefit from the associated enhancement of fish habitat; however, the standing trees and stumps that would remain in these areas would increase the number of areas and total area where this type of hazard to boaters and other recreation visitors would exist. Therefore, this impact would be significant.

This impact would be the same as Impact Rec-4 (CP3) and would be significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Rec-5 (CP5): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows Within the upper Sacramento River portion of the primary study area, increased mean monthly river flows associated with project implementation and operation could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. In general, the flow increases that would occur in some years would be expected to be small (19 percent or less for any month in all water year types); likewise, only a small additional area would be inundated relative to the area inundated under existing conditions or the No-Action Alternative. As a result, the adverse effects are unlikely to be substantial. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-5 (CP1), Rec-5 (CP2), and Rec-5 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-6 (CP5): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the primary study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River. Depending on the time of year and base river flows, increased flow may also have beneficial effects. Because the magnitude of flow increases associated with CP5 would be small (averaging less than 19 percent for any month in all water year types), adverse effects on boaters within the primary study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-6 (CP1), Rec-6 (CP2), and Rec-6 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-7 (CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows Increased mean monthly flows within the upper Sacramento River, particularly during summer when swimming activity is most likely and during fall and winter nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. Increased flows can make swimming and wading more challenging and potentially more hazardous. The magnitude of flow increases associated with CP5 would be small (averaging less than 19 percent for any month in all water year types), and the timing of the increases would be such that adverse effects on angling waders within the primary study area are unlikely.

Swimming is not a common activity on the main channel of the river because of cold-water temperatures. As a result, this impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-7 (CP1), Rec-7 (CP2), and Rec-7 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-8 (CP5): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows Decreased mean monthly flows within the primary study area, particularly during summer when boating and swimming activity is most likely and during fall and winter low-flow periods when wade angling activity is most likely, could result in enhanced boating, swimming, and wading conditions. Decreased flows during normally high-flow periods can make boating less challenging and potentially less hazardous. The magnitude of flow decreases associated with CP5 would be small (averaging less than 12 percent for any month or water year type), and the timing of the decreases (fall and winter months) would be such that effects on boaters, swimmers, and waders within the primary study area are unlikely. As a result, this impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-8 (CP1), Rec-8 (CP2), and Rec-8 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-9 (CP5): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures Project operation would result in improved flow and water temperature conditions in the upper Sacramento River, which would benefit Chinook salmon populations. This would result in enhanced populations of these game fish in the river, which would provide enhanced sport angling opportunities. This impact would be beneficial.

This impact would be the same as Impact Rec-9 (CP2) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-10 (CP5): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program Access to and boating on the upper Sacramento River may be affected temporarily while gravel is placed in the river under the proposed gravel augmentation program. However, gravel placement would occur during only a 1-month period and most augmentation sites would not be adjacent to public river access sites; further, the method of gravel deposition would have little effect on boating. The program could increase the number of shallows encountered by boaters, but shallows are normal

characteristics of the targeted river reaches. Therefore, this impact would be less than significant.

This impact would be the same as Impact Rec-10 (CP4 and CP4A) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-11 (CP5): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites Restoring flow through various sites along the upper Sacramento River would increase boating and fishing access and opportunities for day-use visitors to the park. This impact would be beneficial.

This impact would be the same as Impact Rec-11 (CP4 and CP4A) and would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Rec-12 (CP5): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Within the extended study area, if increased mean monthly river flows were to occur in some months of some years as a result of project implementation and operation under CP5, the increased flows could inundate recreation facilities or portions of recreation facilities, such as boat launch ramps and unimproved riverbank sites used for boat launching and other activities. However, even with the increases, flows on the Sacramento, Feather, and American rivers would remain moderate and well below normal winter and spring high flows. As a result, adverse effects on river facilities or informal use areas within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-12 (CP1), Rec-12 (CP2), and Rec-12 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-13 (CP5): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly flows within the extended study area, particularly during summer and fall when boating activity is most likely, could result in more difficult conditions for boat launching and boating on the Sacramento River and other rivers affected by the project. Depending on the time of year and base river flows, increased flow may also have beneficial effects on boating by reducing shallow bars and riffles, thus improving navigability. However, the timing and flow conditions under which the flow increases are likely to occur on the Sacramento, American, and Feather rivers under CP5, and the continuation of moderate flows even with the increase, suggest that adverse

effects on boaters within the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-13 (CP1), Rec-13 (CP2), and Rec-13 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-14 (CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers below CVP and SWP Reservoirs as a Result of Increased River Flows Increased mean monthly river flows within the extended study area during some months of some years, particularly during summer when swimming activity is most likely and during nonpeak-flow periods when wade angling activity is most likely, could result in more difficult swimming and wading conditions. These activities could become more hazardous and thus less attractive to river users. However, given the timing of the likely flow increases under CP5, the conditions under such increases would occur, and the continuation of moderate flows even with the increase, adverse effects on swimmers and waders in the extended study area are unlikely. This impact would be less than significant.

This impact would be similar to but greater than Impacts Rec-14 (CP1), Rec-14 (CP2), and Rec-14 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Rec-15 (CP5): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows Decreased mean monthly flows below CVP and SWP reservoirs during fall and winter low-flow periods when wade angling activity is most common, and during summer and fall when boating and river floating is popular in some areas, could have adverse effects if reduced flows were to reduce fishing success or boating navigability. Given the modest flow decreases in the Sacramento River associated with CP5 and the timing of the changes, effects on these recreation uses of the Sacramento River within the extended study area are unlikely. However, given the magnitude and timing of the largest flow decreases during some years on the Feather and American rivers below CVP and SWP reservoirs in the extended study area, adverse effects may occur. This impact would be potentially significant.

This impact would be similar to but greater than Impacts Rec-15 (CP1), Rec-15 (CP2), and Rec-15 (CP3) because the alteration of flow regimes of the lower Sacramento River and rivers below CVP and SWP reservoirs would be greater under CP5 than under CP1, CP2, or CP3. This impact would be potentially

significant. Mitigation for this impact is proposed in Section 18.3.5, “Mitigation Measures.”

18.3.5 Mitigation Measures

Table 18-10 presents a summary of mitigation measures for recreation and public access.

Table 18-10. Summary of Mitigation Measures for Recreation and Public Access

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Rec-1 (No-Action): Increased Use of Shasta Lake Recreation Facilities and Demand for Recreation Opportunities on Shasta Lake and in the Vicinity Impact Rec-1 (CP1–CP5): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Rec-2 (No-Action): Increased Use and Demand for Recreation Opportunities on the Upper Sacramento River Impact Rec-2 (CP1–CP5): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam	LOS before Mitigation	LTS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Rec-2: Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Rec-3 (No-Action): Increased Use and Demand for Recreation Opportunities on the Lower Sacramento River and in the Delta Impact Rec-3 (CP1–CP5): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Rec-4 (No-Action): Increased Use and Demand for Recreation Opportunities in the CVP and SWP Service Areas Impact Rec-4 (CP1–CP5): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone	LOS before Mitigation	LTS	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Rec-4: Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS

Table 18-10. Summary of Mitigation Measures for Recreation and Public Access (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Rec-5 (CP1–CP5): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-6 (CP1–CP5): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-7 (CP1–CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-8 (CP1–CP5): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-9 (CP1–CP5): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures	LOS before Mitigation	NI	B	B	B	B	B
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	B	B	B	B	B

Table 18-10. Summary of Mitigation Measures for Recreation and Public Access (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Rec-10 (CP1–CP5): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program	LOS before Mitigation	NI	NI	NI	NI	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	LTS	LTS
Impact Rec-11 (CP1–CP5): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites	LOS before Mitigation	NI	NI	NI	NI	B	B
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	B	B
Impact Rec-12 (CP1–CP5): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-13 (CP1–CP5): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 18-10. Summary of Mitigation Measures for Recreation and Public Access (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Rec-14 (CP1–CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None Required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Rec-15 (CP1–CP5): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None Required.	Mitigation Measure Rec-15: Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Key:
B = beneficial
CP = Comprehensive Plan
CVP = Central Valley Project
LOS = level of significance
LTS = less than significant
NI = no impact
PS = potentially significant
S = significant
SWP = State Water Project

No-Action Alternative

No mitigation measures are needed for this alternative.

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

No mitigation is needed for Impact Rec-1 (CP1), Impact Rec-3 (CP1), and Impacts Rec-5 (CP1) through Rec-14 (CP1). Mitigation is provided below for Impacts Rec-2 (CP1) and Rec-4 (CP1), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP1), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP1): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam Reclamation will inform recreation users of the Chappie-Shasta OHV Area about an alternate access route. This route will use existing river crossings either immediately downstream from Shasta Dam or further south. The route will be improved to provide adequate access, security features, and road improvements (e.g., by grading unpaved portions), as necessary, and made sufficient so that vehicles can safely use the route. To mitigate the temporary disruption in public tours of Shasta Dam during construction, Reclamation will develop and provide enhanced information about the dam and its operation at the Reclamation Visitor Center at the dam, which would remain open. Mitigation for temporary loss of access to the trailhead at the west end of Shasta Dam is not necessary because the trailhead itself would be affected by construction.

Implementation of this mitigation measure would reduce Impact Rec-2 (CP1) to a less-than-significant level.

Mitigation Measure Rec-4 (CP1): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps To mitigate impacts on visitor safety from remaining trees and stumps in untreated areas of the newly inundated zone, Reclamation will work with USFS to provide maps, bulletins, informational postings, and other media as deemed appropriate by USFS at boat ramps, marinas, and other developed Shasta Lake recreation sites. Similar information could be provided at public meetings and events and at USFS and other Web sites used by Shasta Lake visitors to learn about conditions at the lake. The information provided will identify the general areas of the shoreline where the hazard exists. It will also inform boaters of the nature of the hazard, the periods of time when the hazard is of concern (i.e., when the reservoir elevation is above the current full pool elevation), and best practices to avoid the hazard while recreating on the lake. Implementation of this mitigation measure would reduce Impact Rec-4 (CP1) to a less-than-significant level.

Mitigation Measure Rec-15 (CP1): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This measure is identical to Mitigation Measure Aqua-15 (CP1), described in Chapter 11, "Fisheries and Aquatic Ecosystems."

This measure would also protect recreation uses on these rivers by ensuring that any potential changes in flow would be within the current range of variability. Implementation of this mitigation measure would reduce Impact Rec-15 (CP1) to a less-than-significant level.

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

No mitigation is needed for Impact Rec-1 (CP2), Impact Rec-3 (CP2), and Impacts Rec-5 (CP2) through Rec-14 (CP2). Mitigation is provided below for Impacts Rec-2 (CP2) and Rec-4 (CP2), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP2), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP2): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam This mitigation measure is identical to Mitigation Measure Rec-2 (CP1). Implementation of this mitigation measure would reduce Impact Rec-2 (CP2) to a less-than-significant level.

Mitigation Measure Rec-4 (CP2): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps This mitigation measure is identical to Mitigation Measure Rec-4 (CP1). Implementation of this mitigation measure would reduce Impact Rec-4 (CP2) to a less-than-significant level.

Mitigation Measure Rec-15 (CP2): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This mitigation measure is identical to Mitigation Measure Rec-15 (CP1). Implementation of this mitigation measure would reduce Impact Rec-15 (CP2) to a less-than-significant level.

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

No mitigation is needed for Impact Rec-1 (CP3), Impact Rec-3 (CP3), and Impacts Rec-5 through Rec-14 (CP3). Mitigation is provided below for Impacts Rec-2 (CP3) and Rec-4 (CP3), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP3), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP3): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam This mitigation measure is identical to Mitigation Measure Rec-2 (CP1). Implementation of this mitigation measure would reduce Impact Rec-2 (CP3) to a less-than-significant level.

Mitigation Measure Rec-4 (CP3): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps This mitigation measure is identical to Mitigation Measure Rec-4 (CP1). Implementation of this mitigation measure would reduce Impact Rec-4 (CP3) to a less-than-significant level.

Mitigation Measure Rec-15 (CP3): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This mitigation measure is identical to Mitigation Measure Rec-15 (CP1). Implementation of this mitigation measure would reduce Impact Rec-15 (CP3) to a less-than-significant level.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

No mitigation is needed for Impact Rec-1 (CP4 and CP4A), Impact Rec-3 (CP4 and CP4A), and Impacts Rec-5 through Rec-14 (CP4 and CP4A). Mitigation is provided below for Impacts Rec-2 (CP4 and CP4A) and Rec-4 (CP4 and CP4A), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP4 and CP4A), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP4 and CP4A): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam This mitigation measure is identical to Mitigation Measure Rec-2 (CP1). Implementation of this mitigation measure would reduce Impact Rec-2 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Rec-4 (CP4 and CP4A): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps This mitigation measure is identical to Mitigation Measure Rec-4 (CP1). Implementation of this mitigation measure would reduce Impact Rec-4 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Rec-15 (CP4 and CP4A): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This mitigation measure is identical to

Mitigation Measure Rec-15 (CP1). Implementation of this mitigation measure would reduce Impact Rec-15 (CP4 and CP4A) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is needed for Impact Rec-1 (CP5), Impact Rec-3 (CP5), and Impacts Rec-5 (CP5) through Rec-14 (CP5). Mitigation is provided below for Impacts Rec-2 (CP5) and Rec-4 (CP5), which would affect recreation at Shasta Lake recreation facilities, and for Impact Rec-15 (CP5), which would affect recreation on rivers in the extended study area.

Mitigation Measure Rec-2 (CP5): Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam This mitigation measure is identical to Mitigation Measure Rec-2 (CP1). Implementation of this mitigation measure would reduce Impact Rec-2 (CP5) to a less-than-significant level.

Mitigation Measure Rec-4 (CP5): Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps This mitigation measure is identical to Mitigation Measure Rec-4 (CP1). Implementation of this mitigation measure would reduce Impact Rec-4 (CP5) to a less-than-significant level.

Mitigation Measure Rec-15 (CP5): Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements This mitigation measure is identical to Mitigation Measure Rec-15 (CP1). Implementation of this mitigation measure would reduce Impact Rec-15 (CP5) to a less-than-significant level.

18.3.6 Cumulative Effects

Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences,” discusses overall cumulative impacts methodology related to the action alternatives, including the relationship to the CALFED Bay-Delta Program Programmatic EIS/EIR cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria. Table 3-1, “Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area,” in Chapter 3, lists the present and reasonably foreseeable future projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 related to Quantitative Analysis would affect recreation resources in the primary study area. The following analysis is based on potential cumulative effects on the extended study area related to projects listed under the

Quantitative Analysis and in the primary and extended study area for those projects that are listed under Qualitative Analysis on Table 3-1. Example projects listed in Table 3-1 that may affect recreation resources in the primary and extended study area include, but are not limited to, Fish Passage Program at Shasta Dam, Trinity River Mainstem Fishery Restoration Program, Sacramento River Conservation Area Forum Program, Central Valley Flood Protection Plan, PG&E Hydroelectric Project License Implementation, and Antlers Bridge Replacement.

Past and present programs and projects that have affected recreation resources in the primary and extended study area relate to dam construction, water operations and flow schedules, flood management activities, land use changes, and construction projects.

A diverse variety of programs that have been developed or are under development by Federal, State, and local agencies–individually and in conjunction with other agencies–are among the reasonably foreseeable future projects that may affect environmental conditions in the primary and extended study areas and therefore may contribute to cumulative effects.

These projects include construction and operation of projects or implementation of programs that may have the potential to adversely affect both land- and water-based recreation and, in combination, to cause an existing significant cumulative effect. For example, construction of some projects or implementation of programs may temporarily constrain boat navigation. Some of these project facilities may displace recreation facilities or activities, or may cause a long-term impediment to navigation on waterways. Water-based recreation may also be indirectly affected because of changes in reservoir water storage or changes in river flows downstream from reservoirs attributable to these projects. To the extent possible, foreseeable actions included in Table 3-1 under the Quantitative Analysis, have been incorporated in the CalSim-II model and data developed for analysis of operational impacts on reservoir elevations and river flows under the project alternatives.

Several programs provide only general plans or frameworks for potential future projects or actions; no construction or other implementation of the programs has yet occurred, and no site-specific projects have been identified or undergone environmental analysis. Therefore, no effects of past or present projects are associated with these programs, and future projects that may occur are uncertain. Some of the programs or projects may result in temporary construction effects; however, the exact locations of these projects are unknown at this time. Many ongoing and future programs include public access or recreation objectives or measures, or would protect or enhance water quality, fisheries, wildlife habitat, and other biological resources that support recreation uses. These programs have the potential to result in beneficial effects on recreation, which could help reduce potentially significant cumulative effects.

The effects of climate change on operations at Shasta Lake could potentially affect water-based recreation opportunities both at the lake and downstream. As described in the Climate Change Modeling Appendix, climate change could result in higher reservoir releases in the future because of an increase in winter and early-spring inflow into the lake from high-intensity storm events. The change in reservoir releases could be necessary to manage for flood events resulting from these potentially larger storms. The potential increase in releases from the reservoir could lead to long-term changes in downstream channel equilibrium, which could affect the Sacramento River's ease of use for water-based recreation.

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

As described in Section 18.3.4, "Direct and Indirect Effects," above, without mitigation CP1 could cause significant and potentially significant effects on recreation and public access. These effects consist of temporary construction-related disruption of recreation access and activities at and near Shasta Dam; increased hazards to boaters and other recreationists at Shasta Lake from standing timber and stumps remaining in untreated areas of the inundation zone; and increased difficulty for boaters and anglers in using the Sacramento River and rivers below CVP and SWP reservoirs as a result of decreased river flows. These contributing adverse effects from CP1 would be cumulatively considerable. With implementation of Mitigation Measures Rec-2 (CP1), Rec-4 (CP1), and Rec-15 (CP1), adverse effects from CP1 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.

As stated previously, effects of climate change on operations at Shasta Lake could include a higher frequency of high-flow events, potentially resulting in changes to water-based recreation opportunities downstream. As described in the Climate Change Modeling Appendix, climate warming could result in more intense rainstorms, an increased occurrence of high-intensity rainfall, earlier melting of seasonal snowpack, and more events of rain or snow. These expected consequences of climate change may create more frequent and severe flooding associated with lakes and rivers, and thus greater challenges to water-based recreation in the Sacramento River in the primary and extended study areas.

However, as noted in the Climate Change Modeling Appendix, studies also generally predict that climate change may cause Shasta Lake to be unable to stay above the 550,000 acre-feet dead pool in some critical years. With the lake at such a low level, an increase in adverse effects on recreation on the lake could result in critical years.

Implementation of CP1 could potentially diminish the effects of increased flows and potential flooding on downstream recreation in the Sacramento River by

providing additional reservoir storage capacity after construction; however, it would not likely increase the anticipated adverse effects on recreation on Shasta Lake in critical years. When added to the anticipated effects of climate change, raising Shasta Dam would not have a significant cumulative effect on recreation.

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. With implementation of Mitigation Measures Rec-2 (CP2), Rec-4 (CP2), and Rec-15 (CP2), adverse effects from CP2 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.

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

The cumulative effects of CP3 would be similar to those of CP1, but greater in magnitude. With implementation of Mitigation Measures Rec-2 (CP3), Rec-4 (CP3), and Rec-15 (CP3), adverse effects from CP3 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

The cumulative effects would be similar to those of CP1 for CP4, but greater in magnitude. The cumulative effects would be similar to those of CP2 for CP4A. With implementation of Mitigation Measures Rec-2 (CP4 and CP4A), Rec-4 (CP4 and CP4A), and Rec-15 (CP4 and CP4A), adverse effects from CP4 or CP4A would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. 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. With implementation of Mitigation Measures Rec-2 (CP5), Rec-4 (CP5), and Rec-15 (CP5), adverse effects from CP5 would be reduced to a less-than-significant level. These adverse effects would no longer result in a cumulatively considerable incremental contribution to significant cumulative effects on recreation and public access. This would not be a cumulatively significant effect.

Chapter 19
Aesthetics and Visual Resources

19.1 Affected Environment

This chapter describes the affected environment related to aesthetics and visual resources for the dam and reservoir modifications proposed under the SLWRI.

Because of the potential influence of the proposed modification of Shasta Dam on water deliveries over a large geographic area, the SLWRI includes both a primary study area and an extended study area. The primary study area has been further divided into Shasta Lake and vicinity and the upper Sacramento River (Shasta Dam to Red Bluff). The extended study area consists of the lower Sacramento River and Delta and the CVP/SWP service areas.

19.1.1 Visual Environment

Both natural and artificial landscape features contribute to perceived visual images and the aesthetic value of a view. The value is determined by contrasts, forms, and textures exhibited by the natural environment (e.g., geology, hydrology, vegetation, and wildlife), as well as human-made features. The aesthetic value of an area is a measure of its visual character and quality combined with the viewer's response to the area (DOT 1981). In general terms, the visual landscape is considered to be a vital component of an area's overall resource value. The ability of the landscape to undergo alteration without losing its visual character is considered important for the maintenance of high scenic value. As development deviates from the natural landscape, visual impacts increase. The visual impacts of a project are determined by a number of factors, including effects on the visual character and quality (e.g., form, line, color, and texture), visual exposure, viewer sensitivity, and the number of viewers who are expected to see the project.

People respond differently to changes in the physical environment, depending on their prior experiences and expectations, their proximity to the views, and the length of time the view is visible to them. Visual effects analyses tend to be highly subjective. For this reason, aesthetics and visual resources are addressed qualitatively rather than quantitatively.

This section focuses on the primary study area consisting of Shasta Lake and vicinity and the upper Sacramento River from Shasta Dam downstream to Red Bluff. The focus is on the primary study area because implementation of the project would have virtually no effect on aesthetic values and visual resources in the extended study area.

The visual environment, or character, is a function of both the natural and man-made landscape features that make up a view. The character of any given area is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. The perception of visual character can vary significantly as season, hour, light, shadow, weather, and the other elements of a view change. Form, line, color, and texture are the basic components used to describe visual character and quality for most visual assessments (DOT 1981). The dominance of each of these components on the landscape forms the viewer's impression of the landscape, and therefore, the aesthetic value of the landscape. The aesthetic value of an area is a measure of its visual character and scenic quality combined with the viewer response.

The overall sensitivity and response of a viewer to the quality of a view is based on a combination of viewer exposure and viewer sensitivity. "Viewer exposure" refers to the visibility of resources in the landscape, the proximity of the vantage point to the view, the elevation of the viewer relative to the view, the frequency and duration of the viewing, the number of observers, and the preconceived expectations of individual viewers or groups. "Viewer sensitivity" refers to the extent of the public's concern for particular landscapes. Judgments of visual quality and viewer response should be based on a regional frame of reference. The geographic setting and nature of the visual resource will significantly influence the degree of visual quality and sensitivity experienced by the viewer. For example, the presence of a small hill in an otherwise flat landscape may be considered a significant visual element, but a hill of the same size may have very little significance when located in mountainous terrain.

For purposes of this report, a viewshed is defined as the surface area visible from a particular location (e.g., a highway pull-out, campground, or marina) or sequence of locations (e.g., along a highway or trail). The scenic attractiveness and distance zones also influence the aesthetic value of a viewshed.

Scenic Attractiveness

Scenic attractiveness is classified as:

- **Class A "distinctive"** – Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

- **Class B "typical"** – Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide ordinary or common scenic quality. These landscapes generally have positive, yet common, attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

- **Class C "indistinctive"** – Areas where landform, vegetation patterns, water characteristics, and cultural features have low scenic quality. Water and rock forms of any consequence are often missing in Class C landscapes. These landscapes have weak or missing attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

Class A and B visual resources typically are found in State or Federal parks, recreation areas, and wilderness areas, including rivers and lakes. Class C resources generally are areas that have low scenic quality and consist of more common landscapes.

Distance Zones

In addition to scenic attractiveness, three primary distance zones are used, as appropriate, to characterize the viewsheds described in the following sections. These distance zones, described below, are foreground, middle ground, and background.

- **Foreground (0 to 0.5 mile)** – At a foreground distance, people can distinguish small boughs or leaf clusters, tree trunks and large branches, individual shrubs, clumps of wildflowers, medium-sized animals, and medium to large birds.

- **Middle ground (0.5 to 4 miles)** – At a middle ground distance, people can distinguish individual tree forms, large boulders, flower fields, small openings in the forest or tree line, and small rock outcrops. Form, texture, and color remain dominant and pattern is important.

- **Background (4 miles to horizon)** – At a background distance, people can distinguish groves or stands of trees, large openings in the forest, and large rock outcrops. Texture is not detectable and color has flattened, but large patterns of vegetation or rocks are still distinguishable, and landform ridgelines and horizon lines are the dominant visual characteristics.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

For purposes of the aesthetics and visual resources assessment, the primary study area encompasses Shasta Lake and vicinity and the upper Sacramento River in Northern California. Shasta Dam is located about 9 miles northwest of Redding, and the dam and the entire reservoir are in 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. The upper Sacramento River portion includes dam-related infrastructure downstream from the dam, Keswick Reservoir, and watersheds that are tributary to the Sacramento River downstream to Red Bluff.

The terrain of the primary study area is extremely diverse and includes the mountainous terrain surrounding Shasta Lake as well as the landscapes of the Central Valley below Keswick Reservoir. Upstream from Keswick Reservoir, slopes are characterized by a mix of pine and oak forests and, to varying degrees, chaparral and rock outcrops. The landscape includes topographic features of the Klamath Mountains, the southern Cascade Range, and the Central Valley. Two volcanic features – Mount Shasta and Mount Lassen – can be seen from numerous vantage points throughout the area.

Shasta Lake is the central visual attraction of the portion of the primary study area upstream from Shasta Dam. It is the largest lake in the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). The Shasta and Trinity Units of the NRA are managed by the USFS Shasta-Trinity National Forest (STNF) to provide high-quality recreational experiences and visual perceptions to the public. Shasta Lake offers the public a variety of outdoor recreational experiences and activities, including boating, water-skiing, swimming, fishing, camping, picnicking, hiking, hunting, and mountain biking. Recreation at the lake is managed by USFS consistent with the STNF *Land and Resource Management Plan* (LRMP) (USFS 1995b) and guidelines established for the Shasta and Trinity units of the NRA.

Shasta Lake has a surface area of 29,500 acres, with a shoreline of about 420 miles. Currently, there are 9 marinas on Shasta Lake, most of which are located in coves. Although numerous campgrounds provide facilities for land-based recreation, the primary recreational use of the lake is water-based. Many types of boats use the lake, including private and commercial houseboats, powerboats, and personal watercraft.

The construction of Shasta Dam inundated the canyons of the Sacramento, Pit, and McCloud rivers, as well as numerous tributaries. The diversity of visual experiences at Shasta Lake and the surrounding slopes is influenced by fluctuating water levels, compounded by human-made features such as Interstate 5 (I-5), the Union Pacific Railroad (UPRR), and electrical transmission facilities. A variety of commercial and residential uses occurs in, on, or near Shasta Lake.

Shasta Lake is crossed from north to south by I-5 via the Pit River Bridge at the western end of the Pit Arm and the Antlers Bridge near the northern end of the Sacramento Arm. Views from both of these bridges are dominated by Shasta Lake and the surrounding landscapes; the views encompass minimal development, although Bridge Bay Resort can be clearly seen from the southbound lanes of the Pit River Bridge and some commercial and residential development can be seen from the Antlers Bridge.

The STNF LRMP classifies National Forest System (NFS) lands based on visual quality objectives (VQO). VQOs identify how much a management activity can contrast visually with the character of the landscape. The Shasta

and Trinity units of the NRA include lands managed by the STNF to meet the following VQOs: modification, partial retention, and retention. Areas designated as "modification" are typically developed areas, such as campgrounds, marinas, and boat launch ramps, with management activities in the foreground and a natural appearance in the middle ground. "Partial retention" refers to those areas where management activities remain visually subordinate on the landscape. "Retention" areas are those where management activities are not visually evident. The "Preservation" VQO designation allows for ecological changes only. Management activities, except for very low visual impact recreation facilities are prohibited. The "Maximum Modification" VQO applies to areas in which changes in the landscape are strong and would be obvious to the average viewer. These changes stand out as a dominating impression of the landscape, yet they are shaped so that they might resemble natural patterns when viewed from a distance of 3 miles to 5 miles or more. These areas visually appear to be major disturbances.

The LRMP defines three principal criteria to classify VQOs: (1) sensitivity levels, (2) scenic quality of the landscape, and (3) distance from the main viewing areas. Table 19-1 compares the acreage of VQOs (as defined in the LRMP) to the total area of NFS lands managed by USFS in the Shasta and Trinity units of the NRA.

Table 19-1. Shasta-Trinity National Forest Inventoried Visual Quality Objectives

Inventoried VQO	NFS Lands (2,705,234 acres)		NRA Lands (Shasta and Trinity Units) (121,505 acres)	
	Acres[1]	Percent[2]	Acres[3]	Percent[4]
Preservation	498,700	18	28,095	23
Retention	175,000	6	92,387	76
Partial Retention	590,600	22	0	0
Modification	597,600	22	1,112	1
Maximum Modification	259,100	10	0	0

Sources: USFS 1995b, 2007

Notes:

[1] Number of acres of lands of the VQO type in the LRMP management area (NFS land only)

[2] Percentage of lands of the VQO type in the LRMP management area (NFS land only)

[3] Number of acres of land by VQO type in the NRA (Shasta and Trinity Units) management area (NFS land only)

[4] Percentage of lands by VQO type in the LRMP management area (NFS land only)

Key:

LRMP = *Land and Resource Management Plan*

NFS = National Forest System

NRA = National Recreation Area

VQO = visual quality objective

In the NRA, Shasta Dam and Shasta Lake are the dominant components of the visual environment. The lake, combined with constructed facilities (e.g., Shasta Dam, Pit River Bridge, Bridge Bay Resort) and natural features (e.g.,

mountains, rivers, canyons, vegetation) observable from various locations have a substantial influence on the visual character of the existing landscape.

The remaining parts of this section describe the visual resources in the primary study area. Much of the content of these descriptions was taken from reconnaissance-level data gathered during the SLWRI by Reclamation and its consultants. The STNF also provided information used to characterize these visual resources. Visual resources are described in terms of visual sensitivity and viewer response.

Viewsheds A number of factors can influence the aesthetic value of viewsheds in the primary study area, which are dominated by constructed features and natural landscapes. Although exposed surfaces associated with grading and barren shoreline may be obvious, factors such as vegetation, lighting, and glare can also substantially influence these viewsheds both spatially and temporally. The viewshed types that occur in the primary study area are listed below and described in the following sections:

- Panoramic views
- Vista points
- Landscape features
- Distinctive built features
- Built features (detractions)
- Exposed shoreline of Shasta Lake
- External views

Panoramic Views A panoramic view is defined as the unbroken view of an entire surrounding area. In the Shasta Dam and Shasta Lake area, panoramic viewing opportunities are governed by the elevation, aspect, and location of the viewer. The steep, mountainous topography around Shasta Lake largely influences the degree to which any given area can be seen from a particular vantage point. Vegetation, lighting, and glare also influence a panoramic view. For example, panoramic views as seen from the lake level vary greatly from those seen from the I-5 corridor higher up the slope.

The contrast between Shasta Lake and the surrounding mountains affords visitors a diversity of views from various locations around the lake. The length and configuration of the shoreline of Shasta Lake coupled with the mountainous terrain represent an important visual and scenic resource in the region.

Panoramic viewsheds are plentiful throughout the primary study area. Among the most dramatic and high-quality views is that of the so-called "Three Shastas," consisting of Shasta Dam, Shasta Lake, and Mount Shasta. The photograph in Figure 19-1, taken from the State Route (SR) 151 vista point above the Shasta Dam Visitor Center, illustrates the Three Shastas with the dam in the foreground, the lake in the middle ground, and Mount Shasta in the background. This view is a widely publicized panorama that draws large numbers of visitors to the area annually. Class A and B views extend for miles to the north, east, and west from the SR 151 vista point.

For purposes of this assessment, panoramic viewsheds consist primarily of views visible from locations immediately adjacent to or above Shasta Dam that are subject to heavy use (e.g., Bridge Bay Resort, Shasta Dam Visitor Center, the I-5 corridor). However, some less accessible, but nonetheless important, locations such as residences, campgrounds, marinas, and other facilities may also provide opportunities for panoramic views and thus have been included in the assessment of potential impacts on panoramic views.

Figure 19-1. Panoramic view of the Three Shastas (Shasta Dam, Shasta Lake, and Mount Shasta) as seen from the State Route 151 Vista Point

Vista Points Vista points differ from panoramic views in the level of visible expanse. Panoramic views encompass an entire surrounding area, whereas views from vista points are limited by what can be seen through an opening, such as between rows of trees or buildings. Shasta Lake and the surrounding area offer almost limitless viewing opportunities. Viewsheds have been assessed based on

Figure 19-2. Typical View of Shasta Lake from a Lakeside Campsite (taken from the Dekkas Rock Campground, McCloud Arm)

sites that are representative of popular use areas such as marinas, residences, and other recreational features.

Most of the shoreline around the lake (above the ordinary high-water line) is heavily vegetated and its topography varies significantly. Views from most onshore recreation areas are limited by stands of trees and undulating banks. Figure 19-2 shows a view of the lake from a typical lakeside campsite, in this case the Dekkas Rock Campground located on the McCloud Arm. Views of the shoreline from the water are also influenced by topography and vegetation. Although large expanses of the shoreline may be visible to boaters, lake elevation and bank topography ultimately determine what can be seen by boaters.

Figure 19-3. Some of the Distinctive Landscape Features Visible from the Bridge Bay Resort, Including a Portion of the Bridge Bay Resort

Landscape Features "Landscape feature" is a term used to describe the land characteristics of a particular area, such as a forested or mountainous site. Several landscape features characterize the primary study area, including forest, rocky outcrops, and urban development. Well-known landscape features in the primary study area include Shasta Dam, Mount Shasta, the Sundial Bridge, and the Sacramento River. The distance of the feature upstream from Shasta Dam, coupled with variations in lake levels, influences the view of landscape features. As the lake level falls, the various arms look more like rivers (e.g., channelized, boulder-strewn) and less like a lake. Figure 19-3 illustrates some of the distinctive landscape features visible from a portion of the Bridge Bay Marina, the Pit River Bridge, and limestone outcrops located along the McCloud Arm.

Figure 19-4. Shasta Dam and Infrastructure

Distinctive Built Features The aesthetic quality of a distinctive built feature is subject to individual interpretation. This subjective interpretation is influenced by the contrast of these features with their setting. For example, engineered features such as Shasta Dam and its infrastructure (Figure 19-4) can be considered to detract from the "natural" character of the setting, because some viewers might argue that the natural character of the features inundated by Shasta Lake is its greatest strength. The dam, which was completed in 1945, is a curved concrete gravity-type dam containing 6.5 million cubic yards of concrete weighing 15 million tons. It is the second largest dam in mass in the United States. (Grand Coulee Dam on the Columbia River in Washington State is the largest.)

The 3,460-foot-long dam is 602 feet high, 543 feet thick at the bottom, and 30 feet thick at the top (Reclamation 2005). The face of the dam covers 31 acres, equal to 6 football fields and their stadiums, and the 487-foot spillway is the largest built waterfall in the world – three times the height of Niagara Falls. The spillway, as seen from the west, measures 375 feet in width with 3 drum gates, each 110 feet wide, 28 feet tall, and weighing 500 tons. There are 18 outlets on the face of the dam, each 8½ feet in diameter (large enough to drive a pickup truck through) with a maximum spillage capacity of 186,000 cubic feet per second.

With more than 400 miles of shoreline, Shasta Lake is the largest human-made lake in California. The water storage capacity is more than 4.5 million acre-feet. The surface area of the lake is 29,740 acres, and the lake drains 6,665 square miles (Reclamation 2005). The lake is one of the major landmarks in Northern California.

Built Features (Detractions)
An opinion concerning the attractiveness of a built feature is formed by the viewer's perception, biases, and personal preferences. A feature seen as an eyesore by one viewer may very well be considered attractive by another. Built features such as bridges, structures, roads, power transmission lines, and water storage tanks are generally visible only from site-specific locations (e.g., the visitor center, marinas, sections of I-5) in the primary study area. Figure 19-5 shows an example of built features found in the primary study area (in this case, a railroad bridge in the foreground and the Antlers/I-5 Bridge in the background, as seen from Lakeshore Drive).

Figure 19-5. Examples of Built Features in the Primary Study Area

Additional built features of interest in the primary study area include bridges, roads, utilities, and commercial, administrative, and residential structures.

Figure 19-6. The "Bathtub Ring" Effect

Exposed Shoreline of Shasta Lake Currently, Shasta Lake reaches or nearly reaches full pool levels about once every 5 years. Because it is a reservoir, water levels fluctuate in response to climatic conditions and operational requirements. Typical operational scenarios involve drawing the reservoir down during the demand period (May through October) and storing runoff during the winter/spring period. By its nature, the amount of shoreline exposed below the full pool level elevation fluctuates daily. In extremely dry years, more than 200 vertical feet of shoreline may be exposed for extended periods through the fall.

Figure 19-7. View of Shasta Lake from a Residence Located off Northwoods Road, Lakehead, California

Unlike bodies of water that are influenced by tides or other natural fluctuations, Shasta Lake does not support habitats that can adapt to large changes in environmental conditions. Therefore, the exposed shoreline below the full pool level is essentially devoid of vegetation (Figure 19-6). As illustrated in this figure, the relatively gradual slope to the lake bottom results in a greater area of exposed shoreline with lower water levels, resulting in the "bathtub ring" effect common to California reservoirs (Reclamation 2006). As the elevation of the water surface decreases, the viewing quality changes spatially and temporally. Erosional processes, primarily wave erosion, exacerbate this situation. The seasonal fluctuations in water levels and, consequently, the amount of exposed shoreline greatly affect the visual quality of Shasta Lake.

External Views A number of factors may affect the viewsheds described in the preceding section. Exposed surfaces associated with barren shoreline and

activities such as grading may be obvious, but factors such as vegetation, lighting, and glare could also substantially affect these viewsheds both spatially and temporally.

Topography and property boundaries influence the public's external views of the primary study area. Views of the lake from private property are infrequent. Most private parcels are located some distance from the lake, and views of the lake are buffered by vegetation and the topography of NFS lands surrounding the lake. Nevertheless, some of the private parcels in the vicinity of Shasta Lake have views of the lake, although the quality of these views varies. Figure 19-7 shows a view of Shasta Lake from a nearby residence (the McCloud Arm is seen in the middle ground and the Pit Arm in the background).

Light and Glare A majority of the lands surrounding Shasta Lake are densely vegetated and undeveloped. As a result, there are relatively few sources of artificial light and glare in the Shasta Lake and vicinity portion of the primary study area. The reaches of the upper Sacramento River that pass through developed communities, such as Redding and Anderson, do have substantial sources of light and glare, and, to a lesser degree, light and glare are observable between the City of Shasta Lake and Lakehead. Vehicle traffic and roadway lighting along the I-5 corridor, scattered residential and commercial development, and reflective surfaces such as boats and marinas are among the primary sources of light and glare. The Shasta Dam compound has a variety of sources of light and glare. The backdrop of Shasta Dam at night is nonetheless an attraction for visitors and residents.

Exposed bare mineral soils, which characterize the "bathtub ring" around the perimeter of the lake during periods of drawdown, are a potential source of glare (Figure 19-6). The chroma of these soils is generally light, and the contrast of the bathtub ring with upslope vegetation and downslope water is readily apparent from various distances.

Vegetation Vegetation is an important variable in characterizing visual conditions. The type, location, diversity, and distribution of vegetation influence form and texture, depending on the vantage point of the viewer. The diverse assemblage of vegetation and barren areas in and adjacent to the primary study area varies seasonally. As mentioned previously, forestlands surround Shasta Lake. The transition from chaparral/montane hardwood–dominated habitat at the southern end of the lake to a conifer-dominated forest to the north and east is apparent to travelers on I-5 as well as to people viewing the area from the lake level or a vista point.

Typically, vegetation extends from the ordinary high-water line of Shasta Lake into the adjacent uplands. Changes in vegetation type are apparent as the viewer's eye is drawn upward from lake level to surrounding ridgelines. Because there is no vegetation below the ordinary high-water line, a distinct

demarcation is visible between upland vegetation and water levels as the reservoir fluctuates.

Viewer Groups The perceptions of viewers are influenced by their location, specific activities in which they are engaged, personal degree of awareness, and individual values and goals. Activities associated with the project could affect three distinct viewer groups: motorists, residents, and recreationists.

Motorists For the purposes of this report, motorists are people who view the primary study area from a moving vehicle. Motorists can be drivers or passengers. This group typically consists of commuters, local residents, business travelers, and tourists.

Tourists are often acutely aware of viewsheds. Business travelers, commuters, and local residents who travel the same routes frequently may become inured to a view but, at the same time, are more likely to be aware of visual changes than occasional passersby. In general, views of Shasta Lake from motorists on I-5 are of short duration but relatively frequent from Bridge Bay north to Lakehead. The longest duration and most expansive panoramic view of Shasta Lake from I-5 occurs as the roadway approaches and crosses Shasta Lake over the Pit River Bridge from both the north and the south. Traveling this route at a speed of 55 miles per hour, the viewer would be able to observe the lake and its vicinity for approximately 1 minute. Other I-5 views may vary from 4 to 16 seconds, depending on the direction and speed of travel.

Less traveled roads in the vicinity of Shasta Lake, such as SR 151, Salt Creek Road, and Gilman Road, also offer views of the lake. Most views of the lake from these roads are limited to vistas (views framed by trees or structures) and are therefore of short duration. However, one of the best vantage points from which to view the Three Shastas is at an overlook along SR 151, a State scenic highway (Figure 19-1). Motorists traveling north who do not stop at the overlook also see a spectacular view of the Three Shastas while traveling, although the view is of short duration.

Residents For the purposes of this report, residents are people whose homes, businesses, and/or property are near, and have a view of, a portion of the primary study area. The sensitivity of residents to aesthetic values and changes to a viewshed is highly individual. In addition, the sensitivity of residents to changes in a viewshed is influenced, in part, by the location and the length of time that the view from a particular location appears altered from its previous condition (e.g., temporary changes during construction or long-term modifications to the landscape).

Views of Shasta Lake from private properties are limited by land ownership patterns; most of the lands surrounding Shasta Lake are managed by Federal agencies. Views from these lands are influenced by access, vegetation, and topography. Homes on nearby ridges, such as those on the ridgeline between

Packers Bay and Turntable Bay, typically have partial views of Shasta Lake. Similarly, homes clustered along the Sacramento Arm near Lakehead have views upstream and downstream from the arm, although the views are limited by the steep topography.

Recreationists For the purposes of this report, recreationists are people who use the lands in the NRA for recreation. Like residents, recreational users of Shasta Lake are highly sensitive to the visual character of Shasta Lake and the surrounding environment.

Recreationists are people who participate in land-based activities, such as hiking along the shoreline, camping in the NRA's many campgrounds, or water-based activities, such as boating, fishing, or rafting. In addition to four recreational residence tracts permitted by the STNF (e.g., Silverthorn Tract), several commercial facilities offer overnight accommodations adjacent to the shoreline. Recreational users often have a unique perspective on the surrounding environment.

Visual Assessment Units and Key Observation Points Visual assessment units (VAU) are areas of distinct visual character in a viewshed that provide a framework for comparing the visual effects of alternatives. Key observation points (KOP) are commonly traveled routes or other likely observation points in a VAU from which a representative group (motorists, residents, and recreationists) can observe a viewshed.

VAUs are defined by areas where the features or activities associated with the project would occur in the line of sight of a KOP and represent foreground or middle ground views (i.e., within 4 miles of a KOP in the VAU). KOPs were established at locations from which portions of the primary study area can clearly be seen by members of the various viewer groups. Table 19-2 lists the KOPs established in the primary study area. Locations of VAUs and KOPs are shown in Figures 19-8a through 19-8h. Photographs taken from each KOP are provided after each figure.

Table 19-2. Key Observation Points

VAU	Figure	KOP #	Photo #	Description of Key Observation Point
Shasta Dam	19-8a	1	1a	View of the Three Shastas (Shasta Dam, Shasta Lake, and Mount Shasta) from the SR 151 overlook above the Shasta Dam Visitor Center and downstream from Shasta Dam
		1	1b	View of the upper Sacramento River below Shasta Dam from the SR 151 overlook above the Shasta Dam Visitor Center and downstream from Shasta Dam
		2	2a	View of the Main Body of Shasta Lake from Shasta Dam
		2	2b	View of the Shasta Dam spillway and the upper Sacramento River from Shasta Dam
		2	2c	View of the Centimudi Boat Ramp from Shasta Dam
		3	3a	View from the Chappie-Shasta OHV Area staging area looking northeast
		3	3b	View from the Chappie-Shasta OHV Area staging area looking south
		4	4a	View from the Chappie-Shasta OHV Area campground looking northeast
		4	4b	View from the Chappie-Shasta OHV Area campground looking southwest
		5	5a	View from the Coram Ranch River House looking northeast
		5	5b	View from the Coram Ranch River House looking southeast
		6	6a	View from the Coram Ranch Dogwood House looking northeast
		6	6b	View from the Coram Ranch Dogwood House looking southeast
		7	7a	View from the Coram Ranch Residence looking northeast
		7	7b	View from the Coram Ranch residence looking east
		7	7c	View from the Coram Ranch residence looking southeast
		8	8	View from the Coram Ranch Guest Quarters looking northeast
		9	9a	View from the road above the Chappie-Shasta OHV Area staging area looking northeast
		9	9b	View from the road above the Chappie-Shasta OHV Area staging area looking southwest
		10	10a	View of Shasta Dam from pullout east of the dam on Lake Boulevard looking northwest
		10	10b	View of Shasta Lake from pullout east of the dam on Lake Boulevard looking northeast
		11	11	View of Shasta Dam from the Main Body of Shasta Lake

Table 19-2. Key Observation Points (contd.)

VAU	Figure	KOP #	Photo #	Description of Key Observation Point
Dry Creek Trail	19-8b	1	1	View of Dry Creek Trail northwest of Shasta Dam looking west from the Main Body of Shasta Lake
Little Backbone Inlet	19-8b	1	1a	View of the mouth of Little Backbone inlet looking northeast from the Main Body of Shasta Lake
		1	1b	View of the mouth of Little Backbone inlet looking northwest from the Main Body of Shasta Lake
Digger Bay	19-8b	1	1	View of the Main Body of Shasta Lake from the upper parking area west of the Digger Bay Boat Ramp
		2	2	View of the upper parking area at Digger Bay Marina looking east
		3	3a	View of Digger Bay Marina looking northwest from boat ramp
		3	3b	View of Digger Bay Marina shoreline looking west from boat ramp
		3	3c	View of Digger Bay Boat Ramp and parking area looking south from marina
Packers Bay	19-8c	1	1	View of Packers Bay from the Packers Bay Boat Ramp
Bridge Bay	19-8c	1	1a	View of Bridge Bay looking north from the Bridge Bay store
		1	1b	View of Bridge Bay looking northwest from the parking lot of the Bridge Bay store
		2	2	View of the I-5/Pit River Bridge from Bridge Bay
		3	3a	View of the Union Pacific Railroad train tunnel looking south from the Bridge Bay Resort maintenance area
		3	3b	View of the Union Pacific Railroad train tunnel looking north from the Bridge Bay Resort maintenance area
		3	3c	View of Bridge Bay Marina 4 from the Bridge Bay Resort maintenance parking area
		4	4a	View of the south shoreline from Bridge Bay Marina 4 stairway
		4	4b	View looking northwest from Bridge Bay Marina 4 stairway
Sacramento Arm	19-8d	1	1	View of the Sacramento Arm from Riverview Drive southbound near the community of Pollock
		2	2	View of the Sacramento Arm from Riverview Drive southbound near the community of Pollock
		3	3	View of the Sacramento Arm looking east from the Doney Creek Bridge on Lakeshore Drive near the community of Lakehead
		4	4a	View of the Sacramento Arm from Lakeshore East Campground near the community of Lakeshore
		4	4b	View of the Sacramento Arm looking southeast from Lakeshore East Campground

Table 19-2. Key Observation Points (contd.)

VAU	Figure	KOP #	Photo #	Description of Key Observation Point
Sacramento Arm (contd.)	19-8d (contd.)	5	5a	View of the inlet looking northwest from Charlie Creek Bridge on Lakeshore Drive
		5	5b	View of the Sacramento Arm looking south from Charlie Creek Bridge on Lakeshore Drive
		6	6a	View of the Sacramento Arm from the Beehive Campground access road near Lakeshore
		6	6b	View of Sugarloaf Creek inlet/Sacramento Arm from Beehive Campground near Lakeshore
		6	6c	View of Sugarloaf Creek inlet/Sacramento Arm from Beehive Campground near Lakeshore
		7	7a	View of Sugarloaf Cove near Lakeshore from north shore looking south
		7	7b	View of Sugarloaf Cove from north shore looking northwest
		8	8	View of Sugarloaf Marina from the end of Daisy Lane
		9	9a	View looking south from Sugarloaf Resort Marina access
		9	9b	View toward the Salt Creek inlet from Sugarloaf Resort Marina access
		9	9c	View of Sugarloaf Marina from Sugarloaf Resort
		10	10a	View looking south toward Sugarloaf Marina from the Sugarloaf Boat Ramp
		10	10b	View looking southeast at the Sacramento Arm from the Sugarloaf Boat Ramp
		10	10c	View looking northeast at the Sacramento Arm from the Sugarloaf Boat Ramp entrance
		11	11a	View looking east from the Tsasdi Resort Marina
		11	11b	View looking south from the Tsasdi Resort Marina
		12	12a	View looking east toward I-5 from the Lakeshore Resort Campground
		12	12b	View looking southeast from the Lakeshore Resort Campground
		13	13	View of the Salt Creek Inlet looking south from the Oak Grove Day Use Area
		14	14a	View looking northeast from Lower Salt Creek Road at the Salt Creek Resort
		14	14b	View looking northwest from Lower Salt Creek Road at the Salt Creek Resort
		15	15a	View of the Salt Creek Inlet from Lower Salt Creek Road
		15	15b	View of the Salt Creek Inlet from Lower Salt Creek Road

Table 19-2. Key Observation Points (contd.)

VAU	Figure	KOP #	Photo #	Description of Key Observation Point
Sacramento Arm (contd.)	19-8d (contd.)	16	16	View of Antlers Bridge/I-5 looking southwest from Antlers Public Boat Ramp
		17	17a	View of Antlers Public Boat Ramp/Picnic Area parking lot from picnic area looking north
		17	17b	View of Sacramento Arm from Antlers Public Boat Ramp/Picnic Area from picnic area looking south
		18	18a	View from typical campsite at Antlers Resort looking north
		18	18b	View from typical campsite at Antlers Resort looking east
		18	18c	View from typical campsite at Antlers Resort looking southwest
McCloud Arm	19-8e	1	1	View of the McCloud Arm, Turntable Bay, and vicinity from a residence located off of Northwoods Road, west of I-5
		2	2	View of Turntable Bay from the McCloud Arm of Shasta Lake
		3	3	View of the Bailey Cove Boat Ramp from the Bailey Cove parking lot
		4	4	View of Holiday Harbor from the Bailey Cove Day Use Area
		5	5	View of Holiday Harbor from the Holiday Harbor Campground entrance
		6	6	View looking south toward the McCloud Arm from the Shasta Caverns parking lot
		7	7	View from the former Lakeview Resort caretaker residence
		8	8a	View of the McCloud Arm looking south from the former Lakeview Resort boat ramp
		8	8b	View of the McCloud Arm looking northeast from the former Lakeview Resort boat ramp
		8	8c	View of the Lakeview Resort Marina from the former Lakeview Resort boat ramp
		9	9	View of the former Lakeview Resort from the McCloud Arm of Shasta Lake
		10	10	View of Shasta Caverns dock on east side of lake from the McCloud Arm of Shasta Lake
		11	11a	View of the McCloud Arm downstream from the Hirz Bay Boat Ramp
		11	11b	View of the McCloud Arm upstream from the Hirz Bay Boat Ramp

Table 19-2. Key Observation Points (contd.)

VAU	Figure	KOP #	Photo #	Description of Key Observation Point
McCloud Arm (contd.)	19-8e (contd.)	12	12	View of Hirz Bay from the McCloud Arm of Shasta Lake
		13	13a	View of Campbell Creek inlet looking southeast from the McCloud Arm of Shasta Lake
		13	13b	View of Campbell Creek inlet looking east from the McCloud Arm of Shasta Lake
		14	14a	View of the McCloud Arm downstream, from the Dekkas Rock Campground
		14	14b	View of the McCloud Arm upstream, from the Dekkas Rock Campground
		15	15a	View of the McCloud River upstream, from the McCloud River Bridge
		15	15b	View of the McCloud River downstream, from the McCloud River Bridge
		16	16	View of the McCloud River Bridge, from the eastern approach
		17	17	View of the McCloud Arm from Space 10, McCloud Bridge Campground
		18	18a	View of the McCloud Arm from open area west of Space 1, McCloud Bridge Campground
		18	18b	View of the McCloud Arm from open area west of Space 1, McCloud Bridge Campground
		18	18c	View looking west from the open area west of Space 1, McCloud Bridge Campground
Pit Arm	19-8f	1	1a	View of the Pit Arm from the Jones Valley parking area, looking northwest
		1	1b	View of the Pit Arm from the Jones Valley parking area, looking northeast
		2	2	View of the Pit Arm from the Jones Valley parking area (west end), looking west
		3	3	View of the Pit Arm from the entrance to the Jones Valley Campground
		4	4	View of the Pit Arm looking north from the Jones Valley Resort Boat Ramp
		5	5	View of the Pit Arm from Juniper Drive, Silverthorn Resort

Table 19-2. Key Observation Points (contd.)

VAU	Figure	KOP #	Photo #	Description of Key Observation Point
Pit Arm (contd.)	19-8f (contd.)	6	6a	View of the Silverthorn Marina from the top of the boat ramp looking east
		6	6b	View of the Silverthorn Marina from the top of the boat ramp looking northeast
		6	6c	View of the Silverthorn Marina from the top of the boat ramp looking north
		7	7	View of the Silverthorn Marina looking south from the Pit Arm of Shasta Lake
		8	8	View of the west side of Ski Island looking east from Shasta Lake
Squaw Arm	19-8g	1	1	View of Bully Hill looking north from the Squaw Arm of Shasta Lake
		2	2	View of Monday Flat looking north from the Squaw Arm of Shasta Lake
I-5 Corridor	19-8h	1	1a	View of the Pit Arm (right) and the McCloud Arm (left) from the Pit River Bridge, as seen from I-5 northbound
		1	1b	View of Bridge Bay Resort from the Pit River Bridge, as seen from I-5 southbound
		2	2	View of the Pit River Bridge looking west from the Pit Arm of Shasta Lake
		3	3a	View of the Sacramento Arm looking toward the Antlers Campground from the Antlers Bridge, as seen from I-5 northbound
		3	3b	View of the Antlers Public Boat Ramp from the Antlers Bridge, as seen from I-5 northbound
		4	4	View of the Sacramento Arm west of the Antlers Bridge, as seen from I-5 southbound
		5	5	View of the McCloud Arm and vicinity at Turntable Bay, as seen from I-5 northbound

Key:
I-5 = Interstate 5
KOP = key observation point
OHV = off-highway vehicle
SR = State Route
VAU = visual assessment unit

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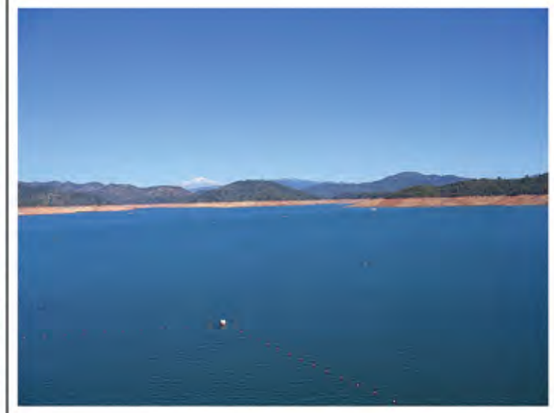
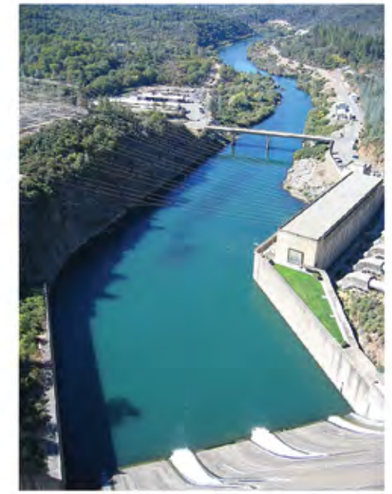
Figure 19-8a. Visual Assessment Unit and Key Observation Points

Shasta Dam VAU, KOP 1, Photo 1a
View of the Three Shastas (Shasta Dam, Shasta Lake, and Mount Shasta) from the SR 151 overlook above the Shasta Dam Visitor Center and downstream of Shasta Dam.

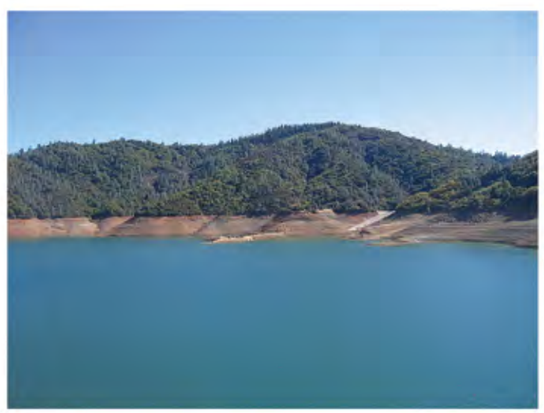
Shasta Dam VAU, KOP 1, Photo 1b
View of the upper Sacramento River below Shasta Dam from the SR 151 overlook above the Shasta Dam Visitor Center and downstream of Shasta Dam.



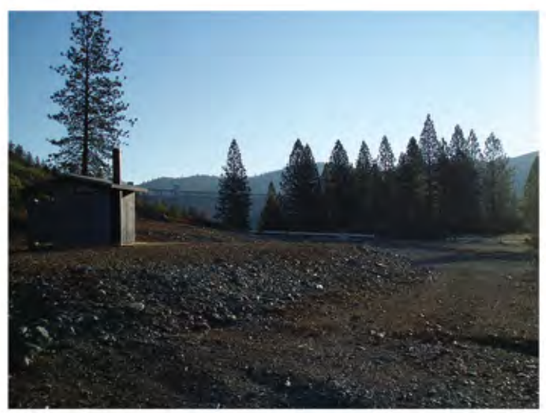
Shasta Dam VAU, KOP 2, Photo 2a
View of the main body of Shasta Lake from Shasta Dam.



Shasta Dam VAU, KOP 2, Photo 2b
View of the Shasta Dam spillway and the upper Sacramento River from Shasta Dam.



Shasta Dam VAU, KOP 2, Photo 2c
View of the Centimudi Boat Launch from Shasta Dam.



Shasta Dam VAU, KOP 3, Photo 3a
View from the Chappie - Shasta Off-Highway Vehicle (OHV) Area staging area looking northeast.

Shasta Dam VAU, KOP 3, Photo 3b
View from the Chappie - Shasta OHV Area staging area looking south.

Shasta Dam VAU, KOP 4, Photo 4a
View from the Chappie - Shasta OHV Area campground looking northeast.

Photographs for Figure 19-8a, Plate 1

Shasta Dam VAU, KOP 4, Photo 4b
View from the Chappie - Shasta OHV Area campground looking southwest.

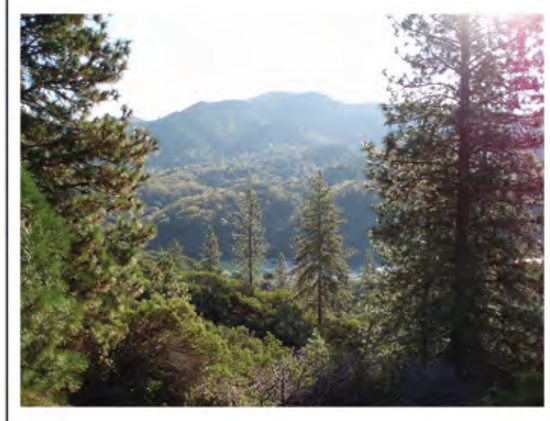
Shasta Dam VAU, KOP 5, Photo 5a
View from the Coram Ranch River House looking northeast.

Shasta Dam VAU, KOP 5, Photo 5b
View from the Coram Ranch River House looking southeast.

Shasta Dam VAU, KOP 6, Photo 6a
View from the Coram Ranch Dogwood House looking northeast.

Shasta Dam VAU, KOP 6, Photo 6b
View from the Coram Ranch Dogwood House looking southeast.

Shasta Dam VAU, KOP 7, Photo 7a
View from the Coram Ranch Residence looking northeast.



Shasta Dam VAU, KOP 7, Photo 7b
View from the Coram Ranch Residence looking east.

Shasta Dam VAU, KOP 7, Photo 7c
View from the Coram Ranch Residence looking southeast.

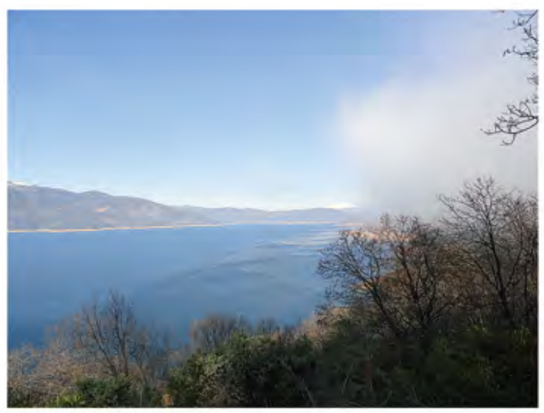
Photographs for Figure 19-8a, Plate 2

Shasta Dam VAU, KOP 8, Photo 8
View from the Coram Ranch Guest Quarters looking northeast.

Shasta Dam VAU, KOP 9, Photo 9a
View from the road above the Chappie - Shasta OHV Area staging area looking northeast.

Shasta Dam VAU, KOP 9, Photo 9b
View from the road above the Chappie - Shasta OHV Area staging area looking southwest.

Shasta Dam VAU, KOP 10, Photo 10a
View of Shasta Dam from pullout east of the dam on Lake Boulevard looking northwest.



Shasta Dam VAU, KOP 10, Photo 10b
View of Shasta Lake from pullout east of the dam on Lake Boulevard looking northeast.

Shasta Dam VAU, KOP 11, Photo 11
View of Shasta Dam from the main body of Shasta Lake.

Photographs for Figure 19-8a, Plate 3

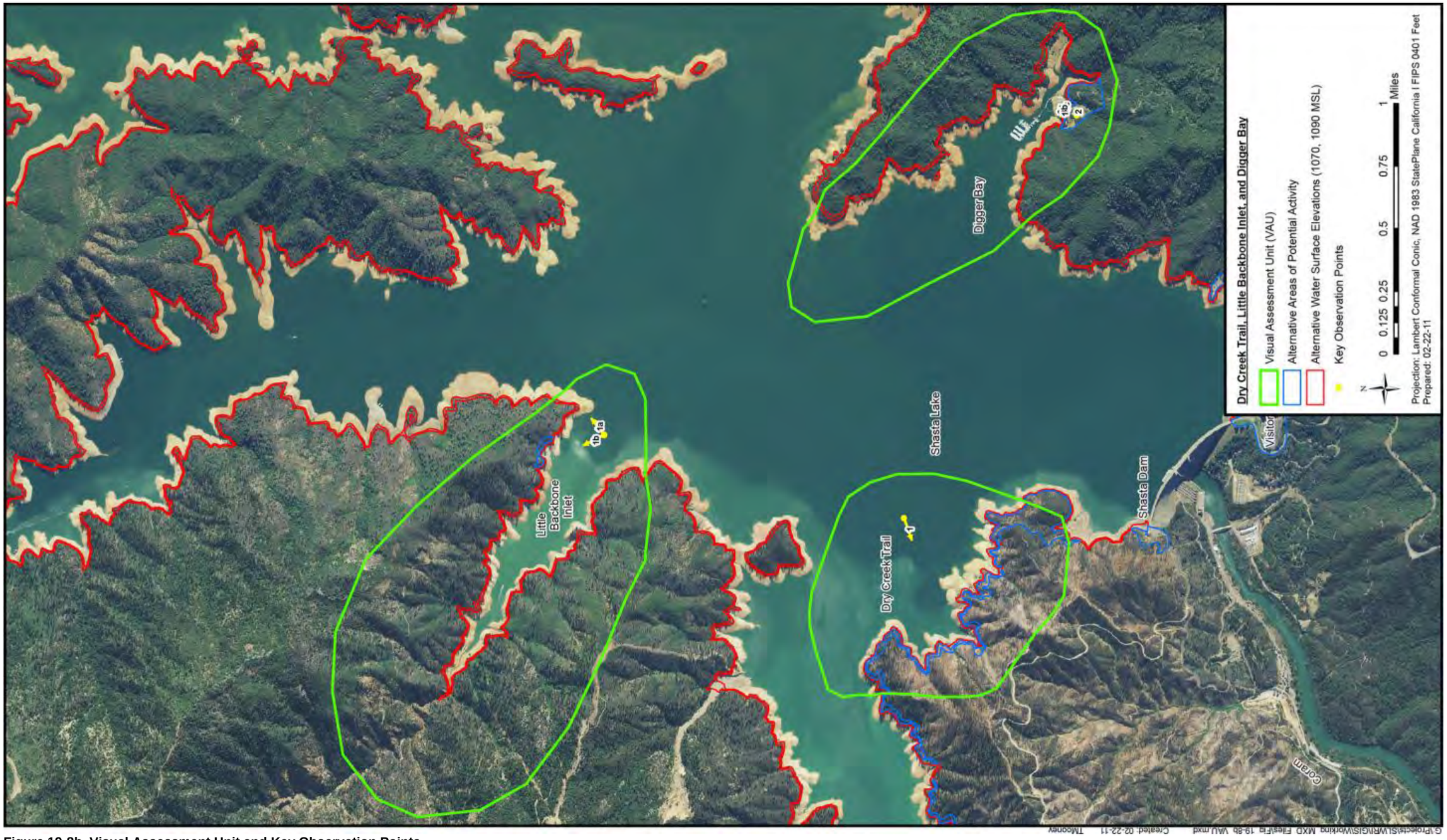


Figure 19-8b. Visual Assessment Unit and Key Observation Points

Dry Creek Trail VAU, KOP1, Photo 1
View of Dry Creek Trail northwest of Shasta Dam looking west from the main body of Shasta Lake.

Little Backbone Inlet VAU, KOP 1, Photo 1a
View of the mouth of Little Backbone inlet looking northeast from the main body of Shasta Lake.

Little Backbone Inlet VAU, KOP 1, Photo 1b
View of the mouth of Little Backbone inlet looking northwest from the main body of Shasta Lake.

Digger Bay VAU, KOP 1, Photo 1
View of the main body of Shasta Lake from the upper parking area west of the Digger Bay Boat Ramp.

Digger Bay VAU, KOP 2, Photo 2
View of the upper parking area at Digger Bay Marina looking east.

Digger Bay VAU, KOP 3, Photo 3a
View of Digger Bay Marina looking northwest from boat ramp.

Digger Bay VAU, KOP 3, Photo 3b
View of Digger Bay Marina shoreline looking west from boat ramp.

Digger Bay VAU, KOP 3, Photo 3c
View of Digger Bay Boat Ramp and parking area looking south from marina.

Photographs for Figure 19-8b, Plate 1

Figure 19-8c. Visual Assessment Unit and Key Observation Points

Packers Bay VAU, KOP 1, Photo 1
View of Packers Bay from the Packers Bay Boat Ramp.

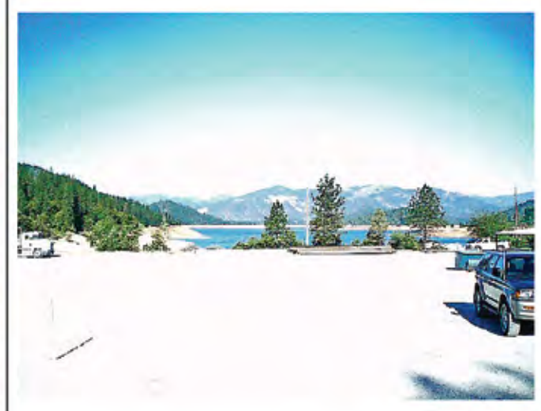
Bridge Bay VAU, KOP 1, Photo 1a
View of Bridge Bay looking north from the Bridge Bay store.

Bridge Bay VAU, KOP 1, Photo 1b
View of Bridge Bay looking northwest from the parking lot of the Bridge Bay store.

Bridge Bay VAU, KOP 2, Photo 2
View of the I-5/Pit River Bridge from Bridge Bay.

Bridge Bay VAU, KOP 3, Photo 3a
View of the Union Pacific Railroad train tunnel looking south from the Bridge Bay Resort maintenance area.

Bridge Bay VAU, KOP 3, Photo 3b
View of the Union Pacific Railroad train tunnel looking north from the Bridge Bay Resort maintenance area.



Bridge Bay VAU, KOP 3, Photo 3c
View of Bridge Bay Marina 4 from the Bridge Bay Resort maintenance parking area.

Bridge Bay VAU, KOP 4, Photo 4a
View of the south shoreline from Bridge Bay Marina 4 stairway.

Photographs for Figure 19-8c, Plate 1

 Bridge Bay VAU, KOP 4, Photo 4b View looking northwest from Bridge Bay Marina 4 stairway.			

Photographs for Figure 19-8c, Plate 2

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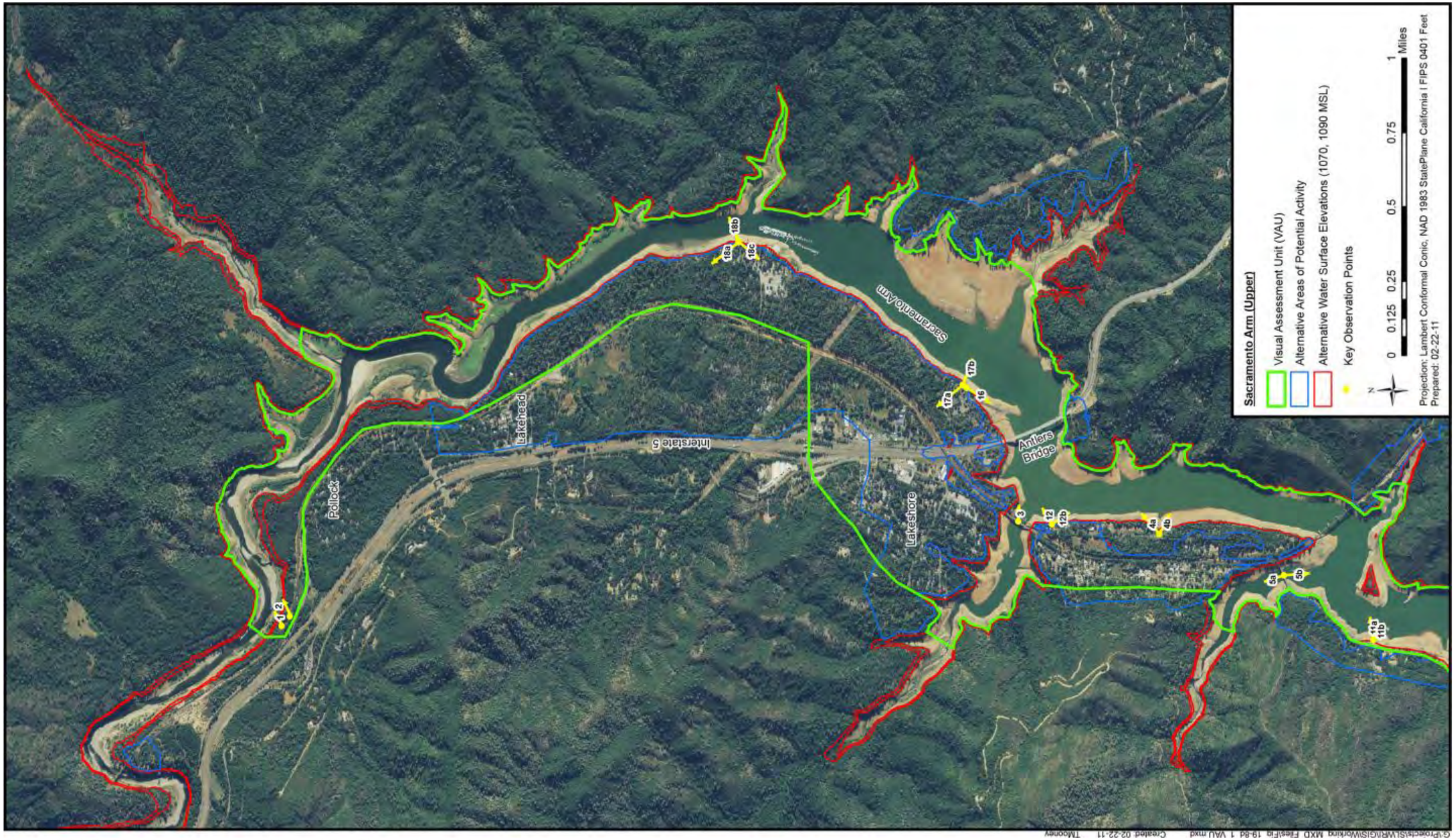


Figure 19-8d. Part 1 – Visual Assessment Unit and Key Observation Points

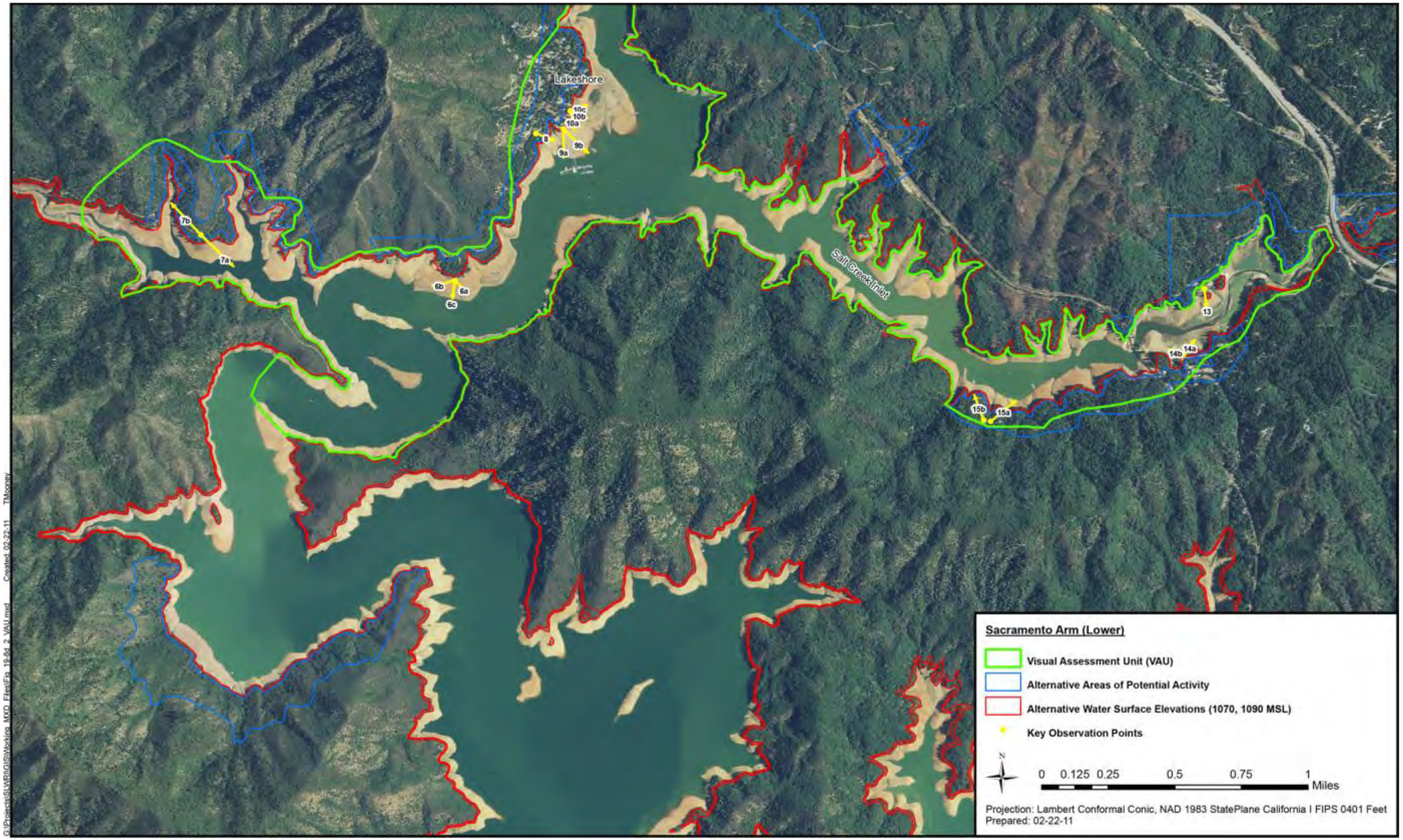


Figure 19-8d. Part 2 – Visual Assessment Unit and Key Observation Points

Sacramento Arm VAU, KOP 1, Photo 1
View of the Sacramento Arm from Riverview Drive southbound near the community of Pollock.

Sacramento Arm VAU, KOP 2, Photo 2
View of the Sacramento Arm from Riverview Drive southbound near the community of Pollock.

Sacramento Arm VAU, KOP 3, Photo 3
View of the Sacramento Arm looking east from the Donley Creek Bridge on Lakeshore Drive near the community of Lakehead.

Sacramento Arm VAU, KOP 4, Photo 4a
View of the Sacramento Arm from Lakeshore East Campground near the community of Lakeshore.

Sacramento Arm VAU, KOP 4, Photo 4b
View of the Sacramento Arm looking southeast from the Lakeshore East Campground.

Sacramento Arm VAU, KOP 5, Photo 5a
View of the inlet looking northwest from Charley Creek Bridge on Lakeshore Drive.

Sacramento Arm VAU, KOP 5, Photo 5b
View of the Sacramento Arm looking south from Charley Creek Bridge on Lakeshore Drive.

Sacramento Arm VAU, KOP 6, Photo 6a
View of the Sacramento Arm from the Beehive Campground access road near Lakeshore.

Photographs for Figure 19-8d, Plate 1

Sacramento Arm VAU, KOP 6, Photo 6b
View of Sugarloaf Creek inlet/Sacramento Arm from Beehive Campground near Lakeshore.

Sacramento Arm VAU, KOP 6, Photo 6c
View of Sugarloaf Creek/Sacramento Arm from Beehive Campground near Lakeshore.

Sacramento Arm VAU, KOP 7, Photo 7a
View of Sugarloaf Cove near Lakeshore from north shore looking south.

Sacramento Arm VAU, KOP 7, Photo 7b
View of Sugarloaf Cove from north shore looking northwest.

Sacramento Arm VAU, KOP 8, Photo 8
View of Sugarloaf Marina from the end of Daisy Lane.

Sacramento Arm VAU, KOP 9, Photo 9a
View looking south from Sugarloaf Resort Marina access.

Sacramento Arm VAU, KOP 9, Photo 9b
View toward the Salt Creek Inlet from Sugarloaf Resort Marina access.

Sacramento Arm VAU, KOP 9, Photo 9c
View of Sugarloaf Marina from Sugarloaf Resort.

Photographs for Figure 19-8d, Plate 2

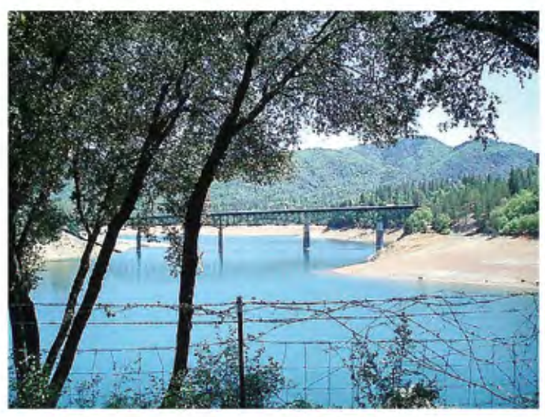
Sacramento Arm VAU, KOP 10, Photo 10a
View looking south toward Sugarloaf Marina from the Sugarloaf Boat Ramp.

Sacramento Arm VAU, KOP 10, Photo 10b
View looking southeast at the Sacramento Arm from the Sugarloaf Boat Ramp.

Sacramento Arm VAU, KOP 10, Photo 10c
View looking northeast at the Sacramento Arm from the Sugarloaf Boat Ramp entrance.

Sacramento Arm VAU, KOP 11, Photo 11a
View looking east from the Tsasdi Resort Marina.

Sacramento Arm VAU, KOP 11, Photo 11b
View looking south from the Tsasdi Resort Marina.



Sacramento Arm VAU, KOP 12, Photo 12a
View looking east toward I-5 from the Lakeshore Resort Campground.

Sacramento Arm VAU, KOP 12, Photo 12b
View looking southeast from the Lakeshore Resort Campground.

Sacramento Arm VAU, KOP 13, Photo 13
View of the Salt Creek Inlet looking south from the Oak Grove Day Use Area.

Photographs for Figure 19-8d, Plate 3

Sacramento Arm VAU, KOP 14, Photo 14a
View looking northeast from Lower Salt Creek Road at the Salt Creek Resort.

Sacramento Arm VAU, KOP 14, Photo 14b
View looking northwest from Lower Salt Creek Road at the Salt Creek Resort.

Sacramento Arm VAU, KOP 15, Photo 15a
View of the Salt Creek Inlet from Lower Salt Creek Road.

Sacramento Arm VAU, KOP 15, Photo 15b
View of the Salt Creek Inlet from Lower Salt Creek Road.

Sacramento Arm VAU, KOP 16, Photo 16
View of Antlers Bridge/I-5 looking southwest from Antlers Public Boat Ramp.

Sacramento Arm VAU, KOP 17, Photo 17a
View of Antlers Public Boat Ramp/Picnic Area parking lot from picnic area looking north.

Sacramento Arm VAU, KOP 17, Photo 17b
View of Sacramento Arm from Antlers Public Boat Ramp/Picnic Area from picnic area looking south.

Sacramento Arm VAU, KOP 18, Photo 18a
View from typical campsite at Antlers Resort looking north.

Photographs for Figure 19-8d, Plate 4

Sacramento Arm VAU, KOP 18, Photo 18b
View from typical campsite at Antlers Resort looking east.

Sacramento Arm VAU, KOP 18, Photo 18c
View from typical campsite at Antlers Resort looking southwest.

Photographs for Figure 19-8d, Plate 5

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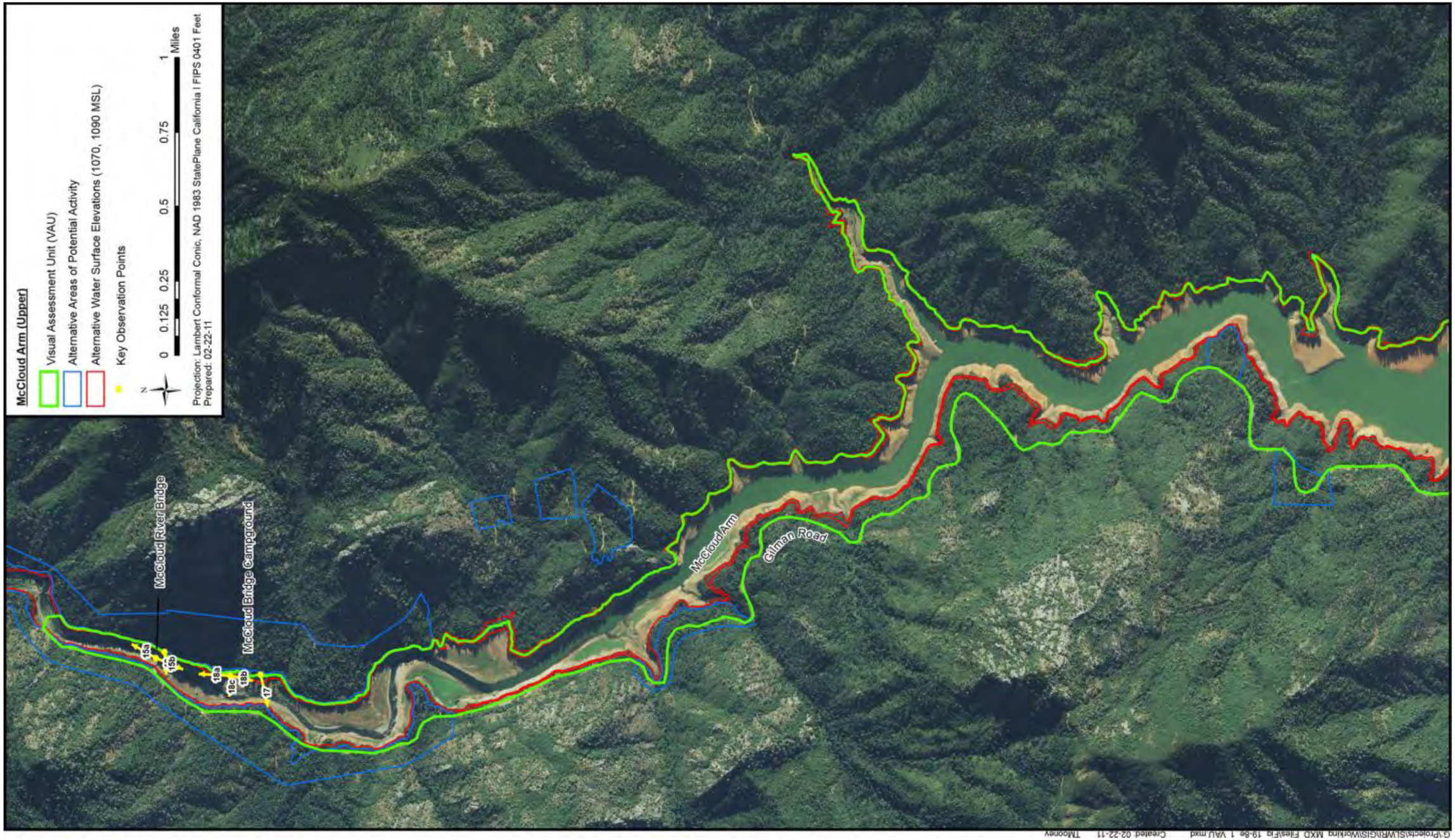

Figure 19-8e. Part 1 – Visual Assessment Unit and Key Observation Points

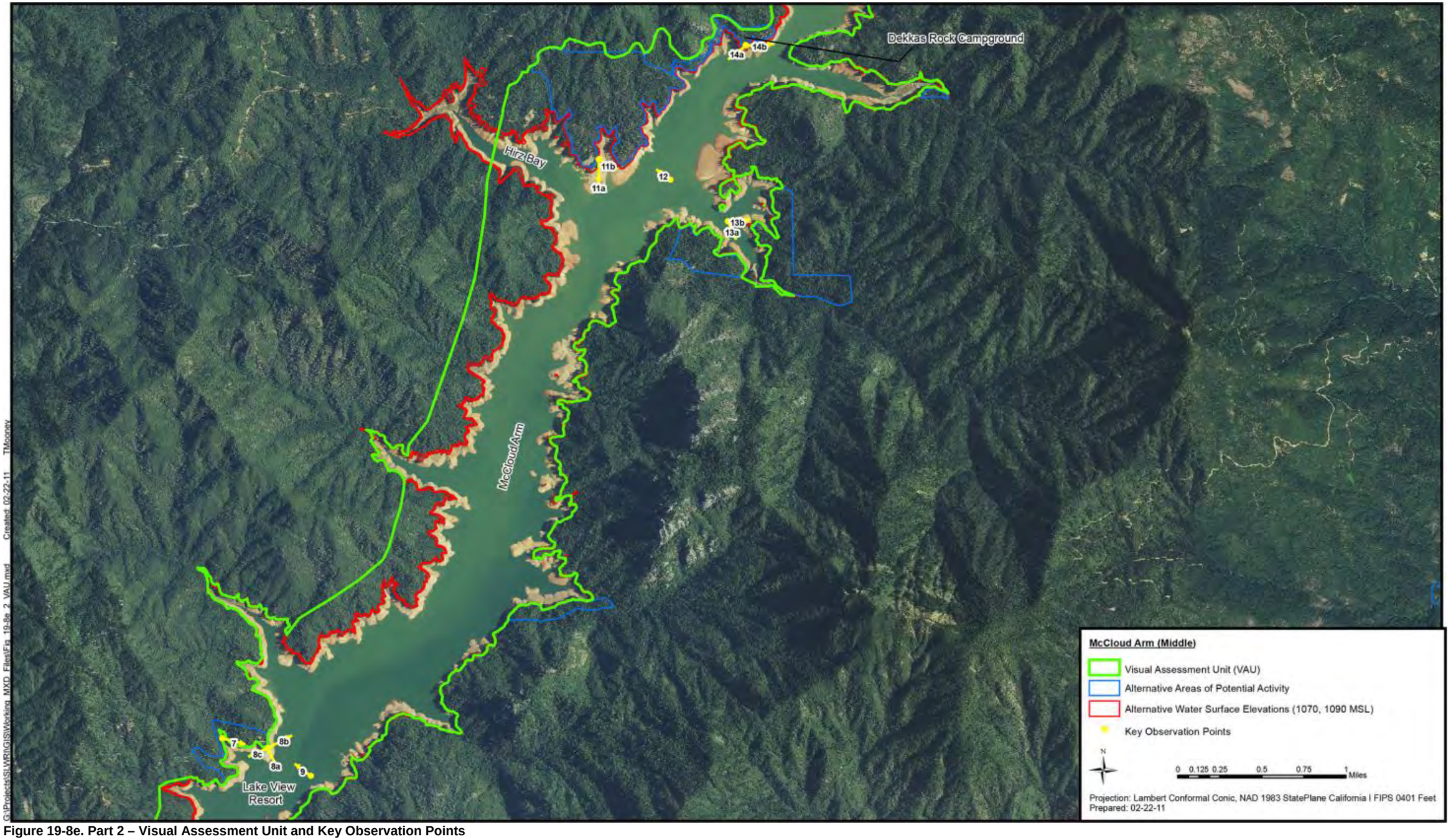

Figure 19-8e. Part 2 – Visual Assessment Unit and Key Observation Points

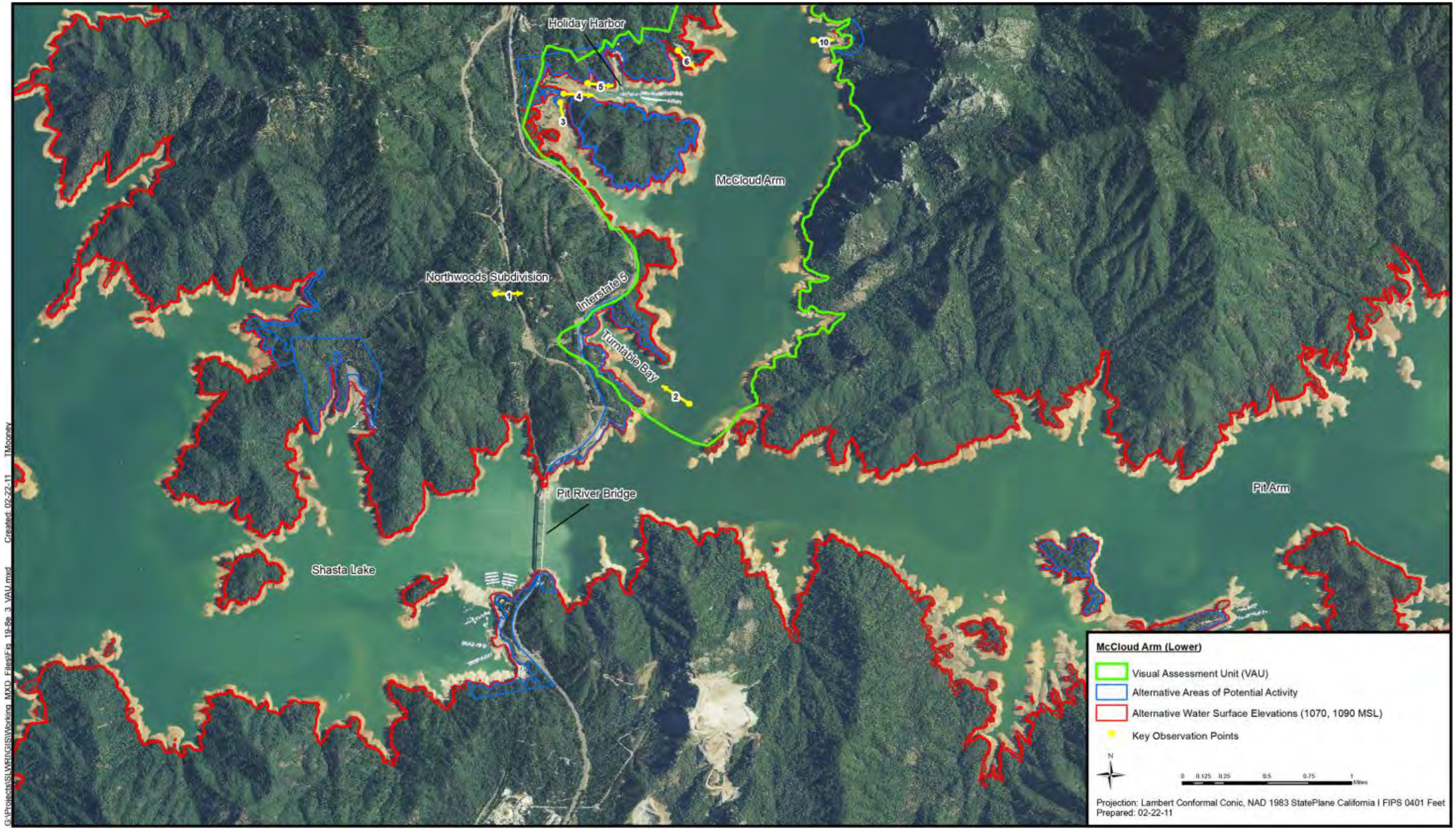

Figure 19-8e. Part 3 – Visual Assessment Unit and Key Observation Points

McCloud Arm VAU, KOP 1, Photo 1
View of the McCloud Arm, Turntable Bay and vicinity from a home located off of Northwoods Road, west of I-5.

McCloud Arm VAU, KOP 2, Photo 2
View of Turntable Bay from the McCloud Arm of Shasta Lake.

McCloud Arm VAU, KOP 3, Photo 3
View of the Bailey Cove Boat Ramp from the Bailey Cove parking lot.

McCloud Arm VAU, KOP 4, Photo 4
View of Holiday Harbor from the Bailey Cove Day Use Area.

McCloud Arm VAU, KOP 5, Photo 5
View of Holiday Harbor from the Holiday Harbor Campground entrance.

McCloud Arm VAU, KOP 6, Photo 6
View looking south toward the McCloud Arm from the Shasta Caverns parking lot.

McCloud Arm VAU, KOP 7, Photo 7
View from the Lake View Resort caretaker residence.

McCloud Arm VAU, KOP 8, Photo 8a
View of the McCloud Arm looking south from the Lake View Resort Boat Ramp.

Photographs for Figure 19-8e, Plate 1

McCloud Arm VAU, KOP 8, Photo 8b
View of the McCloud Arm looking northeast from the Lake View Resort Boat Ramp.

McCloud Arm VAU, KOP 8, Photo 8c
View of the Lake View Resort Marina from the Lake View Resort Boat Ramp.

McCloud Arm VAU, KOP 9, Photo 9
View of Lake View Resort from the McCloud Arm of Shasta Lake.

McCloud Arm VAU, KOP 10, Photo 10
View of Shasta Caverns dock on east side of lake from the McCloud Arm of Shasta Lake.

McCloud Arm VAU, KOP 11, Photo 11a
View of the McCloud Arm downstream from the Hirz Bay Boat Ramp.

McCloud Arm VAU, KOP 11, Photo 11b
View of the McCloud River Arm upstream, from the Hirz Bay Boat Ramp.

McCloud Arm VAU, KOP 12, Photo 12
View of Hirz Bay from the McCloud Arm of Shasta Lake.

McCloud Arm VAU, KOP 13, Photo 13a
View of Campbell Creek inlet looking southeast from the McCloud Arm of Shasta Lake

Photographs for Figure 19-8e, Plate 2

McCloud Arm VAU, KOP 13, Photo 13b
View of Campbell Creek inlet looking east from the McCloud Arm of Shasta Lake

McCloud Arm VAU, KOP 14, Photo 14a
View of the McCloud Arm downstream, from the Dekkas Rock Campground.

McCloud Arm VAU, KOP 14, Photo 14b
View of the McCloud Arm upstream, from the Dekkas Rock Campground.

McCloud Arm VAU, KOP 15, Photo 15a
View of the McCloud River upstream, from the McCloud River Bridge.

McCloud Arm VAU, KOP 15, Photo 15b
View of the McCloud River downstream, from the McCloud River Bridge.

McCloud Arm VAU, KOP 16, Photo 16
View of the McCloud River Bridge, from the eastern approach.

McCloud Arm VAU, KOP 17, Photo 17
View of the McCloud Arm from the McCloud Bridge Campground - Space 10.

McCloud Arm VAU, KOP 18, Photo 18a
View of the McCloud Arm from open area west of Space 1, McCloud Bridge Campground.

Photographs for Figure 19-8e, Plate 3

 McCloud Arm VAU, KOP 18, Photo 18b View of the McCloud Arm from open area west of Space1, McCloud Bridge Campground.	 **McCloud Arm VAU, KOP 18, Photo 18c** View looking west from the open area west of Space 1, McCloud Bridge Campground.		

Photographs for Figure 19-8e, Plate 4

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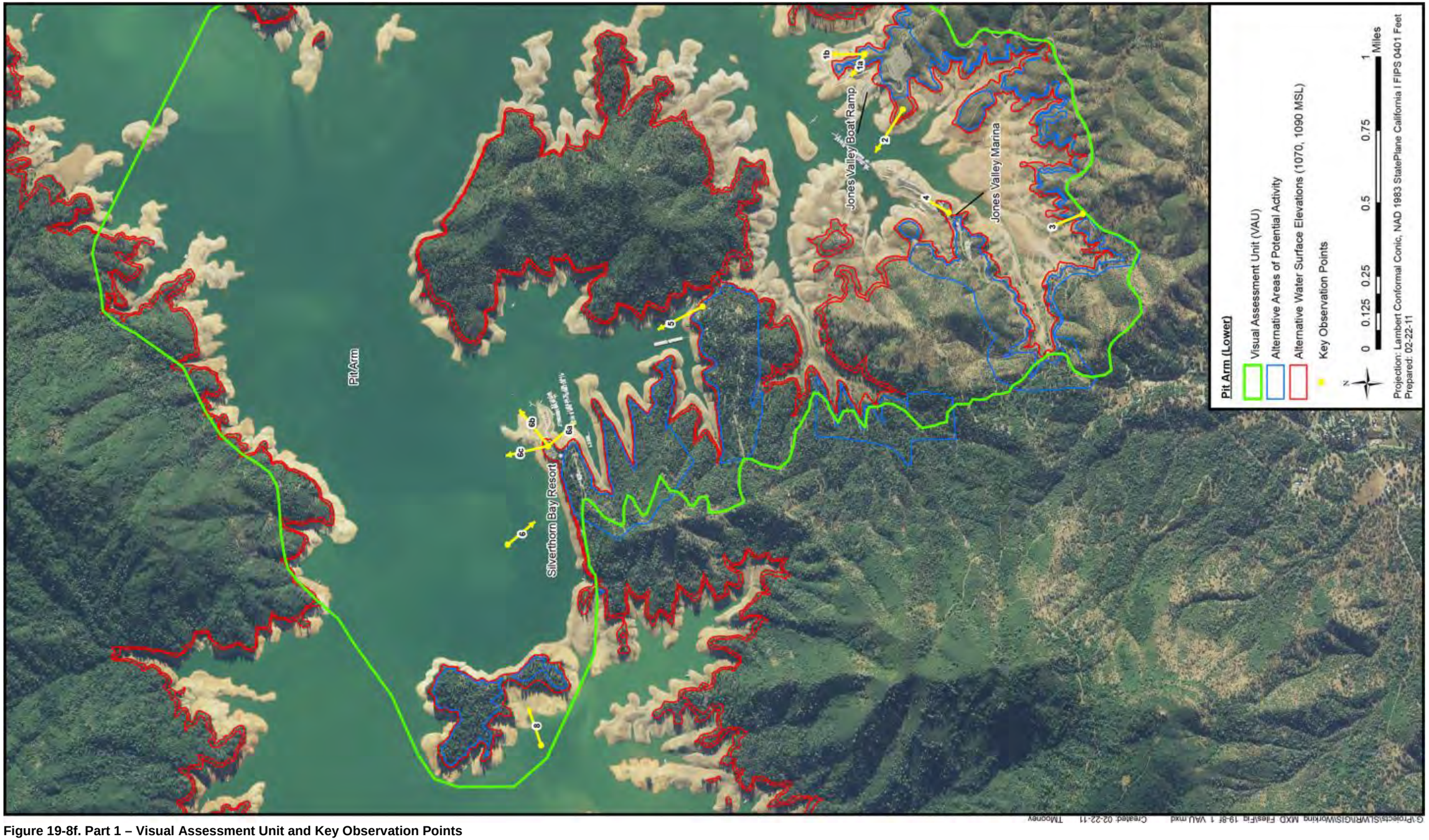

Figure 19-8f. Part 1 – Visual Assessment Unit and Key Observation Points

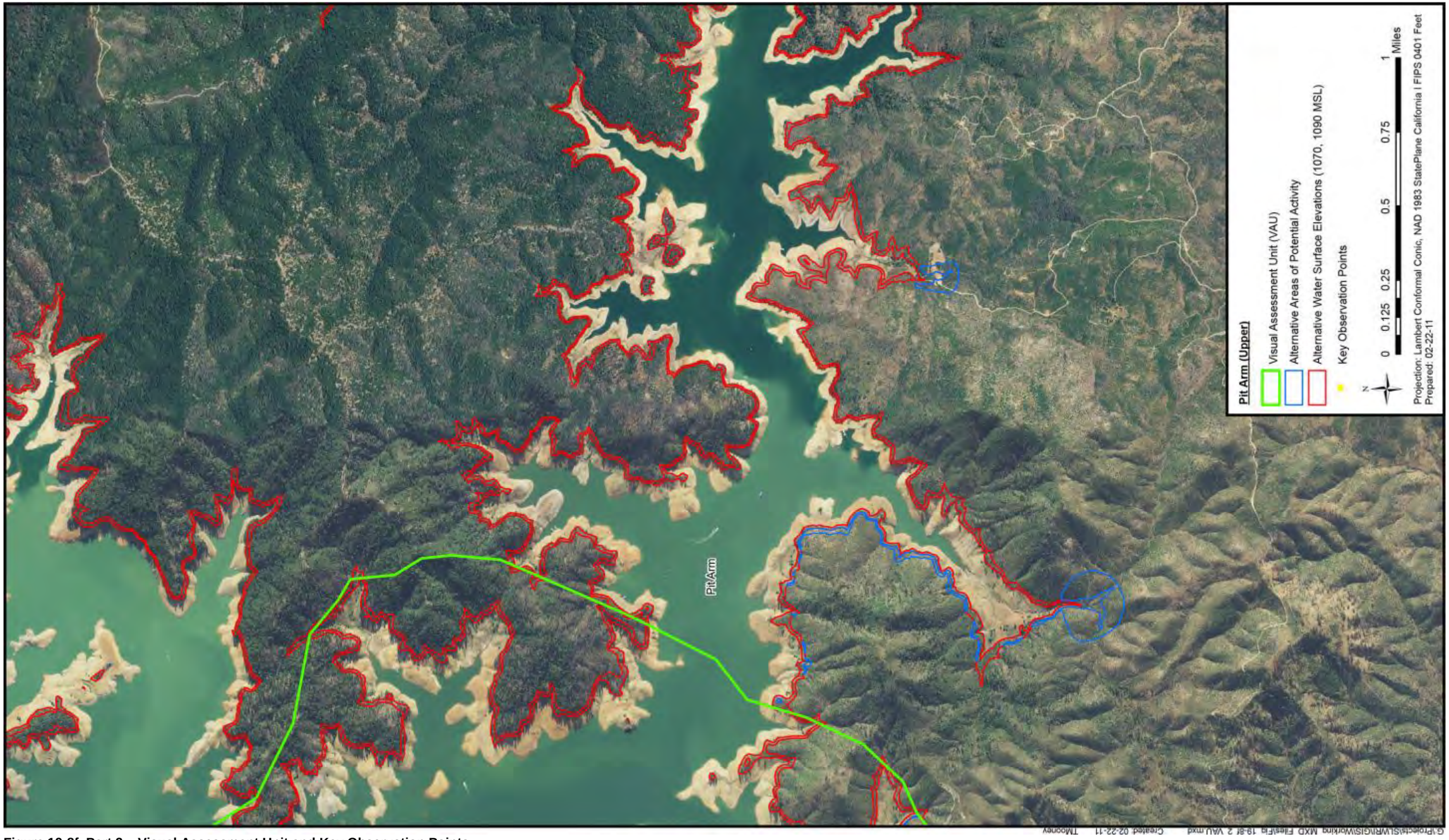

Figure 19-8f. Part 2 – Visual Assessment Unit and Key Observation Points

Pit Arm VAU, KOP 1, Photo 1a
View of the Pit Arm from the Jones Valley parking area, looking northwest.

Pit Arm VAU, KOP 1, Photo 1b
View of the Pit Arm from the Jones Valley parking area, looking northeast.

Pit Arm VAU, KOP 2, Photo 2
View of the Pit Arm from the Jones Valley parking area (west end), looking west.

Pit Arm VAU, KOP 3, Photo 3
View of the Pit Arm from the entrance to the Jones Valley Campground.

Pit Arm VAU, KOP 4, Photo 4
View of the Pit Arm looking north from the Jones Valley Resort Boat Ramp.

Pit Arm VAU, KOP 5, Photo 5
View of the Pit Arm from Juniper Drive, Silverthorn Resort.

Pit Arm VAU, KOP 6, Photo 6a
View of the Silverthorn Marina from the top of the boat ramp looking east.

Pit Arm VAU, KOP 6, Photo 6b
View of the Silverthorn Marina from the top of the boat ramp looking northeast.

Photographs for Figure 19-8f, Plate 1

 Pit Arm VAU, KOP 6, Photo 6c View of the Silverthorn Marina from the top of the boat ramp looking north.	 **Pit Arm VAU, KOP 7, Photo 7** View of Silverthorn Marina looking south from the Pit Arm of Shasta Lake.	 **Pit Arm VAU, KOP 8, Photo 8** View of the west side of Ski Island looking east from Shasta Lake.	

Photographs for Figure 19-8f, Plate 2

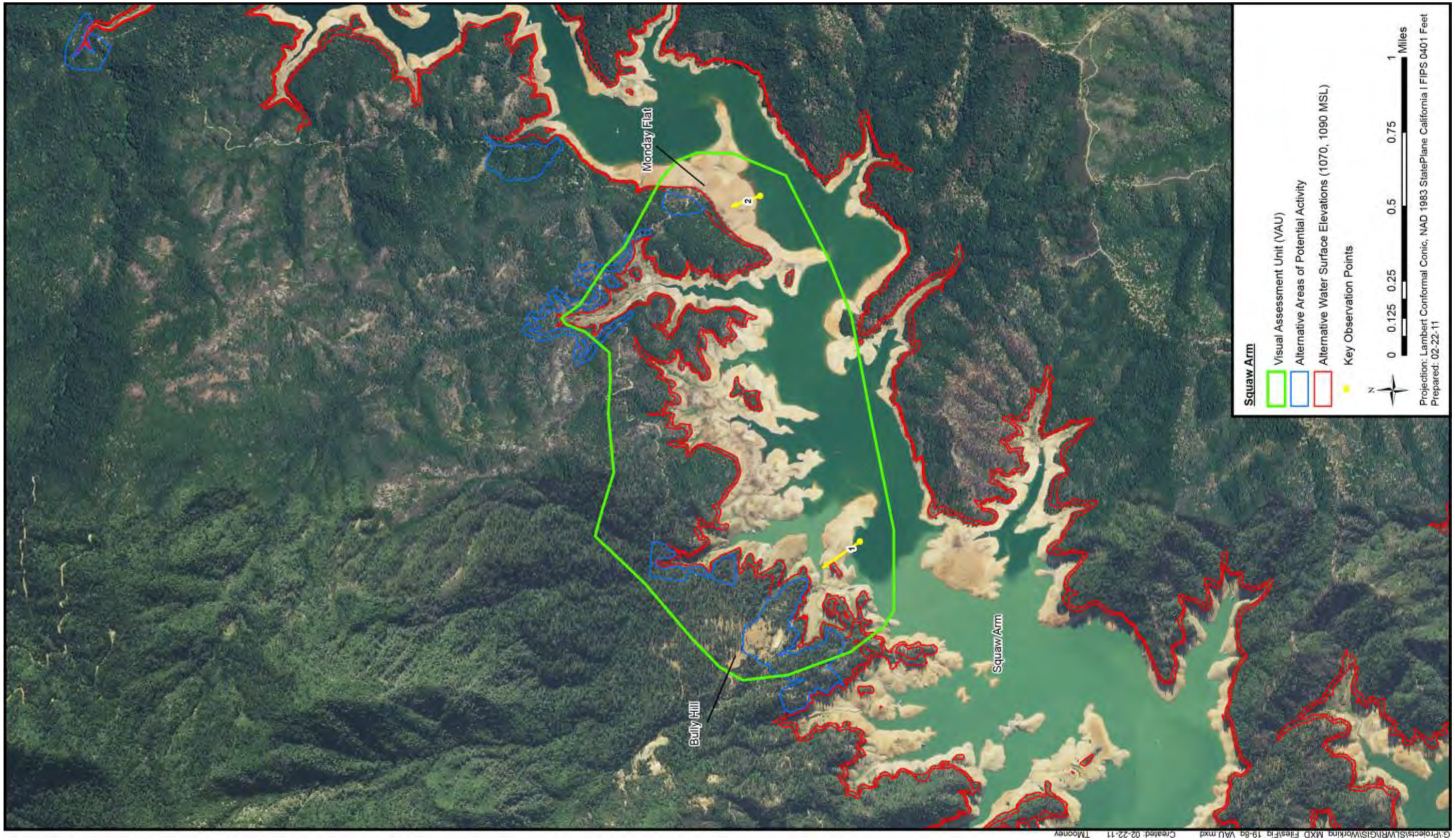

Figure 19-8g. Visual Assessment Unit and Key Observation Points

 Squaw Arm VAU, KOP 1, Photo 1 View of Bully Hill looking north from the Squaw Arm of Shasta Lake.	 **Squaw Arm VAU, KOP 2, Photo 2** View of Monday Flat looking north from the Squaw Arm of Shasta Lake.		

Photographs for Figure 19-8g, Plate 1

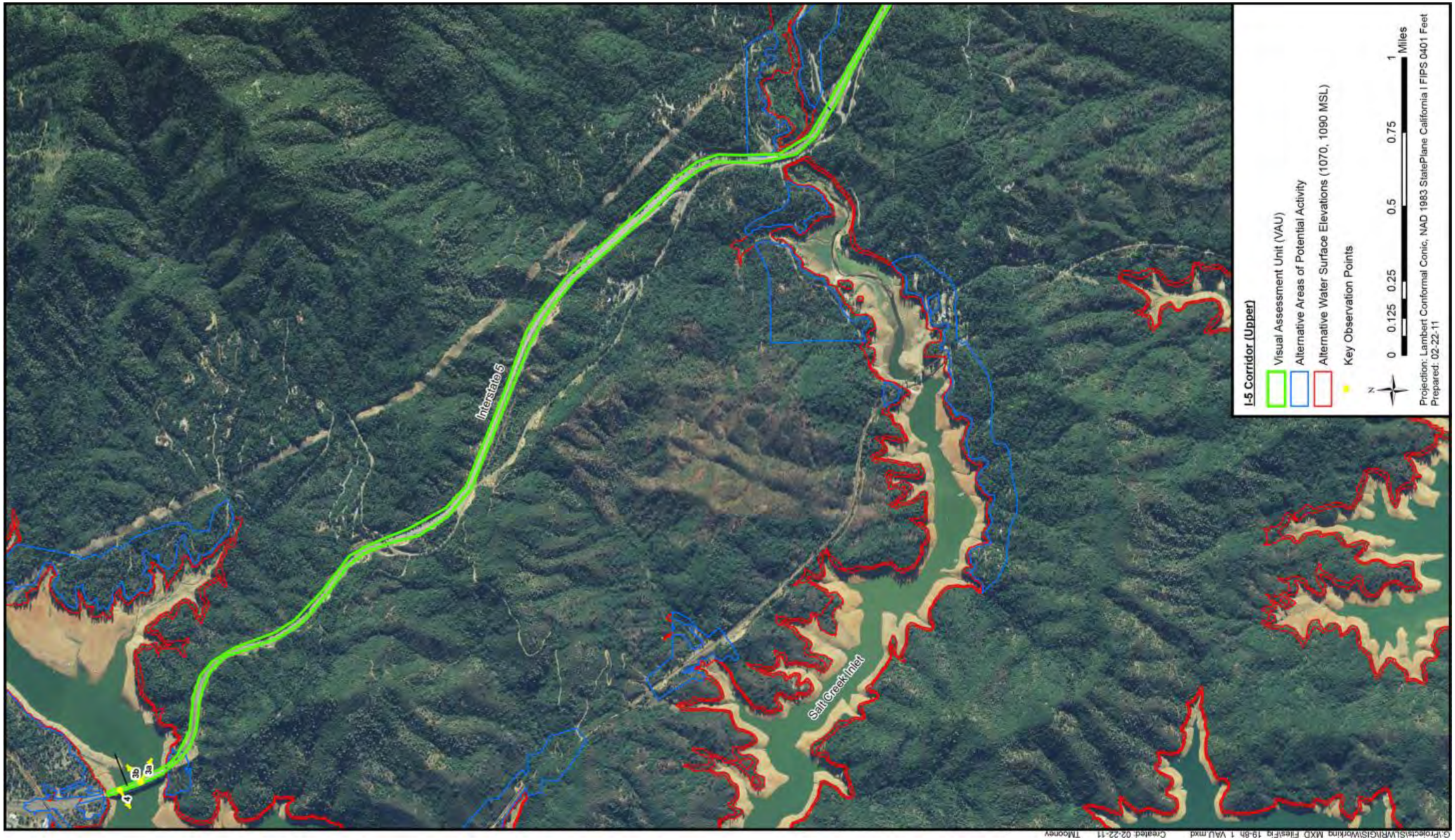

Figure 19-8h. Part 1 – Visual Assessment Unit and Key Observation Points

Figure 19-8h. Part 2 – Visual Assessment Unit and Key Observation Points

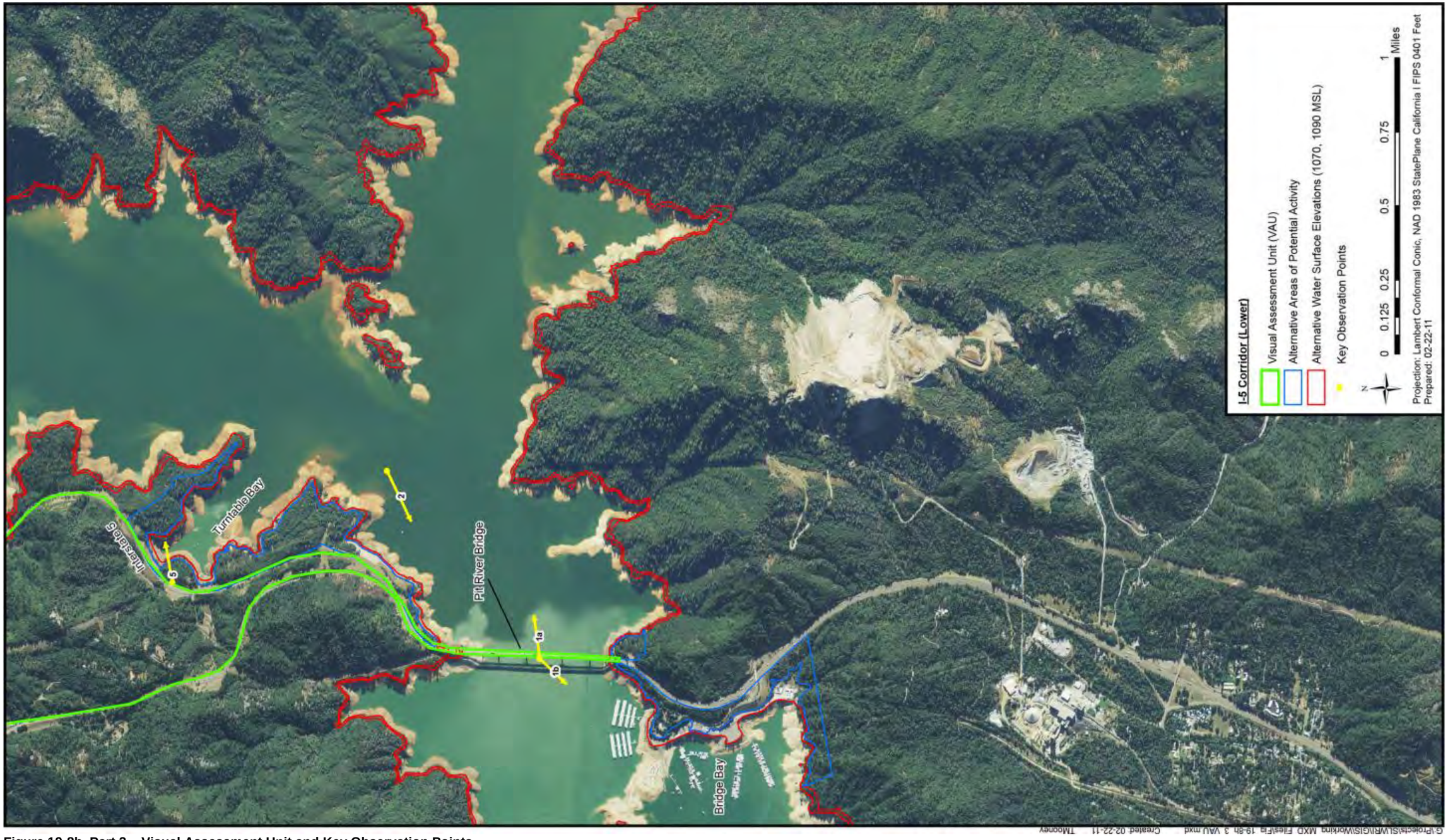

Figure 19-8h. Part 3 – Visual Assessment Unit and Key Observation Points

I-5 Corridor VAU, KOP 1, Photo 1a
View of the Pit Arm (right) and the McCloud Arm (left) from the Pit River Bridge, as seen from I-5 northbound.

I-5 Corridor VAU, KOP 1, Photo 1b
View of Bridge Bay Resort from the Pit River Bridge, as seen from I-5 southbound.

I-5 Corridor VAU, KOP 2, Photo 2
View of the Pit River Bridge looking west from the Pit Arm of Shasta Lake.

I-5 Corridor VAU, KOP 3, Photo 3a
View of the Sacramento Arm looking toward the Antlers Campground from the Antlers Bridge, as seen from I-5 northbound.

I-5 Corridor VAU, KOP 3, Photo 3b
View of the Antlers Public Boat Launch from the Antlers Bridge, as seen from I-5 northbound.

I-5 Corridor VAU, KOP 4, Photo 4
View of the Sacramento Arm west of the Antlers Bridge, as seen from I-5 southbound.

I-5 Corridor VAU, KOP 5, Photo 5
View of the McCloud Arm and vicinity at Turntable Bay, as seen from I-5 northbound.

Photographs for Figure 19-8h, Plate 1

The locations of VAUs were determined using the following steps:

- **Identification of Visually Sensitive Areas** – A determination of sensitivity was made by considering the level of use that a particular view receives by the public. Driving routes, recreational areas, and designated scenic corridors subject to heavy to moderate use represented the numerous sites in the primary study area that could be considered visually sensitive. Examples of visually sensitive areas include the I-5 corridor over the Pit River Bridge, the Shasta Dam Visitor Center, and Bridge Bay Resort.

- **Definition of the Landscape Character** – The landscape character is shaped by the physical, biological, and cultural attributes that combine to make a landscape identifiable or unique. The diverse terrain of the region coupled with the unique attributes of Shasta Lake and the Sacramento River are examples of the landscape character of the primary study area.

- **Identification of Visually Sensitive Observation Points** – This step was used to identify visually sensitive observation points throughout the primary study area that could be adversely affected by changes to the visual environment resulting from project implementation. Important examples of visually sensitive observation points include the vista point located on SR 151 and residences overlooking portions of Shasta Lake. Views from such points would be affected by changes in water levels, as well as the changes to infrastructure associated with raising Shasta Dam and enlarging Shasta Lake.

- **Identification of Visually Affected KOPs** – KOPs are determined by the extent of observable visual impacts from a specific location, and would depend on the location and distance of the affected area relative to the visually sensitive observation point. The analysis of impacts at such sites considered whether or not project activities would be in the direct line of sight or would occur in the foreground (0 to 0.5 mile) or middle ground (0.5 to 4 miles) view. The distinctiveness of features begins to diminish beyond 3 miles. KOPs represent observation points in the primary study area having a direct line of sight to, or a view of, the foreground or middle ground of affected areas. The KOPs selected for the analysis of project impacts are identified in Table 19-2 and are further described in the following section.

- **Classification of Scenic Attractiveness** – Scenic attractiveness refers to a classification system used to distinguish unique or remarkable views from those that are more mundane. As described previously, the classification system consists of the following categories: Class A, “distinctive”; Class B, “typical”; and Class C “indistinctive.”

Following is a discussion of the VAUs and associated KOPs that were identified for the primary study area. Because the primary study area is so large and much of it is remote, VAUs were established at locations subject to relatively high levels of use where changes to the visual environment would be most apparent.

Shasta Dam VAU The Shasta Dam VAU was established to illustrate the views of Shasta Dam from the SR 151 overlook, the Shasta Dam Visitor Center, and the Main Body of Shasta Lake. All of these locations draw numerous visitors annually and receive widespread publicity in regional tour guides. Shasta Dam and the adjacent visitor center provide a unique setting from which the public's visual impression of the overall impact of the project (i.e., raising of water levels, increased dam elevation) would be made. A popular attraction in the Shasta Dam VAU is to walk across the dam. Unregulated vehicle traffic is restricted because of homeland security concerns. However, since 2010, visitors have been allowed to drive across the dam between 6 a.m. and 10 p.m. after producing a valid driver's license and vehicle registration and subjecting their vehicle and any trailer to inspection. In addition, boaters and other water-based recreationists have expansive views of the waterside face of the dam.

Shasta Dam VAU – KOP 1 Views from the Shasta Dam overlook on SR 151 capture the essence of the region by offering unobstructed views of the Three Shastas (Shasta Dam in the foreground, Shasta Lake in the middle ground, and Mount Shasta in the background). Situated on the mountainside above the southeast side of the dam, the overlook offers viewers the opportunity to observe not only the Three Shastas, but also the upper Sacramento River as it flows from the dam spillway and miles of mountainous, forested terrain in most directions. The unique and outstanding scenic quality of this view makes it a Class A visual resource that also contains components of the more typical Class B views (e.g., forest, ridgelines).

KOP 1, Photo 1a, illustrates the Class A panoramic views from the SR 151 overlook to the north/northeast. The dam, the southern end of the Main Body of the lake, and the forested landscape are prominent; Mount Shasta, about 50 miles away, is dominant in the background. Also clearly visible, but less remarkable than the dam, is the dam's infrastructure, including the powerhouse and maintenance roads. The uniqueness of the dam and its infrastructure set against a dramatic landscape of forest and mountains makes this view a Class A visual resource.

KOP 1, Photo 1b, illustrates the limited Class B views of the upper Sacramento River channel downstream from the spillway from the SR 151 overlook. The Sacramento River, regulated by Keswick Reservoir, flows through a steep canyon and is obscured from view by topography and vegetation. The Chappie-Shasta Off-Highway Vehicle (OHV) Area, managed by the U.S. Department of the Interior, Bureau of Land Management (BLM), along with sections of County Road 5G011 (which is accessed via the dam) and an abandoned railroad

line, are visible on the north side of the river, but the river channel itself is not visible from this KOP.

Shasta Dam VAU – KOP 2 KOP 2, Photo 2a, illustrates the Class A and B views of the southern end of the lake as seen from the center of the roadway crossing over Shasta Dam. A panoramic view of the southern end of the lake, which occupies the foreground and the middle ground with Mount Shasta on the horizon, is seen from this area. The Centimudi Boat Ramp is clearly visible in the middle ground to the east (KOP 2, Photo 2c).

Turning to the west (KOP 2, Photo 2b), the Shasta Dam compound and the Sacramento River below the dam form the primary focal point from this viewpoint. The river meanders out of sight about 1 mile downstream from the dam. This spectacular view of the spillway is a Class A visual resource.

Shasta Dam VAU – KOP 3 Downstream from the dam, on the right (north) side of the Sacramento River, BLM maintains the Chappie-Shasta OHV Area. KOP 3 was established to illustrate the limited views of the downstream face of Shasta Dam from the OHV main staging area. As shown in Photo 3a, the middle ground of the view is dominated by a Class B view of the upper part of Shasta Dam. Vegetation and topography limit the extent of views of the dam from this location and, as illustrated by Photo 3b, also effectively block views of the river channel south toward the river from the staging area.

Shasta Dam VAU – KOP 4 A public campground at the OHV staging area provides views for OHV recreationists. Although Shasta Dam is not visible from the campground, the Sacramento River dominates the middle ground view to the north, east, and south. KOP 4, Photos 4a and 4b, respectively, show the Class B views of the river upstream and downstream.

Shasta Dam VAU – KOPs 5, 6, 7, and 8 Approximately 0.25 mile downstream from the OHV staging area, south of the boundary of the Shasta Unit of the NRA, are the historic mining community of Coram and the Coram Ranch, a privately owned recreation resort. KOPs 5, 6, 7, and 8 were established to illustrate the varying degrees of river views (and at one location (KOP 7, Photo 7a), a view of Shasta Dam) from the Coram Ranch cabins. Views from the River House (KOP 5, Photos 5a and 5b), the Dogwood House (KOP 6, Photos 6a and 6b), and the modular cabins (KOP 8, Photo 8) are considered Class B, offering views of the Sacramento River approximately 1 mile downstream from the dam. The most remarkable view of the primary study area from the ranch is the view of Shasta Dam from the ranch's main house (KOP 7, Photo 7a). Although distance places the dam in the middle ground, as seen from the main house, the view of the dam is nonetheless impressive. Foreground vegetation serves to frame the dam and draw the viewer's focus to the feature. KOP 7, Photos 7b and 7c, illustrate the views of the Sacramento River from the main ranch house. The views from KOP 7 of Shasta Dam and the Sacramento River are considered to be Class A.

Shasta Dam VAU – KOP 9 KOP 9 was established to demonstrate the view of Shasta Dam and the Sacramento River from Coram Road, upslope of the OHV staging area. The Class A view of the river and dam from KOP 9 (Photo 9a) shows the foreground, middle ground, and background landscape. Although most of the dam is visible, its base and a portion of the right abutment (north end) are obscured by topography. The narrowing of the river channel toward the background draws the viewer's eye toward the dam and the mountains in the background. The Class B view looking downstream (Photo 9b) offers partial views of the river, limited by vegetation and topography.

Shasta Dam VAU – KOP 10 KOP 10 was established to illustrate the view afforded motorists traveling on Lake Boulevard. Coming into the NRA from the south, approximately 0.5 mile of the extreme northern end of Lake Boulevard follows the shoreline of Shasta Lake before ending at the Shasta Lake Visitor Center. Similar to views from SR 151 (KOP 1), the elevation of the roadway above the lake allows for expansive vistas from pullouts along the route. Photo 10a shows the Class A vista point view of the lakeside face of Shasta Dam, the Main Body of Shasta Lake in the middle ground, and the forested mountain terrain that dominates the background. Vegetation and topography in the foreground frame the view but also restrict it. The full extent of the view from KOP 10 cannot be fully appreciated by viewers unless they stop at a roadside pullout; otherwise, they will quickly pass it by when traveling on Lake Boulevard.

Views of Shasta Lake, the surrounding mountains, and Mount Shasta (in the distant background) looking north from KOP 10 (Photo 10b) are impressive but more typical of views around Shasta Lake. The Class B view of the lake and its vicinity from this location would be most noticed by motorists traveling east on Lake Boulevard, but the view would be of short duration because the road turns abruptly south away from the lake a short distance beyond this point.

Shasta Dam VAU – KOP 11 KOP 11, Photo 11, illustrates the panoramic view that boaters and other water-based recreationists in the Main Body of the lake have of Shasta Dam. The attractiveness of a distinctive built feature, such as the dam, in contrast to the natural character of its surroundings (e.g., water and mountains) is subjective; nonetheless, it is an impressive sight. The uniqueness of the dam set against a dramatic landscape of water and mountains makes this view a Class A visual resource.

Dry Creek Trail VAU The proximity of the Dry Creek Trail area to Shasta Dam makes it a prominent part of the landscape when viewed from the Main Body of Shasta Lake. Most of the Dry Creek Trail shoreline is not visible from the dam, the Chappie-Shasta OHV Area staging area and campground, or other areas frequented by the public because it is obstructed by topography and has limited public access. Although the Dry Creek Access Road meanders through the uplands adjacent to the shoreline, the road is primitive and used only by OHV recreationists, mountain bikers, and the occasional hiker.

Dry Creek Trail VAU – KOP 1 Most views of the shoreline from the road are obstructed by vegetation and distance. KOP 1 (Photo 1) shows the lakeside view, which is the most common vantage point from which visitors to Shasta Lake would see the Dry Creek Trail shoreline. This Class B view is common throughout the Shasta Lake portion of the primary study area.

Little Backbone Inlet VAU The Little Backbone Inlet VAU was established to illustrate the more typical views that boaters and other water-based recreationists would have of the western side of Shasta Lake. Much of this area has been previously disturbed by mining, wildfire, and OHV activities. Because most of the western shoreline is remote and undeveloped, few people visit the area.

Little Backbone Inlet VAU – KOP 1 As with much of the western shoreline, the distance from the more populated parts of the primary study area makes it difficult to discern specific details of the landscape. KOP 1, Photos 1a and 1b, illustrate the Class B views in this part of the lake.

Digger Bay VAU The Digger Bay Marina is one of the most difficult marinas on Shasta Lake to access by car. Although it is only 3 miles from the City of Shasta Lake, the road is narrow and extremely winding and the surrounding terrain is very steep. Nonetheless, this USFS-permitted marina offers a variety of amenities that make it a popular destination, including the only source of gas on the western part of the lake, a small store, and boat rentals.

Digger Bay VAU – KOPs 1, 2, and 3 Views of Shasta Lake from the upper parking area are limited by vegetation and topography (KOP 1, Photo 1, and KOP 2, Photo 2). Similarly, views of Shasta Lake (KOP 3, Photo 3a) and the uplands adjacent to the marina (KOP 3, Photos 3b and 3c) are also extremely limited by vegetation and topography. These views are a Class C, indistinctive visual resource.

Packers Bay VAU

Packers Bay VAU – KOP 1 Although smaller than nearby Bridge Bay Resort, Packers Bay is a popular destination for water-based recreationists. In addition to a boat ramp managed by USFS, the Packers Bay Marina (permitted by USFS) features amenities such as gas, houseboat rentals, and a small store that is open on a seasonal basis in a less congested environment than at other recreational facilities around the lake. Scenery in and around the Packers Bay Marina is not terribly dramatic, but rather is typical of the region. KOP 1, Photo 1, shows the Class B view from the Packers Bay Boat Ramp.

Bridge Bay VAU The Bridge Bay Resort and Marina, permitted by USFS, is the largest and one of the most popular marinas on the lake. Its close proximity to I-5 and amenities such as a restaurant, lodging, a store, and a full-service boat marina with houseboat rentals draw a large number of visitors annually. Tourists and motorists, particularly those traveling along the I-5 corridor, are

attracted to Bridge Bay by its accessibility. It is from Bridge Bay that most visitors to the region are likely to derive their initial visual perception of Shasta Lake and the surrounding area.

Bridge Bay VAU – KOP 1 KOP 1, Photos 1a and 1b, illustrate the view of Shasta Lake from the main parking area adjacent to the Bridge Bay store. During full pool or nearly full pool periods, this parking area is used heavily by visitors, boat owners, and other recreationists accessing the lake from Bridge Bay. As the water recedes, marina users and other recreationists tend to follow it downslope, thus lessening the level of use received by this parking area and subsequently altering the viewing perspective. Photo 1a illustrates the Class B view of the Bridge Bay Marina as seen from KOP 1. Landscape features in this photo as well as Photo 1b, taken from the same KOP but from a slightly different perspective, are generally typical for the area – that is, positive yet common.

Bridge Bay VAU – KOP 2 KOP 2, Photo 2, illustrates the striking view of the I-5 Pit River Bridge and the UPRR trestle that is located on the lower deck of the bi-level bridge structure, as seen from the northern part of the Bridge Bay Marina. This view is available not only from the parking lot and northern marina, but from the resort's restaurant and hotel as well. As a result of its strong positive attributes (e.g., uniqueness, pattern, balance, mystery), the bridge, which is a Class A visual resource, dominates the middle ground of the scene.

Bridge Bay VAU – KOP 3 South of Bridge Bay's Marina 4, which is located in the extreme southeast corner of the main body of the lake adjacent to the UPRR tracks, is the Bridge Bay Marina maintenance area. From this location there is a view of the train tunnels adjacent to the east side of the maintenance area. KOP 3, Photo 3a, shows the northern end of the southernmost tunnel, and Photo 3b (taken from the same location) shows the southern end of the northernmost tunnel. Both perspectives would be apparent only to people working in the maintenance area or those who purposely access the area to view the trains. The track and its features are set back against the hillside; therefore, distance, shadow, and topography would obscure most views of this location from the lake, and viewers passing through the primary study area on the train would not have much opportunity to view the lake. Photo 3c, taken from the same location as the previous two photos, demonstrates the distance of the tracks from the Main Body of the lake and illustrates the site's Class B view.

Bridge Bay VAU – KOP 4 KOP 4 was established to document the initial impression that visitors accessing Bridge Bay's Marina 4 would experience from the stairway. Similar to the photos showing views from KOP 1, KOP 4, Photos 4a and 4b, show the Class B views of the lake from this location.

Sacramento Arm VAU The Sacramento Arm is the busiest and most developed arm of Shasta Lake. For purposes of this assessment, the Sacramento Arm VAU consists of the northern portion of the Sacramento Arm from the Sugarloaf Creek inlet north.

Sacramento Arm VAU – KOPs 1 and 2 In the Pollock area, the Sacramento Arm begins to display characteristics of a river channel more than a lake. Banks on either side of the channel become increasingly narrow as one travels upstream. KOPs 1 and 2 were established to illustrate the limited views from Riverview Drive, a local road running parallel to the east side of I-5 that is primarily used by residents and recreationists to access Shasta Lake. Photos 1 and 2 illustrate views available to motorists traveling along Riverview Drive. Despite being less than 350 feet from the lake, the elevation of Riverview Drive and adjacent vegetation obscure most views that motorists would have from this roadway. The indistinctive views from both of these KOPs are best characterized as Class C, having low scenic quality.

Sacramento Arm VAU – KOP 3 The community of Lakeshore, which stretches along the west (right) side of the Sacramento Arm, is composed primarily of permanent and vacation homes and a few commercial resorts. Proceeding south on Lakeshore Drive, along the western (right) shoreline, the first inlet that is crossed (Doney Creek) allows for extended views upstream and a complex view of the Sacramento Arm downstream (Photo 3). The complexity of the latter view stems from the presence of a UPRR trestle, which parallels the roadway in the foreground, and the Antlers Bridge in the middle ground. Although these structures contribute to an interesting view, neither is unique; therefore, both aspects from this KOP are best characterized as having a Class B scenic quality. Assuming a speed of 45 miles per hour (mph), motorists passing over the Doney Creek inlet would be exposed to the views on either side of the roadway for approximately 9 seconds.

Sacramento Arm VAU – KOP 4 Continuing south on Lakeshore Drive, USFS's Lakeshore East Campground offers views of the Sacramento Arm. Although these views are somewhat obscured by trees, views both upstream and downstream from the campground's main entrance are fairly broad (KOP 4, Photos 4a and 4b, respectively). Photo 4a illustrates the distance upstream that can be seen from this KOP. The features in this view, such as the Antlers Bridge in the background, are not unique or remarkable. Similarly, the downstream view (Photo 4b) is typical for the area. Thus, views of the lake from the campground entrance are best characterized as having a Class B scenic quality.

Sacramento Arm VAU – KOP 5 Lakeshore Drive crosses the lake for the second time to the south of I-5 at the Charlie Creek inlet. Similar to the views described for KOP 3 and KOP 4 views from the Charlie Creek Bridge, both to the northwest (KOP 5, Photo 5a) and to the southeast (Photo 5b), are expansive, but common to the area (Class B scenic quality): the lake in the foreground, vegetation in the middle ground, and mountains in the background. Assuming a

speed of 45 mph, motorists passing over the Charlie Creek inlet would be exposed to the views on either side of the roadway for approximately 8 seconds.

Sacramento Arm VAU – KOP 6 The Beehive Campground, managed by USFS as a dispersed campground, typifies the nature of the views afforded visitors to the parts of the lake west of I-5. As shown by KOP 6, Photos 6a, 6b, and 6c, views are expansive but generally unremarkable. There are no features unique to the area to distinguish it from other nearby Class B vantage points.

Sacramento Arm VAU – KOP 7 Sugarloaf Cove is located in one of the most remote parts of the Sacramento Arm. Aside from a narrow road in the uplands that leads into the rugged Backbone Ridge region, there are no recreational improvements in the cove. Photos 7a and 7b illustrate the narrowness of the cove, where a broad bathtub ring of soils is exposed during periods of drawdown. Views in the Sugarloaf Cove area are indistinctive and are best characterized as Class C, having low scenic quality.

Sacramento Arm VAU – KOPs 8, 9, and 10 Sugarloaf Resort Marina is situated adjacent to a residential and commercial area. KOPs 8, 9, and 10 were established to show the view of the marina and its features from several aspects including homes (KOP 8, Photo 8), the marina access road (KOP 9, Photos 9a–9c), and the public boat ramp (KOP 10, Photo 10). The broad expanse of views from the Sugarloaf shoreline, coupled with the attributes of the marina's structure (e.g., pattern, balance, intactness), is somewhat unusual in the area but typical for Shasta Lake (thus, a Class B distinction).

Sacramento Arm VAU – KOP 11 The Tsasdi Resort, a privately owned recreation facility located on Lakeshore Drive, offers guests a variety of outdoor activities, including hiking, fishing, and boating. Cabins and other resort buildings are situated on the hillside overlooking the lake. The resort maintains its own boat dock, which is accessed from a small parking area immediately adjacent to Lakeshore Drive. The view shown in Photo 11a, looking east from this parking area, is somewhat distinctive but not unique. A railroad trestle crossing the lake in the middle ground creates diversity of pattern in the view, but because the feature is not unique, it is best characterized as having a Class B scenic quality. Similarly, the view to the south from the same KOP is fairly typical for the area and is also best described as having a Class B scenic quality.

Sacramento Arm VAU – KOP 12 Located on the uplands above the east (right) side of the lake is the Lakeshore Resort Campground. This privately owned resort is near the community of Lakeshore (less than 0.25 mile) and I-5 (approximately 0.5 mile), which makes it a popular recreation destination. Although scenic, neither the upstream view (to the east) (Photo 12a) nor the downstream view (to the southeast) (Photo 12b) is unique for the area (thus, Class B). The Antlers Bridge in the middle ground of the upstream view is prominent and creates a sense of balance between the foreground and background, but the view is not distinct (i.e., unusual, unique, or outstanding) in

the context of the project area and is best characterized as having a Class B scenic quality.

Sacramento Arm VAU – KOP 13 One of the most significant inlets branching off of the Sacramento Arm is the Salt Creek Inlet. USFS campgrounds (Nelson Point and Oak Grove) and a day use area (Oak Grove) on the north (right) side of this inlet are inaccessible by boat because the water in the inlet is shallow. As shown in Photo 13, taken from the Oak Grove Day Use Area, land-based recreation facilities are a fair distance from water (this photo was taken in May 2008). Steep topography below the ordinary high-water line significantly restricts the view from this KOP. The lake's bathtub ring dominates the Class C, indistinctive view. The quality of the view during periods in which the lake is full or nearly full would be more typical of the project area and would thus be better characterized as having a Class B scenic quality.

Sacramento Arm VAU – KOP 14 The south (left) shore of the Salt Creek Inlet supports a variety of residences, including privately owned cabins on NFS lands. Access via Salt Creek Lodge Road parallels much of the inlet's shoreline. KOP 14, established at the intersection of Salt Creek Lodge Road and Lower Salt Creek Road, illustrates the Class A views available to motorists, residents, and recreationists passing through the area. Features that set views from this KOP apart from the more typical views previously described for many of the KOPs in the primary study area are the presence of Mount Shasta in the background (although the mountain is difficult to distinguish because of haze present at the time Photo 14a was taken) and the distinctiveness of the UPRR trestle in the middle ground of Photo 14b. As viewed from KOP 14, the trestle imparts a sense of mystery; its northern end draws the viewer's eye to the background, where the trestle seemingly disappears into the mountainside.

Sacramento Arm VAU – KOP 15 KOP 15 illustrates a typical view from the residential development along Lower Salt Creek Road. The area is relatively steep and densely forested. The dominance of vegetation in the foreground of Photos 15a and 15b is indicative of the nature of views from residences, which have scenic quality (Class B) that is common for the region.

Sacramento Arm VAU – KOP 16 The Antlers Public Boat Ramp is located immediately east of I-5 and directly faces the Antlers Bridge, which spans the Sacramento Arm. As seen from the boat ramp, vegetation frames the bridge in the middle ground of the view (Photo 16). Built features (the boat ramp, Antlers Bridge, I-5) dominate the view, whereas unique landscape features, such as the river that meanders through the foreground and middle ground and the rugged mountains in the background, add to the uniqueness, pattern, and mystery of the view. The scenic quality of this view make it a Class A visual resource that also includes components of the more typical Class B views (e.g., forest, ridgelines).

Sacramento Arm VAU – KOP 17 KOP 17 was established to illustrate views from the Antlers Picnic Area located at the top of the Antlers Public Boat Ramp. Several picnic tables and benches allow the public the opportunity to sit and view both the upland parking area (Photo 17a) and the lake (Photo 17b). As shown by Photo 17a, the view of the public parking area is indistinctive, and thus, a Class C view. The view of the lake from the picnic area (Photo 17b) is somewhat more distinctive than the view toward the parking lot, but it is fairly typical of views from the Shasta Lake shoreline. Vegetation and topography often limit views of the water. This view would be a Class B, typical visual resource.

Sacramento Arm VAU – KOP 18 KOP 18 (Photos 18a–18c) was established to illustrate the views that campers staying at one of the public resorts or campgrounds around Shasta Lake would typically see (in this case, the Antlers Resort). Visual resources associated with the uplands (Photo 18a), lake (Photo 18b), and campground facilities (Photo 18c) are a combination of Class C indistinctive and Class B typical.

McCloud Arm VAU The McCloud Arm of Shasta Lake is notable for the towering gray limestone mountains that line the eastern shore of the arm. Large, naturally formed caverns in the limestone are popular tourist and spelunking destinations. Lake Shasta Caverns, a commercial operation, operates out of Bailey Cove and ferries visitors across the lake. In fact, boats provide the only access to the right bank of most of the McCloud Arm. Although parts of the lower reach of the McCloud Arm are visible from I-5, topography, including a gradual narrowing of the arm toward its upstream end and heavily forested uplands, limits most views to areas immediately surrounding the scattered residences, campgrounds, boat ramps, and small resorts along the arm.

McCloud Arm VAU – KOP 1 Located near the confluence of the McCloud and Pit arms, Turntable Bay currently houses administrative facilities, including USFS boat docks. As demonstrated by KOP 1 (Photo 1), Turntable Bay and vicinity can be seen by ridgeline homes overlooking the lake. Transitory views from the area in and around Turntable Bay (such as those available to motorists and boaters) are dependent on water levels, which in turn would determine the quality of the view (i.e., Class B or, subjectively, Class C).

McCloud Arm VAU – KOP 2 KOP 2 (Photo 2) was established near one of the most heavily used and visible areas on Shasta Lake: the confluence of the McCloud and Pit arms, on the east side of the I-5 Pit River Bridge. Boaters accessing the various arms of the lake east of Bridge Bay will pass through this area. As seen from the lake, views of the shoreline are panoramic; however, the quality of the view varies widely depending on the middle ground and background features (e.g., the presence of a distinctive built feature such as the Pit River Bridge or a snow-covered Mount Shasta). Photo 2 showing Turntable Bay is an example of the Class B typical view that is predominant around

Shasta Lake. This photo also illustrates the conspicuous bathtub ring that is seen along the entire perimeter of the lake as water levels draw down.

McCloud Arm VAU – KOPs 3 and 4 Bailey Cove is a USFS recreational facility that includes a public picnic area, campground, and boat ramp easily accessible from I-5. KOP 3, Photo 3, shows the narrow inlet in which the boat ramp is located. From the south-facing perspective of the boat ramp and its adjoining parking lot, little of the main body of the McCloud Arm can be seen. Class B views are typical for the area. North of the boat ramp, Bailey Cove, including a portion of Holiday Harbor, can be seen from the Bailey Cove Day Use/Picnic Area. Although Bailey Cove proper is separated from the inlet into which the boat ramp extends by the peninsular shape of the area, the quality of the views is similar. KOP 4, Photo 4, shows the limited Class B view to the east from the picnic area.

McCloud Arm VAU – KOP 5 Farther upstream is the Holiday Harbor Resort and Marina. This facility includes a campground, a marina, and a small store. KOP 5 (Photo 5) shows the distinctive, Class A view of the Holiday Harbor Marina as viewed from the Holiday Harbor Campground. Although the marina is nested in a small inlet, the view from this location draws the viewer's eye to the main body of the McCloud Arm framed by the limestone outcrops and the mountains in the background.

McCloud Arm VAU – KOP 6 Lake Shasta Caverns is a popular regional tourist destination located approximately 1.5 miles east of I-5. The west (right) shore public reception area includes a parking area, a store, restrooms, a play area, and a boat dock, which houses the privately owned ferry used to transport visitors across the lake to the caverns. With the exception of the boat dock, all public areas are located in uplands, and, as shown by KOP 6, Photo 6, the lake and eastern limestone outcrops are not readily apparent from the caverns parking lot. The aesthetic value of the lake and surrounding scenery is an important component of the experience offered by the Lake Shasta Caverns tour, which exposes visitors to a variety of Class A and B views during its various tours. The proprietor has expanded the sightseeing tour options to include dinner cruises during the summer that depart from the Lake Shasta Caverns reception center.

McCloud Arm VAU – KOPs 7 and 8 KOP 7, Photo 7, was established to show the view of the lake and the former Lakeview Marina from the former Lakeview Resort's caretaker residence. This destination is one of the most remote marinas and boat ramps on the McCloud Arm, located about 3 miles east of I-5. The dramatic background of mountains and limestone outcrops rising out of the lake makes the view from KOP 7 a Class A view, although the view available to the general public from this location is somewhat blocked by the caretaker's house and surrounding vegetation. Better opportunities for public views of the lake and vicinity from the former Lakeview Resort property are available farther up the shoreline at the boat ramp. As viewed from KOP 8, the

boat ramp extends south into the main body of the McCloud Arm, where people are exposed to expansive views looking south toward the Pit Arm (Photo 8a). The contrast and landscape features of the foreground, middle ground, and background create Class A views of the lake from this location. Turning to the north (Photo 8b), the Class A views continue. Views from the boat ramp looking west toward the former Lakeview Marina and caretaker's residence (Photo 8c) are somewhat more common (i.e., Class B) for Shasta Lake.

McCloud Arm VAU – KOPs 9 and 10 KOPs 9 and 10 were established to illustrate shoreline views midway along the McCloud Arm. The north/south alignment of the arm results in noticeable changes in vegetation and terrain. Although the southerly parts of the arm tend to support a more shrub-dominated habitat, views begin to become more scenic moving north up the arm as conifers and significant rocky outcrops become more evident. The conspicuous bathtub ring that is visible along the entire perimeter of the lake as water levels draw down is just as evident in this part of the lake as it is elsewhere, and the forested mountains in the uplands in the middle ground and background settings (KOP 9, Photo 9) are relatively common Class B visual resources. However, vivid rock outcrops, such as those around Shasta Caverns (KOP 10, Photo 10), add a level of mystery to the upper part of the McCloud Arm. KOP 10, Photo 10, shows an example of the distinctive Class A visual resources found along the McCloud Arm.

McCloud Arm VAU – KOP 11 The McCloud Arm's trend toward the north/northeast routes it away from the I-5 corridor and into largely undeveloped, publicly managed and privately owned lands. Visually, a majority of the views of the upper reach of the McCloud Arm are limited primarily to boaters on the lake, a few homes scattered throughout the uplands adjacent to Gilman Road, and an assortment of USFS campgrounds and day use areas that extend along the increasingly narrow channel.

Hirz Bay is a boat launch and group camping facility managed by USFS on the McCloud Arm. Although Hirz Bay is approximately 10 miles from I-5, it is a popular destination for campers, boaters, and hikers. The Hirz Bay Trail, a gently sloping walking trail that extends from Hirz Bay to Dekkas Rock, is mentioned in regional travel guides as offering views of the lake and spectacular limestone outcrops (Soares 1992; Trails.com 2007).

Although views of the lake from the campground and surrounding lakeshore are limited by topography and vegetation, the boat ramp, closer to the shoreline, affords a wider expanse of views of the water. Progressive narrowing of the channel is apparent when looking from downstream to upstream (KOP 11, Photos 11a and 11b, respectively). The expansiveness of the views from Hirz Bay, although somewhat typical for the region, could be characterized as Class A bordering on Class B.

McCloud Arm VAU – KOP 12 KOP 12 was established to illustrate views of the Hirz Bay and vicinity shoreline from Shasta Lake. As shown by Photo 12, the view looking west from the lake evokes a sense of wilderness beyond the shoreline and does not hint at the level of development that lies between the middle ground and background (i.e., I-5). Although this view is somewhat typical for the northern part of the McCloud Arm, it could be considered a Class A visual resource because of the sense of intactness it conveys.

McCloud Arm VAU – KOP 13 Campbell Creek, located on the east shore of the McCloud Arm directly across from Hirz Bay, is a residential recreation tract consisting of 28 privately owned cabins on NFS lands. The only practicable access to the area is by boat. Overland access is via a primitive (at best) jeep trail. Therefore, visitors to the area would form their initial impression of the visual resources afforded by the Campbell Creek inlet from the lake. Photo 13a looks toward the south bank of the inlet, where most of the cabins are located beyond the tree line. In many cases, the cabins are difficult to see from the lake because of their colors, which are meant to blend with the natural environment, and the dense forest that surrounds them. Similarly, a few cabins are also located on the eastern shore, but these cabins also have been designed to be unobtrusive to the natural environment (Photo 13b). The expansiveness of the views from the Campbell Creek inlet, although somewhat typical for the region, could be characterized as Class A bordering on Class B.

McCloud Arm VAU – KOP 14 Similar to views of the lake from Hirz Bay, Class B views from Dekkas Rock Campground widen downstream and narrow upstream (KOP 14, Photos 14a and 14b, respectively). Unlike the Hirz Bay camping facilities, which are located some distance from the actual shoreline, the Dekkas Rock Campground offers sites overlooking the lake and near the ordinary high-water line. KOP 14 was established to illustrate views of the progressively narrowing channel from Dekkas Rock Campground (Photos 14a and 14b, respectively). Similar to views from Hirz Bay (KOP 11), views from KOP 14 could also be characterized as Class A bordering on Class B.

McCloud Arm VAU – KOP 15 The McCloud River Bridge is located at the extreme north end of the McCloud Arm approximately 19 miles east of I-5. Despite its relative remoteness, the bridge has frequent traffic, primarily created by recreationists fishing the river, staying in the nearby campground, or exploring the back roads. KOP 15 shows that unobstructed views of the McCloud Arm are available both upstream and downstream from the bridge (Photos 15a and 15b, respectively). Although topography eventually interrupts these Class A views, a relatively long stretch of the entire channel width is visible from either direction.

McCloud Arm VAU – KOP 16 Views of the McCloud River Bridge from the west approach are partially obscured by seasonal roadside vegetation, and the alignment of the eastern approach (KOP 16, Photo 16) prevents any views of the reservoir or the bridge until the road turns onto the bridge. Thus, the

indistinctive or low scenic quality of the view from this KOP is characteristic of a Class C designation.

McCloud Arm VAU – KOPs 17 and 18 Immediately south of the McCloud River Bridge on the east side of the McCloud Arm is the USFS McCloud River Campground. Scenic views from the campground are, in general, remarkable as a result of the surrounding topography and landscape features, such as the bridge, mountains, and the upper end of the McCloud Arm. KOP 17, which is located in Campsite 10, is typical of the Class A views available from campsites in the campground. As demonstrated by KOP 18 (Photos 18a–18c), views from areas around the campsites broaden as the viewer moves closer to the river channel.

Pit Arm VAU

Pit Arm VAU – KOPs 1, 2, 3, and 4 KOPs 1–4 were established to illustrate the gentle shoreline topography of the Pit Arm in the vicinity of Jones Valley, upstream from Silverthorn Resort. Beyond the Jones Valley inlet, there is only one developed campsite accessible by boat. The increasing narrowness of the arm and the potential hazard to boats posed by the remnants of standing dead trees (snags) below the lake's ordinary high-water line make the Jones Valley area a popular destination for people who want to fish or who seek a quieter, more secluded recreational experience than activities such as waterskiing offer.

Expansive views of the lake and surrounding mountains (as viewed from KOP 1, Photos 1a and 1b; KOP 2, Photo 2; KOP 3, Photo 3; and KOP 4, Photo 4) are somewhat typical and common to the area and thus would be characterized as having a Class B scenic quality. Although it is not apparent because of weather conditions at the time the photo was taken (October 26, 2007) (Photo 1b), on a clear day Mount Shasta is visible in the background. This factor would enhance the quality of the view from the Jones Valley Public Boat Ramp parking lot looking north, making it a Class A scenic designation.

Pit Arm VAU – KOP 5 KOP 5 illustrates a typical view from the houses and cabins in the residential development adjacent to the Silverthorn Resort. The dominance of vegetation in the foreground of Photo 5 is indicative of the nature of views from area homes and cabins. The neighborhood is built on a densely vegetated and steep peninsula with residences on the north side of the ridge facing the Silverthorn Marina and Resort; however, topography and dense vegetation obscure most views of the marina and resort facilities (Photo 5). Views from KOP 5 are typical Class B. Houses and cabins on the south side of the ridge face toward undeveloped areas around Jones Valley.

Pit Arm VAU – KOP 6 KOP 6, Photos 6a–6c, show views of the lake from the Silverthorn Resort boat ramp. Silverthorn Resort is a full-service commercial development offering cabin rentals, restaurants, houseboat rentals, a boat ramp, and a marina. Photo 6a illustrates the Class B view of the Silverthorn

Marina as seen from KOP 6. Landscape features in this photo and in Photos 6b and 6c, taken from the same KOP (but from a different aspect), are generally typical for the area—that is, positive yet common.

Pit Arm VAU – KOP 7 As seen from Shasta Lake, it is difficult to determine the level of development associated with the Silverthorn Resort and marina (KOP 7, Photo 7). A peninsula obscures most of the marina and boat ramp from view, as is apparent from KOP 7. Silverthorn Resort is an example of a built feature that may not be considered particularly attractive by viewers. The surrounding environment (i.e., vegetation, topography) is fairly typical for this part of the Pit Arm and would be considered a Class B, and possibly even a Class C, visual resource.

Pit Arm VAU – KOP 8 Ski Island is one of the most popular destinations in the Pit Arm. Close to Silverthorn Resort, Ski Island offers primitive campsites and easy access. KOP 8, Photo 8, was established to illustrate the view that boaters have as they approach the island from the west. The presence of mature conifers adds to the scenic attractiveness of Ski Island, making it a Class B visual resource.

Squaw Creek Arm VAU

Squaw Creek Arm VAU – KOPs 1 and 2 The Bully Hill (KOP 1, Photo 1) and Monday Flat (KOP 2, Photo 2) areas in the Squaw Creek Arm of Shasta Lake are among the flatter, more easily accessible areas of the lake for boaters looking for a place to land. The bathtub-ring effect is exacerbated by the relatively flatter topography of the area. As water levels drop, a greater expanse of unvegetated shoreline is exposed than appears in many other parts of the lake, and the distance to vegetated uplands is greater than in steeper areas. Although the middle ground and background of the views in this part of the lake include a variety of patterns (water, exposed bright soils, vertical vegetation), the view is typical for the Squaw Creek Arm, making it a Class B visual resource.

I-5 Corridor VAU The Pit River Bridge (also known as the Veterans of Foreign Wars Memorial Bridge) is a nearly 3,600-foot-long bi-level structure that conveys I-5 traffic over the Pit Arm of Shasta Lake, northeast of the Bridge Bay Resort. Vehicle traffic passes across the top level of the structure, and a UPRR track is located on the lower level. Views from the bridge are restricted to motorists or those traveling via train; pedestrians are not authorized to use the bridge for safety reasons.

I-5 Corridor VAU – KOP 1 Class A views experienced by motorists from the Pit River Bridge are of relatively long duration from either direction (up to a minute at normal highway speeds of 55 mph). From the I-5 northbound lanes, the lower ends of both the Pit and McCloud arms east of the bridge are clearly visible in the foreground to middle ground, with mountains in the background (KOP 1, Photo 1a). Views from the southbound lanes look west of the bridge

toward the Sacramento Arm. Some features of Bridge Bay Marina can be seen from I-5 southbound (Photo 1b). The elevation of the Pit River Bridge above the existing surface elevation of the lake (full pool and lower) makes it difficult for parts of the lake that are visible from the northbound lanes to be seen from the southbound lanes, and vice versa. Views from either lane may also be partially obstructed by the bridge railing (depending on the height of the vehicle).

I-5 Corridor VAU – KOP 2 KOP 2 was established near one of the most heavily used and visible areas on Shasta Lake: the confluence of the McCloud and Pit arms, on the east side of the I-5 Pit River Bridge. Boaters accessing the various arms of the lake east of Bridge Bay pass through this area. The panoramic view of the lake, bridge, and surrounding mountains is distinctive and unique to the area. The balance and harmony of the patterns (i.e., water in the foreground leads the viewer's eye to the bridge in the middle ground, and from there to the mountains in the background) make this a Class A visual resource.

I-5 Corridor VAU – KOPs 3 and 4 Although not as readily visible, and of far less extent and shorter in duration than those seen from I-5 over the Pit River Bridge, additional views of Shasta Lake (specifically the Sacramento Arm) are available to motorists traveling on I-5 over the Antlers Bridge, located in the community of Lakehead at the north end of the lake. The lake is constricted by topography and is considerably narrower at this point (KOP 3, Photo 3a). Consequently, Class B views from I-5 are of fairly short duration (approximately 15 seconds assuming a speed of 65 mph). Northbound motorists will notice the Antlers Public Boat Ramp, which extends from the north shore downslope into the lake (KOP 3, Photo 3b). Southbound motorists have a limited view of the portion of the lake located on the west side of the bridge (KOP 4, Photo 4). Steep topography to the south of the Antlers Bridge makes it difficult to see much more than a small, open body of water and the adjacent forested shoreline.

I-5 Corridor VAU – KOP 5 Located near the confluence of the McCloud and Pit arms, Turntable Bay currently houses administrative facilities, including USFS boat docks. As demonstrated by KOP 5, Photo 5, transitory views of Turntable Bay and vicinity can be seen from I-5 by northbound motorists. The panoramic extent of the views, although of short duration as vehicles typically pass through this part of I-5 at high speeds, is typical for the Shasta Lake area but nonetheless impressive. As seen from KOP 5, the view would be a Class B or, subjectively, a Class A visual resource.

Visual Quality Objectives The Shasta and Trinity units of the NRA include lands classified as modification, partial retention, and retention. Areas designated as "modification" in the LRMP are typically developed areas, such as campgrounds, marinas, and boat launch ramps; management activities in the foreground and middle ground in these areas have a natural appearance. "Partial retention" refers to those areas in which management activities remain visually

subordinate on the landscape. “Retention” areas are those where management activities are not visually evident. The acres of lands categorized under each of these classifications are provided in Table 19-1.

The LRMP also includes a series of management prescriptions for various land allocations. The primary prescription for lands adjacent to Shasta Lake in the NRA is “Roaded Recreation.” The objective of this prescription is to provide for an area where there are moderate evidences of the sights and sounds of humans. Modifications are evident and may appear moderate to observers in the area, but will be unnoticed or visually subordinate from sensitive travel routes. This prescription emphasizes recreational opportunities associated with developed road systems and dispersed and developed camp sites (USFS 1995a).

Scenic Highways Many State highways are located in areas of outstanding natural beauty. California’s Scenic Highway Program was created by the Legislature in 1963 to preserve and protect scenic highway corridors from changes that would diminish the aesthetic value of lands adjacent to highways. The State laws governing the Scenic Highway Program are found in the Streets and Highways Code Section 260 et seq. A highway may be designated as “scenic,” depending on how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes on the traveler’s enjoyment of the view. The State Scenic Highway System consists of a list of highways that are either eligible for designation as scenic highways or have been so designated. Shasta County scenic highways are listed in the California Department of Transportation’s list of eligible and officially designated California Scenic Highways (Caltrans 1992).

In Shasta County, and more specifically in the primary study area, I-5 north of the City of Shasta Lake is recognized as a corridor in which the natural environment is dominant. In the primary study area, both I-5 and SR 151 are designated as State routes eligible for official scenic highway designation, although they contain contrasting elements of the natural and built environment (Shasta County 1994). I-5 between Redding (at the SR 299 East intersection) and Anderson is also designated as a corridor in which natural and human-made environments contrast; however, this section of roadway is not eligible for scenic highway designation (Shasta County 1994).

Wild and Scenic River Segments of the McCloud River have been determined eligible for listing under the Federal Wild and Scenic Rivers Act and are protected under the State Public Resources Code. The river has not been formally listed as wild and scenic under either the Federal Wild and Scenic Rivers Act or State Public Resources Code. Public views from area roads of the segments potentially eligible for listing are limited to the relatively short reach that can be seen looking upstream from the McCloud River Bridge on Fender’s Ferry Road. Flows in the lower McCloud River are highly regulated, and annual flows in the river below McCloud Dam do not follow a pattern typical of an

unimpaired mountain river in northern California. The effects of the dam and reservoir modifications proposed under the SLWRI on the wild and scenic river values of the lower McCloud River are discussed in Chapter 25, "Wild and Scenic River Considerations for McCloud River," of this EIS.

Lower Sacramento River and Delta and CVP/SWP Service Areas

The extended study area offers a wide and diverse array of landscapes and features that constitute visual resources. None of these landscapes and features would be affected by activities associated with the project.

19.2 Regulatory Framework

19.2.1 Federal

Aesthetic values and scenic resources in the NRA are managed for the conservation of scenic values that contribute to public enjoyment of the NRA. The USFS Manual (Sections 2380.11 through 2380.19) addresses the management of landscape aesthetics and scenery in the NFS, as well as the NRA (36 Code of Federal Regulations, part 292, subpart B). Included in this directive are standards for the protection of the natural scenic qualities of public travel routes and shoreline protections.

Aesthetic values and visual resources are also generally addressed in the environmental review of Federal projects through NEPA. Some Federal agencies, such as USFS, provide guidelines for the management of visual resources in larger management areas. In response to increasing environmental concerns, USFS developed the Visual Management System to inventory, classify, analyze, and manage its visual resources. The primary objective of the system is to maintain and enhance the natural appearance of the characteristic landscape while actively managing various resources such as timber, grazing, wildlife, and recreation. The Visual Management System measures and evaluates two main elements: the natural and built features of the land and the public's concern for scenic quality. It is important to note that the STNF LRMP will need to be amended to include VQOs specific to Turntable Bay, should an action be implemented that includes development at Turntable Bay. Amendments to the LRMP may also be required for other areas that may be inconsistent with these VQOs if the project is authorized. At this point in the planning process, it is premature to identify these areas specifically.

The following describes the regulatory setting for lands managed by USFS.

Shasta-Trinity National Forest Land and Resource Management Plan

The STNF LRMP contains goals, standards, and guidelines designed to guide the management of the STNF. The following goals, standards, and guidelines related to aesthetic issues associated with the primary study area were excerpted from the LRMP (USFS 1995a).

Visual Quality

Goals (LRMP, p. 4-5):

- Develop or expand opportunities for scenic drives and vista points.
- Maintain a diversity of scenic quality throughout the forest, particularly along major travel corridors, in popular dispersed recreation areas, and in highly developed areas.

Standards and Guidelines (LRMP, pp. 4-27 through 4-28):

- Manage activities and projects to meet adopted VQOs of (1) preservation, (2) retention, (3) partial retention, (4) modification, or (5) maximum modification. On rare occasions, the adopted VQO may not meet management's objectives (e.g., as a result of catastrophic events). Any proposed modification to an adopted VQO must go through the NEPA process and be approved by the Forest Supervisor.
  - Visual Quality Objectives for management activity affecting the shoreline of Lake Shasta are to meet the Retention VQO. Within shoreline areas managed for developed recreation sites, the VQO of Modification is to be met.
- In the following sensitive travel corridors, the foreground portions (areas located up to ¼ to ½ mile from the road viewer) will be managed primarily to meet the adopted VQO of Retention:
  - I-5
- In the following sensitive travel corridors, the middle ground portions (areas between 0.5 miles and 4 miles from the road viewer) will be managed primarily to meet the adopted VQO of Partial Retention:
  - I-5
- In the following sensitive travel corridors, the foreground portions (areas located from ¼ to ½ mile from the road viewer) will be managed primarily to meet the adopted VQO of Partial Retention:
  - Gilman Road (35N60/County 7HOI from I-5 East to McCloud River Bridge)

Management Guide for the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area The management guide for the Whiskeytown-Shasta-Trinity NRA (USFS 2014) contains management guidance intended to achieve or maintain a desired condition. This guidance takes into account opportunities, management recommendations for specific projects, and mitigation measures needed to achieve specific goals. The

following guidance related to visual resources and aesthetics issues associated with the primary study area were excerpted from the management guide.

> All developments and long-term activities in the NRA will be designed with the intent of protecting scenic values. Currently, the Forest uses the Visual Management System to protect scenery and the Forest Plan adopted visual management objectives (VQO's)... [*New developments within the Shasta Unit of the NRA] will utilize concepts from the Built Environment Image Guide for the National Forests and Grasslands ([US]FS 2001). The term built environment, as used in this guide, refers to structures and signs installed or operated by the Forest Service, its cooperators and permittees. The built environment influences visitors' experience as much as the natural environments in the forests. The Built Environment Image Guide… advocates structures that will resonate in form, shape, scale, color, and materials with the natural environment.*

U.S. Bureau of Land Management Resource Management Plan BLM manages a number of parcels of public lands adjacent to the Sacramento River corridor downstream from Shasta Dam. BLM lands in the primary study area are managed by the Redding Field Office. BLM lands within the extended study area are managed by either the Ukiah or Mother Lode field office. The purpose of BLM's resource management plan is to provide overall direction for managing and allocating public resources in each planning area. All BLM management actions must conform to the objectives of the assigned Visual Resource Management (VRM) Class. Actions approved or authorized by BLM will meet these long-term objectives. VRM prescriptions, however, will be limited to only those areas assigned Class I or Class II. Prescriptions will not be assigned to areas where lower VRM classes have been determined. BLM is responsible for administering the following strategies related to visual resource issues common to the districts in the study area (BLM 1992, 2006b, 2008).

Goals

- Protect and enhance the scenic quality and visual integrity of the characteristic landscapes in the planning area.

- Manage public lands in a manner that would protect the quality of the visual resources while allowing management activities to occur.

Objectives (Sierra BLM Resource Management Plan, p. 21)

- Design surface-disturbing projects to meet VRM objectives. Mitigate or prohibit surface-disturbing actions that do not meet VRM objectives.

- Complete visual contrast ratings for new projects to ensure compliance with VRM objectives.
- Complete visual contrast ratings for existing roads and facilities, and identify opportunities to reduce visual impacts through modification or rehabilitation.
- Complete inventory of existing and potential key scenic vista points along road and trail corridors.
- Ensure developments do not detract from scenic integrity by working with counties, agencies, and other entities with management jurisdiction.

19.2.2 State

In 1963, the California Legislature created the Scenic Highway Program to preserve and protect scenic highway corridors from changes that would diminish the aesthetic value of lands adjacent to the highways. The State regulations and guidelines governing the Scenic Highway Program are found in the Streets and Highways Code, Section 260 et seq. A highway may be designated as scenic depending on how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes on the travelers' enjoyment of the view.

Currently, only a short section of I-5 extending from its intersection with SR 97 in the city of Weed to its intersection with SR 89 near the city of Mount Shasta is a designated scenic highway (a part of the Volcanic Legacy Scenic Byway/All American Road). However, there has been interest in obtaining official scenic highway designation for the stretch of I-5 north of Shasta Lake to the Oregon border. Continuing efforts may be made to incorporate this segment of I-5 into the State's Master Plan for officially designated highways.

19.2.3 Regional and Local

The Scenic Highways Element of the *Shasta County General Plan* (Shasta County 1994) is intended to establish and protect highways (including both State and county roads) with scenic value. A "scenic highway" is any freeway, highway, road, street, boulevard, or other vehicular right-of-way that traverses an area of unusual scenic quality. An "official scenic highway" is a scenic highway that has been so designated by the State of California. The visible land area outside the actual right-of-way is generally described as the "viewshed" or the "scenic corridor." The corridor encompasses the land easily visible from the highway. Virtually every highway in Shasta County is a scenic highway; however, some scenic highways are more important than others, based on the visual quality of their scenic corridors, the degree to which the highways are used, and the vulnerability of the corridors to degradation of visual quality (Shasta County 1994).

19.3 Environmental Consequences and Mitigation Measures

This section identifies potential environmental effects on aesthetics and visual resources that could result from the project. Examples of proposed activities common to all project action alternatives that could have an impact on visual resources and aesthetic values include changes to inundation levels, raising Shasta Dam, dike construction, creation of borrow areas, abandonment and relocation of infrastructure, and vegetation clearing.

19.3.1 Methods and Assumptions

Analysis of potential impacts on aesthetic and visual resources is based on guidance provided by USFS and the significance criteria described in the State CEQA Guidelines. To comply with CEQA, significance thresholds are used to evaluate the project's potential impacts on the visual character of the study area, particularly the visual character of areas observable from KOPs. All assessments are qualitative, evaluating potential impacts of the project on the viewshed in relation to the local aesthetic context.

The fact that USFS manages a high proportion of the Federal lands above the current full pool elevation of Shasta Lake supports use of the USFS Visual Management System for this assessment. Under the USFS Visual Management System, the landscape is composed of a diversified variety of landforms, rock forms, and vegetative colors and textures. The widely diversified and unique landscape, and the setting of the study area within the NRA – designated as such in part because of its scenic quality of national importance – makes the overall scenic attractiveness a variety Class "A." (See the description of the classes of scenic attractiveness at the end of the bulleted list below.) To provide some continuity with other Reclamation visual resources assessments, certain aspects of the USFS Scenery Management System are also used in this analysis, as appropriate, namely the concepts of scenic attractiveness and primary distance zones.

A field assessment of the primary study area was conducted to identify areas of visual sensitivity and scenic resources, and to assess the character and quality of the aesthetic resources associated with the primary study area. Because no changes are anticipated to the aesthetic values and visual resources in the extended study area, a field assessment was performed only in the primary study area. This assessment emphasizes the potential relationship between the project and sensitive receptors associated with recreation areas, roadways, and commercial and residential development. VAUs were mapped based on the distinct visual character of the landscape. KOPs were identified in each VAU and photograph points were established. Despite the NRA's Class A overall scenic attractiveness, the assessment of visual quality presented in this EIS is based on the quality of the scenic resources and the visual sensitivity of the most likely viewer group at a particular KOP. Assessment methods were applied to the project alternatives using the following steps:

- **Identify visually sensitive areas** – Areas rated highest for sensitivity are those having views seen by people driving to or from recreational activities or along routes designated as scenic corridors. Stationary views from relatively moderate- to high-use recreation areas and commercial/residential areas are also considered to be sensitive.

- **Define the landscape character** – Landscape character refers to the visual and cultural image of a geographic area. It is composed of the combination of physical, biological, and cultural attributes that make each landscape identifiable or unique. Landscape character embodies distinct landscape attributes that exist throughout an area.

- **Identify visually sensitive observation points** – Analysis of the impacts on visual resources from the implementation of any project alternative should consider both construction and postconstruction views. This step identifies visually sensitive observation points in the primary study area. Identification of visually sensitive observation points allows a comparison of existing views and areas of potential visual impact resulting from one or more alternative.

- **Identify visually affected key observation points** – Based on the location and distance of potential visual impact areas from the visually sensitive observation points, only a portion of the observation points may be significantly affected. This analysis further evaluates observation points to determine whether visual impact areas would occur (1) in the direct line of sight (2) in the foreground (0 to 0.5 mile) and/or middle ground (0.5 to 4 miles) and/or (3) background (4 miles to horizon) views. Observation points with visual impact areas in the direct line of sight or in the foreground, middle ground, or background view are referred to as KOPs, which are described in Section 19.1, "Affected Environment."

- **Classify scenic attractiveness** – Scenic attractiveness classifications are used to categorize visual features as follows: Class A, "distinctive"; Class B, "typical"; and Class C, "indistinctive." These classifications are described in Section 19.1, "Affected Environment."

19.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with 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 EIS must be prepared. An environmental document prepared to comply with CEQA must identify the potentially significant environmental effects of a project. A "[s]ignificant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions in 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 criteria used to determine the significance of impacts for this analysis are based primarily on the State CEQA Guidelines and other associated criteria, including regulatory agency standards. Federal criteria and NEPA guidance were also considered. The following significance criteria were developed based on guidance established in the State CEQA Guidelines, and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative on aesthetics and visual resources would be significant if project implementation would do any of the following:

- Would not comply with VQOs as defined in the STNF LRMP
- Have a substantial adverse effect on a scenic vista
- Substantially damage scenic resources, including trees, rock outcroppings, and historic buildings adjacent to a State scenic highway
- Substantially degrade the existing visual character or quality of the project site and its surroundings
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the project area

19.3.3 Topics Eliminated from Further Consideration

No significant topics related to aesthetics and visual resources have been eliminated from discussion.

19.3.4 Direct and Indirect Effects

The McCloud River upstream from the McCloud River Bridge is eligible for listing as a Wild and Scenic River under the Federal Wild and Scenic Rivers Act. In lieu of recommending Wild and Scenic designation, USFS and other stakeholders entered into a *Coordinated Resource Management Plan* with the primary objective of managing the river to protect its pristine resources. The California Public Resources Code Section 5093.542, established through enactment of the Wild and Scenic Rivers Act, as amended (Sections 5093.50 through 5093.70), provides protection to the reach between the McCloud Reservoir and the McCloud River Bridge. A detailed discussion of the importance of the Federal Wild and Scenic Rivers Act and California Public Resources Code protections for the McCloud River north of the McCloud River Bridge is presented in Chapter 25, “Wild and Scenic River Considerations for McCloud River.”

No-Action Alternative

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Vis-1 (No-Action): Consistency with Guidelines for Visual Resources in the STNF LRMP Under the No-Action Alternative, there would be no inconsistencies with the guidelines for visual resources provided in the STNF LRMP because the project would not be constructed. The visual setting would remain the same as under existing conditions. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Vis-2 (No-Action): Degradation and/or Obstruction of a Scenic View from Key Observation Points Under the No-Action Alternative, scenic views would not be degraded and/or obstructed because the project would not be constructed. The visual setting would remain the same as under existing conditions. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Vis-3 (No-Action): Generation of Increased Daytime Glare and/or Nighttime Lighting Under the No-Action Alternative, daytime and/or nighttime glare from temporary construction and permanently relocated roads, structures and other facilities would not increase because the project would not be constructed. The visual setting would remain the same as under existing conditions. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Vis-4 (No-Action): Consistency with Federal and State Scenic Highway Requirements Under the No-Action Alternative, there would be no inconsistencies with Federal and State Scenic Byway requirements because the project would not be constructed. The visual setting would remain the same as under existing conditions. No impact would occur. Mitigation is not required for the No-Action Alternative.

Lower Sacramento River and Delta, and CVP/SWP Service Areas None of the landscapes and features in the extended study area would be affected by the No-Action Alternative. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

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

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Vis-1 (CP1): Consistency with Guidelines for Visual Resources in the STNF LRMP The effects of the construction-related and operational elements of CP1 would be inconsistent with some of the VQOs established by the STNF LRMP. The LRMP calls for management activities that would be visible from the I-5 corridor and SR 151 to remain visually subordinate on the landscape and not be noticeable to the casual observer (a VQO of “retention”). Foreground

views from KOPs most often used by the public, such as campgrounds and boat launches, are also managed according to the VQO of retention, whereas middle ground views are managed according to the "partial retention" VQO (management activities in the middle ground having a natural appearance). The construction-related and operational elements of CP1 would be more visible from some viewpoints than others. The operation of construction equipment and its presence on the landscape would be a visual distraction when visible from KOPs. In addition, what might be considered short-term impacts on visual resources and aesthetics for some viewer groups, such as tourists, might be considered long-term impacts for other viewer groups, such as residents. The LRMP does not distinguish between short-term and long-term VQOs or between classes of viewers, although for the purposes of this assessment, viewer groups were considered in the evaluation of impacts. This impact would be significant.

USFS VQOs for the Shasta and Trinity units of the NRA allow for some active land management. The LRMP calls for a VQO of retention along the Shasta Lake shoreline and modification in developed recreation sites. Vegetation removal along the shoreline and in some developed recreation sites under CP1 would exceed the definitions of retention and modification, better fitting the VQO of "maximum modification" (management activities are dominant, but appear natural when seen as background). Although affected areas could, over time, regain the attributes of the retention or modification VQOs, noticeable changes to aesthetic values and visual resources along the shoreline and in affected developed recreation sites resulting from CP1 would be apparent during and for an undetermined period after construction.

The LRMP calls for the foregrounds and middle grounds of State- and county-designated scenic highways that pass through the Shasta and Trinity units of the NRA, including portions of the I-5 corridor and SR 151, to be managed for the retention VQO. However, the effects of CP1 (i.e., clearing of vegetation at specific locations) on aesthetic values and visual resources as seen from the highways would be visible in some areas during and after project construction. The appearance of areas that are visible from these highways could become similar to existing conditions when the project is completed.

In some areas, implementation of CP1 would result in impacts on visual resources that are inconsistent with LRMP VQOs. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-2 (CP1): Degradation and/or Obstruction of a Scenic View from Key Observation Points Under CP1, the "bathtub ring" that is apparent during less than full pool conditions would become larger. Existing scenic views of areas where utilities and infrastructure would be relocated could be obstructed or degraded. Views from some KOPs, including those of the renowned "Three Shastas," would be obstructed or degraded during construction, and to varying

degrees, for several years post-construction. Throughout the primary study area, vegetation retention or removal activities (proposed activities would vary by relocation area) would also degrade scenic views. Although project-related changes to the landscape could become less visible over time, these changes would be highly visible during construction. This impact would be significant.

Under CP1, changes to the scenic views of Shasta Lake and the surrounding landscape would be most apparent when the lake is not full. From KOPs with panoramic views of Shasta Lake, the appearance of the expanded bathtub ring would be only minimally changed, given the overall size of the affected area. As the pool fluctuates, changes to the bathtub ring may not be apparent to transitory viewers. For some groups such as residents, however, changes to the size of the bathtub ring would be more apparent and of longer duration. For all viewer groups, leaving vegetation in place below the inundation level or removing vegetation from the shoreline would be visible in all VAUs.

Scenic views of areas where utilities and infrastructure would be relocated would be at least temporarily degraded or obstructed during and after construction. Changes to these views could be highly visible from some KOPs.

Construction activities and materials associated with CP1 could also be highly visible. In particular, views from KOPs in the Shasta Dam VAU (e.g., the SR 151 scenic overlook, the Shasta Dam Visitor Center, the Coram Ranch House, and the lake) would be highly affected by construction activities and materials, including the movement of heavy equipment and the construction of scaffolding and framing. The use of materials not consistent with the color, texture, and form of the surrounding landscape or that could generate glare would have a permanent impact on views from KOPs.

Implementation of CP1 would temporarily, and could permanently, degrade and obstruct scenic views from KOPs. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, “Mitigation Measures.”

Impact Vis-3 (CP1): Generation of Increased Daytime Glare and/or Nighttime Lighting The increased area of light-colored soils around the Shasta Lake shoreline that are exposed during periods of drawdown and, conversely, the increased area of water surface associated with CP1 would increase the potential for daytime glare. The relocation of roads and infrastructure could also create new sources of reflective daytime glare. In addition, construction equipment could be a temporary source of reflective daytime glare. Extensive construction activities at night requiring the use of vehicle and perimeter lighting, particularly in the vicinity of Shasta Dam, would be necessary for several years. New sources of permanent nighttime lighting would also be required for some locations, such as relocated roads and recreational facilities. This impact would be significant.

CP1 would increase the area of bare mineral soil exposed along the Shasta Lake shoreline during periods of drawdown. The light color of these soils is a significant source of unavoidable daytime glare. Water also serves as a source of substantial glare. The increased water surface area created by a 6.5-foot dam raise would increase the potential for unavoidable daytime glare being encountered by sensitive receptors around the lake. Changes in water surface elevations, particularly water level increases, would change the refractive angle of the water surface, thus potentially exposing sensitive receptors, such as campgrounds or residences, to a new source of significant glare. The intensity and duration of daytime glare would vary with changes in the angle of the sun and the elevation of the water surface.

Relocation of roads and infrastructure could create a source of both daytime and nighttime glare from temporary construction and permanently relocated roads, structures, and other facilities. Guardrails and other roadway fixtures, such as retaining walls, safety barriers, light standards, and other structures, have the potential to be reflective under natural and artificial light. In addition, nighttime lighting may be required at some locations, including roadways and recreation facilities, for safety purposes.

Construction activities associated with CP1 would generate daytime glare at various locations in the primary study area, most noticeably in areas where equipment would be operated, such as Shasta Dam. The potential for glare caused by light reflecting off construction equipment would vary with changes in the angle of the sun. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, “Mitigation Measures.”

Impact Vis-4 (CP1): Consistency with Federal and State Scenic Highway Requirements The distance to proposed construction/relocation areas around Shasta Lake from SR 151, the only State-designated Scenic Highway in the primary study area, would make changes resulting from CP1 very difficult to differentiate. There are no federally designated scenic roadways in the area. This impact would be less than significant.

SR 151 is the only State-designated Scenic Highway in the primary study area. There are no federally designated scenic roadways in the primary study area. Under CP1, project construction activities around Shasta Dam would be visible from SR 151. The distance between the SR 151 vista point, high on the mountainside overlooking Shasta Dam, and the other proposed construction/relocation areas around the lake would make it very difficult for most viewers to differentiate changes resulting from CP1. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas None of the landscapes and features in the extended study area would be affected by

activities associated with CP1. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

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

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Vis-1 (CP2): Consistency with Guidelines for Visual Resources in the STNF LRMP The effects of the construction-related and operational elements of CP2 would be inconsistent with some of the VQOs established by the STNF LRMP. The LRMP calls for management activities that would be visible from the I-5 corridor and SR 151 to remain visually subordinate on the landscape and not be noticeable to the casual observer (a VQO of "retention"). Foreground views from KOPs most often used by the public, such as campgrounds and boat launches, are also managed according to the VQO of retention, whereas middle ground views are managed according to the "partial retention" VQO (management activities in the middle ground having a natural appearance). The construction-related and operational elements of CP2 would be more visible from some viewpoints than others. The operation of construction equipment and its presence on the landscape would be a visual distraction when visible from KOPs. In addition, what might be considered short-term impacts on visual resources and aesthetics for some viewer groups, such as tourists, might be considered long-term impacts for other viewer groups, such as residents. The LRMP does not distinguish between short-term and long-term VQOs or between classes of viewers, although for the purposes of this assessment, viewer groups were considered in the evaluation of impacts. This impact would be significant.

This impact would be similar to Impact Vis-1 (CP1). Construction-related and operational elements of CP2 would be inconsistent with some of the VQOs established by the STNF LRMP. The larger inundation area proposed under CP2 would result in an increased opportunity for management activities to be visible from the I-5 corridor, SR 151, and other areas managed according to retention and modification VQOs. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-2 (CP2): Degradation and/or Obstruction of a Scenic View from Key Observation Points Under CP2, the "bathtub ring" that is apparent during less than full pool conditions would become larger. Existing scenic views of areas where utilities and infrastructure would be relocated could be obstructed or degraded. Views from some KOPs, including those of the renowned "Three Shastas," would be obstructed or degraded during construction and for several years post-construction. Throughout the primary study area, vegetation retention or removal activities (proposed activities would vary by relocation area) would also degrade scenic views. Although project-related changes to the landscape could become less visible over time, these changes would be highly visible during construction. This impact would be significant.

This impact would be similar to Impact Vis-2 (CP1). Under CP2, the "bathtub ring" that is apparent during less than full pool conditions would become larger than what would be exposed under CP1. CP2 would also require the relocation of more utilities and infrastructure and more vegetation retention or removal than CP1. In addition, the time frame for construction and implementation of the project would increase, which would prolong the period that scenic views are degraded by the project. Although project-related changes to the landscape could become less visible over time, these changes would be highly visible during construction. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-3 (CP2): Generation of Increased Daytime Glare and/or Nighttime Lighting The increased area of light-colored soils around the Shasta Lake shoreline that are exposed during periods of drawdown and, conversely, the increased area of water surface associated with CP2 would increase the potential for daytime glare. The relocation of roads and infrastructure could also create new sources of reflective daytime glare. In addition, construction equipment could be a temporary source of reflective daytime glare. Extensive construction activities at night requiring the use of vehicle and perimeter lighting, particularly in the vicinity of Shasta Dam, would be necessary for several years. New sources of permanent nighttime lighting would also be required for some locations, such as relocated roads and recreational facilities. This impact would be significant.

This impact would be similar to Impact Vis-3 (CP1). Under CP2, more light-colored soils would be exposed, which would expand the amount of daytime glare. Construction and implementation of the project would take place over a longer period of time, which would prolong the requirement for nighttime lighting during construction and daytime glare from construction equipment. More roads and other infrastructure would be relocated, which would increase the amount of related daytime glare and nighttime lighting. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-4 (CP2): Consistency with Federal and State Scenic Highway Requirements The distance to proposed construction/relocation areas around Shasta Lake from SR 151, the only State-designated Scenic Highway in the primary study area, would make changes resulting from CP2 very difficult to differentiate. There are no Federally designated scenic roadways in the area. This impact would be less than significant.

This impact would be similar to Impact Vis-4 (CP1). Although the scale of vegetation removal and other activities associated with the construction at the proposed relocation sites would be larger under CP2 than under CP1, the distance of most construction activities from SR 151 – the only designated scenic highway in the primary study area – would prevent CP2 from being inconsistent with State Scenic Highway requirements. This impact would be

less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas None of the landscapes and features in the extended study area would be affected by activities associated with CP2. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

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

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Vis-1 (CP3): Consistency with Guidelines for Visual Resources in the STNF LRMP The effects of the construction-related and operational elements of CP3 would be inconsistent with some of the VQOs established by the STNF LRMP. The LRMP calls for management activities that would be visible from the I-5 corridor and SR 151 to remain visually subordinate on the landscape and not be noticeable to the casual observer (a VQO of "retention"). Foreground views from KOPs most often used by the public, such as campgrounds and boat launches, are also managed according to the VQO of retention, whereas middle ground views are managed according to the "partial retention" VQO (management activities in the middle ground having a natural appearance). The construction-related and operational elements of CP3 would be more visible from some viewpoints than others. The operation of construction equipment and its presence on the landscape would be a visual distraction when visible from KOPs. In addition, what might be considered short-term impacts on visual resources and aesthetics for some viewer groups, such as tourists, might be considered long-term impacts for other viewer groups, such as residents. The LRMP does not distinguish between short-term and long-term VQOs or between classes of viewers, although for the purposes of this assessment, viewer groups were considered in the evaluation of impacts. This impact would be significant.

This impact would be similar to Impact Vis-1 (CP1). Construction-related and operational elements of CP3 would be inconsistent with some of the VQOs established by the STNF LRMP. The larger inundation area proposed under CP3 would result in an increased opportunity for management activities to be visible from the I-5 corridor, SR 151, and other areas managed according to retention and modification VQOs. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-2 (CP3): Degradation and/or Obstruction of a Scenic View from Key Observation Points Under CP3, the "bathtub ring" that is apparent during less than full pool conditions would become larger. Existing scenic views of areas where utilities and infrastructure would be relocated could be obstructed or degraded. Views from some KOPs, including those of the renowned "Three Shastas," would be obstructed or degraded during construction. Throughout the

primary study area, vegetation retention or removal activities (proposed activities would vary by relocation area) would also degrade scenic views. Although project-related changes to the landscape could become less visible over time, these changes would be highly visible during construction. This impact would be significant.

This impact would be similar to Impact Vis-2 (CP1). Under CP3, the "bathtub ring" that is apparent during less than full pool conditions would become larger than what would be exposed under CP1 or CP2. CP3 would also require the relocation of more utilities and infrastructure and more vegetation retention or removal than CP1 or CP2. In addition, the time frame for construction and implementation of the project would increase, which would prolong the period that scenic views are degraded by the project. Although project-related changes to the landscape could become less visible over time, these changes would be highly visible during construction. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-3 (CP3): Generation of Increased Daytime Glare and/or Nighttime Lighting The increased area of light-colored soils around the Shasta Lake shoreline that are exposed during periods of drawdown and, conversely, the increased area of water surface associated with CP3 would increase the potential for daytime glare. The relocation of roads and infrastructure could also create new sources of reflective daytime glare. In addition, construction equipment could be a temporary source of reflective daytime glare. Extensive construction activities at night requiring the use of vehicle and perimeter lighting, particularly in the vicinity of Shasta Dam, would be necessary for several years. New sources of permanent nighttime lighting would also be required for some locations, such as relocated roads and recreational facilities. This impact would be significant.

This impact would be similar to Impact Vis-3 (CP1). Under CP3, more light-colored soils would be exposed, which would expand the amount of daytime glare. Construction and implementation of the project would take place over a longer period of time, which would prolong the requirement for nighttime lighting during construction and daytime glare from construction equipment. More roads and other infrastructure would be relocated, which would increase the amount of related daytime glare and nighttime lighting. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-4 (CP3): Consistency with Federal and State Scenic Highway Requirements The distance to proposed construction/relocation areas around Shasta Lake from SR 151, the only State-designated Scenic Highway in the primary study area, would make changes resulting from CP3 very difficult to differentiate. There are no Federally designated scenic roadways in the area. This impact would be less than significant.

This impact would be similar to Impact Vis-4 (CP1). Although the scale of vegetation removal and other activities associated with the construction at the proposed relocation sites would be larger under CP3 than under CP1 or CP2, the distance of most construction activities from SR 151 – the only designated scenic highway in the primary study area – would prevent CP3 from being inconsistent with State Scenic Highway requirements. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas None of the landscapes and features in the extended study area would be affected by activities associated with CP3. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Vis-1 (CP4 and CP4A): Consistency with Guidelines for Visual Resources in the STNF LRMP The effects of the construction-related and operational elements of CP4 or CP4A would be inconsistent with some of the VQOs established by the STNF LRMP. The LRMP calls for management activities that would be visible from the I-5 corridor and SR 151 to remain visually subordinate on the landscape and not be noticeable to the casual observer (a VQO of “retention”). Foreground views from KOPs most often used by the public, such as campgrounds and boat launches, are also managed according to the VQO of retention, whereas middle ground views are managed according to the “partial retention” VQO (management activities in the middle ground having a natural appearance). The construction-related and operational elements of CP4 or CP4A would be more visible from some viewpoints than others. The operation of construction equipment and its presence on the landscape would be a visual distraction when visible from KOPs. In addition, what might be considered short-term impacts on visual resources and aesthetics for some viewer groups, such as tourists, might be considered long-term impacts for other viewer groups, such as residents. The LRMP does not distinguish between short-term and long-term VQOs or between classes of viewers, although for the purposes of this assessment, viewer groups were considered in the evaluation of impacts. This impact would be significant for CP4 or CP4A.

This impact would be similar to Impact Vis-1 (CP1) and Vis-1 (CP3). Construction-related and operational elements of CP4 would be inconsistent with some of the VQOs established by the STNF LRMP. This impact would be significant for CP4. Mitigation for this impact is proposed in Section 19.3.5, “Mitigation Measures.”

This impact would be similar to Impact Vis-1 (CP1) and Vis-1 (CP3). Construction-related and operational elements of CP4A would be inconsistent with some of the VQOs established by the STNF LRMP. This impact would be significant for CP4A. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-2 (CP4 and CP4A): Degradation and/or Obstruction of a Scenic View from Key Observation Points Under CP4 or CP4A, the "bathtub ring" that is apparent during less than full pool conditions would become larger. Existing scenic views of areas where utilities and infrastructure would be relocated could be obstructed or degraded. Views from some KOPs, including those of the renowned "Three Shastas," would be obstructed or degraded during construction and for several years post-construction. Throughout the primary study area, vegetation retention or removal activities (proposed activities would vary by relocation area) would also degrade scenic views. Although project-related changes to the landscape could become less visible over time, these changes would be highly visible during construction. This impact would be significant for CP4 or CP4A.

This impact would be similar to Impact Vis-2 (CP1) and Impact Vis-2 (CP3) with the addition of measures for increasing habitat for anadromous fish. These measures include the placement of spawning-sized gravel at multiple locations and riparian, floodplain, and side channel habitat restoration activities along the Sacramento River between Keswick Dam and the Red Bluff Pumping Plant. Although the direct placement of gravel into the river channel would initially be noticeable to viewers in the immediate vicinity of such actions, project-related changes to the landscape would become less visible over time as gravels are dispersed by natural means. Similarly, habitat restoration activities would affect the existing views in parts of the river, but these changes would become increasingly less noticeable over time as any removed vegetation becomes reestablished.

This impact would be significant for CP4. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

This impact would be significant for CP4A. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-3 (CP4 and CP4A): Generation of Increased Daytime Glare and/or Nighttime Lighting The increased area of light-colored soils around the Shasta Lake shoreline that are exposed during periods of drawdown and, conversely, the increased area of water surface associated with CP4 or CP4A would increase the potential for daytime glare. The relocation of roads and infrastructure could also create new sources of reflective daytime glare. In addition, construction equipment could be a temporary source of reflective daytime glare. Extensive construction activities at night requiring the use of vehicle and perimeter lighting, particularly in the vicinity of Shasta Dam, would

be necessary for several years. New sources of permanent nighttime lighting would also be required for some locations, such as relocated roads and recreational facilities. This impact would be significant for CP4 or CP4A.

This impact would be similar to Impact Vis-3 (CP1) and Impact Vis-3 (CP3) with the exception of the proposed gravel augmentation and upper Sacramento River habitat restoration actions included in CP4 and CP4A. Gravel is typically light colored and reflective; therefore, gravel augmentation would create a temporary source of daytime glare. Over time, as the gravel disperses along the river channel, its potential to be a source of glare would diminish. The habitat restoration activities proposed under CP4 or CP4A could also create a source of temporary daytime glare by the removal of vegetation, exposure of soils, and expansion of water surface. However, the potential for vegetation removal and exposed soils to be a source of daytime glare would be temporary, fading as new vegetation becomes established.

The impact would be significant for CP4. Mitigation for this impact is proposed in Section 19.3.5, “Mitigation Measures.”

The impact would be significant for CP4A. Mitigation for this impact is proposed in Section 19.3.5, “Mitigation Measures.”

Impact Vis-4 (CP4 or CP4A): Consistency with Federal and State Scenic Highway Requirements The distance to proposed construction/relocation areas around Shasta Lake from SR 151, the only State-designated Scenic Highway in the primary study area, would make changes resulting from CP4 or CP4A very difficult to differentiate. There are no Federally designated scenic roadways in the area. This impact would be less than significant for CP4 or CP4A.

This impact would be similar to Impact Vis-4 (CP1) and Impact Vis-4 (CP3). This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to Impact Vis-4 (CP1) and Impact Vis-4 (CP3). This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas None of the landscapes and features in the extended study area would be affected by activities associated with CP4 or CP4A. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise Combination Plan, Anadromous Fish Survival and Water Supply Reliability

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Vis-1 (CP5): Consistency with Guidelines for Visual Resources in the STNF LRMP The effects of the construction-related and operational elements

of CP5 would be inconsistent with some of the VQOs established by the STNF LRMP. The LRMP calls for management activities that would be visible from the I-5 corridor and SR 151 to remain visually subordinate on the landscape and not be noticeable to the casual observer (a VQO of "retention"). Foreground views from KOPs most often used by the public, such as campgrounds and boat launches, are also managed according to the VQO of retention, whereas middle ground views are managed according to the "partial retention" VQO (management activities in the middle ground having a natural appearance). The construction-related and operational elements of CP5 would be more visible from some viewpoints than others. The operation of construction equipment and its presence on the landscape would be a visual distraction when visible from KOPs. In addition, what might be considered short-term impacts on visual resources and aesthetics for some viewer groups, such as tourists, might be considered long-term impacts for other viewer groups, such as residents. The LRMP does not distinguish between short-term and long-term VQOs or between classes of viewers, although for the purposes of this assessment, viewer groups were considered in the evaluation of impacts. This impact would be significant.

This impact would be similar to Impact Vis-1 (CP1) and Impact Vis-1 (CP3). Construction-related and operational elements of CP5 would be inconsistent with some of the VQOs established by the STNF LRMP. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-2 (CP5): Degradation and/or Obstruction of a Scenic View from Key Observation Points Under CP5, the "bathtub ring" that is apparent during less than full pool conditions would become larger. Existing scenic views of areas where utilities and infrastructure would be relocated could be obstructed or degraded. Views from some KOPs, including those of the renowned "Three Shastas," would be obstructed or degraded during construction and for several years post-construction. Throughout the primary study area, vegetation retention or removal activities (proposed activities would vary by relocation area) would also degrade scenic views. Although project-related changes to the landscape could become less visible over time, these changes would be highly visible during construction. This impact would be significant.

This impact would be similar to Impact Vis-2 (CP1) and Impact Vis-2 (CP4 and CP4A). Additional enhancements to relocation areas associated with CP5 could result in a slightly greater level of degradation and/or obstruction of a view from a particular KOP than might occur under CP3, CP4, or CP4A. This impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-3 (CP5): Generation of Increased Daytime Glare and/or Nighttime Lighting The increased area of light-colored soils around the Shasta Lake shoreline that are exposed during periods of drawdown and, conversely, the

increased area of water surface associated with CP5 would increase the potential for daytime glare. The relocation of roads and infrastructure could also create new sources of reflective daytime glare. In addition, construction equipment could be a temporary source of reflective daytime glare. Extensive construction activities at night requiring the use of vehicle and perimeter lighting, particularly in the vicinity of Shasta Dam, would be necessary for several years. New sources of permanent nighttime lighting would also be required for some locations, such as relocated roads and recreational facilities. This impact would be significant.

This impact would be similar to Impact Vis-3 (CP1) and Impact Vis-3 (CP4 or CP4A). Additional enhancements to relocation areas associated with CP5 could result in a slightly greater level of glare than might occur under CP3, CP4, or CP4A. The impact would be significant. Mitigation for this impact is proposed in Section 19.3.5, "Mitigation Measures."

Impact Vis-4 (CP5): Consistency with Federal and State Scenic Highway Requirements The distance to proposed construction/relocation areas around Shasta Lake from SR 151, the only State-designated Scenic Highway in the primary study area, would make changes resulting from CP5 very difficult to differentiate. There are no Federally designated scenic roadways in the area. This impact would be less than significant.

This impact would be similar to Impact Vis-4 (CP1) and Impact Vis-4 (CP3). This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas None of the landscapes and features in the extended study area would be affected by activities associated with CP5. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

19.3.5 Mitigation Measures

Table 19-3 presents a summary of mitigation measures for aesthetics and visual resources.

Table 19-3. Summary of Mitigation Measures for Aesthetics and Visual Resources

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Vis-1: Consistency with Guidelines for Visual Resources in the STNF LRMP (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Vis-1: Amend the STNF LRMP to Include Revised VQOs for developments at Turntable Bay area.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Vis-2: Degradation and/or Obstruction of a Scenic View from Key Observation Points (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Vis-2: Minimize Construction-Related Visual Impacts on Scenic Views From Key Observation Points.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Vis-3: Generation of Increased Daytime Glare and/or Nighttime Lighting (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure Vis-3: Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact Vis-4: Consistency with Federal and State Scenic Highway Requirements (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Key:
CP = Comprehensive Plan
LOS = level of significance
LRMP = Land and Resource Management Plan
LTS = less than significant
NI = no impact
S = significant
STNF = Shasta-Trinity National Forest
SU = significant and unavoidable
VQO = visual quality objective

No-Action Alternative

No mitigation measures are required for the No-Action Alternative.

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

No mitigation is required for Impact Vis-4 (CP1). Impacts Vis-1 (CP1), Vis-2 (CP1), and Vis -3 (CP1) would remain significant and unavoidable despite the use of mitigation. Mitigation is provided below for other impacts of CP1 on aesthetics and visual resources.

Mitigation Measure Vis-1 (CP1): Amend the STNF LRMP to Include Revised VQOs for Newly Constructed Recreation Developments at All New Sites STNF could prepare an amendment to the STNF LRMP that would modify the management prescription for the area in which newly constructed

developed recreation sites are located from Roaded Recreation to Roaded, High-Density Recreation. The new prescription would allow the newly constructed areas to be characterized as a substantially modified natural environment in support of various recreational activities. In those locations, this amendment would serve to modify the VQOs from Retention to Modification. Implementation of this mitigation measure would ensure that the SLWRI will be consistent with the STNF LRMP, as amended. Impacts on visual resources at areas outside of the newly constructed recreation developments may be significant and unavoidable, depending on the designated VQO. Impact Vis-1 (CP1) would be significant and unavoidable in some areas.

Mitigation Measure Vis-2 (CP1): Minimize Construction-related Visual Impacts on Scenic Views from KOPs Reclamation will do the following to minimize potential impacts on visual resources during project construction:

- When not in use (e.g., after hours or when not required for the day's construction activities), construction equipment will remain in the designated contractor staging area.

- When practicable, construction materials that will remain permanently onsite should be consistent in color, texture, and pattern with the surrounding environment.

Implementation of this mitigation measure would reduce the visual impacts of the project related to the temporary operation of construction equipment and the permanent presence of project features on the landscape, but would not necessarily reduce them to a less-than-significant level. Impact Vis-2 (CP1) would be significant and unavoidable.

Mitigation Measure Vis-3 (CP1): Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting Reclamation will do the following to minimize or avoid potential impacts on visual resources and aesthetics from daytime glare and nighttime lighting:

- Avoid constant nighttime lighting and overly bright lighting to the extent possible. The location of lighting will respond to the anticipated use and should not exceed the amount of light actually required by users.

- Lights will be screened and directed away from residences to the highest degree possible, and the amount of nighttime light used will be minimized to the highest degree possible. Lighting will include shielding to minimize offsite light spill and glare. In addition, the following measures will apply:

  - The spacing of luminaire lamps (or comparable vandal-resistant lighting) should be the maximum allowable for traffic safety.

- Luminaires (or comparable vandal-resistant lighting) should be cutoff-type fixtures that cast low-angle illumination to minimize incidental spillover of light onto adjacent private properties and undeveloped open space. Fixtures that project upward or horizontally will not be used.

- Luminaire lamps (or comparable vandal-resistant lighting) will be directed toward the roadway or lighted feature (e.g., campground restrooms, sidewalks) and away from adjacent residences and open space areas.

- Luminaire lamps (or comparable vandal-resistant lighting) will provide good color rendering and natural light qualities. Low-pressure and high-pressure sodium fixtures that are not color corrected will not be used.

- Luminaire lamps (or comparable vandal-resistant lighting) intensity will be the minimum allowable for traffic safety.

- Luminaire lamp (or comparable vandal-resistant lighting) mountings will be downcast and the height of the poles will be minimized to reduce potential for backscatter into the nighttime sky and incidental spillover of light into adjacent private properties and open space.

- Luminaire lamp (or comparable vandal-resistant lighting) mountings will have nonglare finishes.

• Guardrails and other roadway fixtures, including retaining walls, safety barriers, light standards, and other structures, will be limited to the minimum length, height, and bulk necessary to adequately provide for the safety of the roadway user. Earth tone colors in dark shades and flat finishes will be used on all roadway fixtures. New and replacement guardrails will not have a shiny, reflective finish. (These features are typically galvanized steel, which weathers naturally to a nonglare finish, typically within a year or so.) Retaining walls and other erosion control devices or structures will be constructed of natural materials whenever possible and will, to the maximum extent possible, be designed and sited to avoid detracting from the scenic quality of the corridor. Such structures will incorporate heavy texture or articulated plane surfaces that create heavy shadow patterns.

Implementation of this mitigation measure would reduce the impacts of the project related to daytime glare and nighttime lighting, but would not reduce them to a less-than-significant level. ImpactVis-3 (CP1) would be significant and unavoidable.

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

No mitigation is required for Impact Vis-4 (CP2). Impacts Vis-1 (CP2), Vis-2 (CP2), and Vis -3 (CP2) would remain significant and unavoidable despite the use of mitigation. Mitigation is provided below to minimize impacts of CP2 on aesthetics and visual resources to the extent possible.

Mitigation Measure Vis-1 (CP2): Amend the STNF LRMP to Include Revised VQOs for Newly Constructed Recreation Developments at All New Sites This mitigation measure is identical to Mitigation Measure Vis-1 (CP1). Impacts on visual resources at areas outside of the newly constructed recreation developments may be significant and unavoidable, depending on the designated VQO. Impact Vis-1 (CP2) would be significant and unavoidable in some areas.

Mitigation Measure Vis-2 (CP2): Minimize Construction-related Visual Impacts on Scenic Views from KOPs This mitigation measure is identical to Mitigation Measure Vis-1 (CP1). Implementation of this mitigation measure would reduce the impacts of the project related to the temporary operation of construction equipment and the permanent presence of project features on the landscape, but would not necessarily reduce them to a less-than-significant level. Impact Vis-2 (CP2) would be significant and unavoidable.

Mitigation Measure Vis-3 (CP2): Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting This mitigation measure is identical to Mitigation Measure Vis-3 (CP1). Implementation of this mitigation measure would reduce the impacts of the project related to daytime glare and nighttime lighting, but would not reduce them to a less-than-significant level. Impacts Vis-2 (CP2) and Vis-3 (CP2) would be significant and unavoidable.

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

No mitigation is required for Impact Vis-4 (CP3). Impacts Vis-1 (CP3), Vis-2 (CP3), and Vis -3 (CP3) would remain significant and unavoidable despite the use of mitigation. Mitigation is provided below to minimize impacts of CP3 on aesthetics and visual resources to the extent possible.

Mitigation Measure Vis-1 (CP3): Amend the STNF LRMP to Include Revised VQOs for Newly Constructed Recreation Developments at All New Sites This mitigation measure is identical to Mitigation Measure Vis-1 (CP1). Impacts on visual resources at areas outside of the newly constructed recreation developments may be significant and unavoidable, depending on the designated VQO. Impact Vis-1 (CP3) would be significant and unavoidable in some areas.

Mitigation Measure Vis-2 (CP3): Minimize Construction-related Visual Impacts on Scenic Views from KOPs This mitigation measure is identical to Mitigation Measure Vis-1 (CP1). Implementation of this mitigation measure would reduce the impacts of the project related to the temporary operation of

construction equipment and the permanent presence of project features on the landscape, but would not necessarily reduce them to a less-than-significant level. Impact Vis-2 (CP3) would be significant and unavoidable.

Mitigation Measure Vis-3 (CP3): Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting This mitigation measure is identical to Mitigation Measure Vis-3 (CP1). Implementation of this mitigation measure would reduce the impacts of the project related to daytime glare and nighttime lighting, but would not reduce them to a less-than-significant level. Impacts Vis-2 (CP3) and Vis-3 (CP3) would be significant and unavoidable.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation is required for Impact Vis-4 (CP4 and CP4A). Impacts Vis-1 (CP4 and CP4A), Vis-2 (CP4 and CP4A), and Vis -3 (CP4 and CP4A) would remain significant and unavoidable despite the use of mitigation. Mitigation is provided below to minimize impacts of CP4 or CP4A on aesthetics and visual resources to the extent possible.

Mitigation Measure Vis-1 (CP4 and CP4A): Amend the STNF LRMP to Include Revised VQOs for Newly Constructed Recreation Developments at All New Sites This mitigation measure is identical to Mitigation Measure Vis-1 (CP1). Impacts on visual resources at areas outside of the newly constructed recreation developments may be significant and unavoidable, depending on the designated VQO. Impact Vis-1 (CP4 and CP4A) would be significant and unavoidable in some areas.

Mitigation Measure Vis-2 (CP4 and CP4A): Minimize Construction-related Visual Impacts on Scenic Views from KOPs This mitigation measure is identical to Mitigation Measure Vis-1 (CP1). Implementation of this mitigation measure would reduce the impacts of the project related to the temporary operation of construction equipment and the permanent presence of project features on the landscape, but would not necessarily reduce them to a less-than-significant level. Impact Vis-2 (CP4 and CP4A) would be significant and unavoidable.

Mitigation Measure Vis-3 (CP4 or CP4A): Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting This mitigation measure is identical to Mitigation Measure Vis-3 (CP1). Implementation of this mitigation measure would reduce the impacts of the project related to daytime glare and nighttime lighting, but would not reduce them to a less-than-significant level. Impacts Vis-2 (CP4 and CP4A) and Vis-3 (CP4 and CP4A) would be significant and unavoidable.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is required for Impact Vis-4 (CP5). Impacts Vis-1 (CP5), Vis-2 (CP5), and Vis -3 (CP5) would remain significant and unavoidable despite the

use of mitigation. Mitigation is provided below to minimize impacts of CP5 on aesthetics and visual resources to the extent possible.

Mitigation Measure Vis-1 (CP5): Amend the STNF LRMP to Include Revised VQOs for Newly Constructed Recreation Developments at All New Sites This mitigation measure is identical to Mitigation Measure Vis-1 (CP1). Impacts on visual resources at areas outside of the newly constructed recreation developments may be significant and unavoidable, depending on the designated VQO. Impact Vis-1 (CP5) would be significant and unavoidable in some areas.

Mitigation Measure Vis-2 (CP5): Minimize Construction-related Visual Impacts on Scenic Views from KOPs This mitigation measure is identical to Mitigation Measure Vis-1 (CP1). Implementation of this mitigation measure would reduce the impacts of the project related to the temporary operation of construction equipment and the permanent presence of project features on the landscape, but would not necessarily reduce them to a less-than-significant level. Impact Vis-2 (CP5) would be significant and unavoidable.

Mitigation Measure Vis-3 (CP5): Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting This mitigation measure is identical to Mitigation Measure Vis-3 (CP1). Implementation of this mitigation measure would reduce the impacts of the project related to daytime glare and nighttime lighting, but would not reduce them to a less-than-significant level. Impact and Vis-3 (CP5) would be significant and unavoidable.

19.3.6 Cumulative Effects

Cumulative effects are the impacts on the environment that result from the incremental impacts of the project alternative when added to the impacts of other past, present, and reasonably foreseeable future actions (14 California Code of Regulations Section 15355(b), 40 Code of Federal Regulations Section 1508.7), regardless of what agency (Federal or non-Federal) or entity undertakes such other actions. These impacts can result from individually minor, but collectively significant, actions taking place over time.

The President's Council on Environmental Quality's NEPA regulations and the State CEQA Guidelines require that the cumulative impacts of a project be addressed in an environmental document when the cumulative impacts are expected to be significant (40 Code of Federal Regulations Section 1508.25(a)(2), 14 California Code of Regulations Section 15130(a)). When a lead agency assesses a project having an incremental effect that is not "cumulatively considerable," the lead agency need not consider that effect significant. However, the lead agency will briefly describe its basis for concluding that the incremental effect is not cumulatively considerable.

Methods and Assumptions

The analysis of cumulative impacts in this chapter addresses the cumulative impacts of the various project alternatives. The geographic scope of cumulative

impacts on aesthetics and visual resources includes the viewsheds that would be affected by implementation of the SWLRI alternatives, including views from public areas such as roadways, recreation areas, and scenic vistas. The temporal scope impacts would include construction, operation, and maintenance of the project. According to the State CEQA Guidelines, the cumulative impacts discussion "should be guided by the standards of practicality and reasonableness." The State CEQA Guidelines require that a cumulative impacts analysis identify related projects, summarize the expected environmental impacts of those related projects, and analyze the cumulative impacts of the proposed and related projects. Past, present, and reasonably foreseeable projects affecting the same viewsheds as those associated with the primary study area are described in Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences." Because no construction activities associated with the project would occur outside of the primary study area, the geographic scope of the area examined for cumulative impacts is the primary study area identified for this project.

The Antlers Bridge Replacement is an example of the type of project that may contribute to cumulative impacts associated with aesthetics and visual resources in the primary study area, and thus is summarized below.

The California Department of Transportation, in cooperation with the Federal Transit Administration, is in the process of replacing the I-5 Antlers Bridge over Shasta Lake (in the primary study area), near the community of Lakehead. This project includes construction of a 1,942-foot, 5-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 I-5, requiring hillside excavation, construction of a 5-lane freeway section and demolition of the existing 1,500 feet of steel deck truss bridge. The new bridge is being constructed next to the existing bridge, which remains open to traffic until the new bridge is completed. Although not considered to have a significant impact on visual resources and aesthetics (Caltrans and DOT 2007), the project is highly visible from surrounding public areas (I-5 corridor, Antlers Public Boat Ramp, and Lakehead). Construction is expected to be completed in 2014.

Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," discusses overall cumulative impacts methodology related to the action alternatives, including the relationship to the CALFED Bay-Delta Program Programmatic EIS/EIR cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the present and reasonably foreseeable future projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions,

land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 under Quantitative Analysis would have effects on aesthetic and visual resources in the primary study area or have effects in extended study area that contribute to cumulative impacts of the action alternatives since no impacts have been identified in the extended study area. This analysis is based on the projects listed in Table 3-1 under Qualitative Analysis.

Past and present programs projects that have contributed to cumulative impacts on aesthetic and visual resources include dam construction, reservoir operation, flood management projects, land use alterations, and other construction projects.

The impact of the proposed SLWRI alternatives on aesthetics and visual resources in the project study area would be largely significant and unavoidable, and would be collectively significant when included with other actions taking place over time. Past, present, and reasonably foreseeable projects described in Chapter 3, Table 3-1, such as bridge reconstructions (e.g., Antlers Bridge Replacement) and highway modifications along the I-5 corridor, changes to marinas and resorts, vegetation management, land use changes (e.g., Mountain Gate at Shasta Mixed-Use Area Plan), new quarries (e.g., Moody Flats Quarry), and mine reclamation on the surrounding hillsides could all affect the impression that viewers have of the region.

Under all SLWRI alternatives impacts Vis-1, Vis-2, and Vis-3 would be significant and unavoidable. Implementation of the SLWRI alternatives would contribute to cumulative adverse conditions where construction activities and/or permanent changes to the landscape, such as a wider bathtub ring and new recreation facilities, occupy the same field of view as other facilities or impacted landscapes that are in the viewsheds of sensitive viewers in the project study area. Implementation of the proposed SLWRI alternatives would result in impacts on visual resources that would be inconsistent with LRMP VQOs in some parts of the project study area, and would degrade or obstruct scenic views from KOPs. Glare from construction equipment and exposed soils, and the operation of equipment in active construction areas are significant and unavoidable impacts. Mitigation measures Vis-1 through Vis-3 would be implemented to buffer these impacts to the extent possible (e.g., storage of construction equipment in designated areas), although impacts would not be reduced to a less-than-significant level. When assessed with other projects that could change the character and quality of the aesthetics and visual resources in Shasta Lake and vicinity and the upper Sacramento River, impacts resulting from implementation of the proposed SLWRI alternatives would be cumulatively significant.

None of the project alternatives would have a cumulatively considerable effect on aesthetics and visual resources in the extended study area.

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Chapter 20
Transportation and Traffic

20.1 Affected Environment

This section describes the existing transportation network in the primary and extended study areas – specifically those roads, highways, bridges, railroads, ports, transit, navigation, and airports that could be affected by the SLWRI action alternatives.

20.1.1 Roadways

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

The primary study area comprises Shasta Dam, Shasta Lake, and the upper Sacramento River between Shasta Dam and the Red Bluff Pumping Plant in Shasta and Tehama counties. The surface transportation network in the primary study area consists of an interstate freeway, State highways, and smaller connector roads. Traffic in the area is generally moderate to light, except that heavy traffic in the Shasta Lake Unit of the Whiskeytown-Shasta-Trinity National Recreation Area is not unusual during weekends and holidays between May 1 and Labor Day (Reclamation 2004).

Figure 1-1 in Chapter 1, “Introduction,” shows the highways in the primary study area. Interstate 5 (I-5) is the main north-south interstate freeway in the region. Several major arterials run north-south, generally parallel to the Sacramento River. State Route (SR) 99 and SR 70 run north-south; certain sections of both of these routes are expressways. SR 273 runs north-south from Redding, generally paralleling the Sacramento River before it intersects with I-5 several miles north of the Shasta/Tehama county line.

Roadways in the vicinity of Shasta Lake are shown in Figure 20-1a (see Section 20.3.1, “Methods and Assumptions”). Roadways and bridges in the primary study area that could be affected by the SLWRI include Lakeshore Drive, Lower Salt Creek Road, Silverthorn Road, Gillman Road, and Salt Creek Road. These roads are described in more detail below.

Lakeshore Drive is a two-lane paved road that begins in the Lakeshore Area, immediately west of I-5, and continues south to the Sugarloaf Creek. Some segments of Lakeshore Drive are owned and maintained by Shasta County and some segments are owned and maintained by USFS.

Lower Salt Creek Road is a two-lane paved road that provides access to the Lower Salt Creek Shoreline area and Campground. Lower Salt Creek Road is owned and maintained by Shasta County.

Silverthorn Road is a two-lane paved road and provides access to the Silverthorn Area. A portion of Silverthorn Road is owned and maintained by the USFS and a portion of Silverthorn Road is maintained by Shasta County.

Gillman Road is a two-lane paved road that runs along the west side of the McCloud River Arm portion of Shasta Lake. Gillman Road is owned and maintained by Shasta County.

Salt Creek Road is an unpaved road, ranging from 10 to 12 feet wide and runs along the west side of the Squaw Creek Arm portion of Shasta Lake. Salt Creek Road is owned and operated by USFS.

Bridges in the primary study area include Antlers Bridge and Pit River Bridge (also carries Union Pacific Railroad (UPRR)), which are located along I-5; Doney Creek Bridge and Charlie Creek Bridge, which are located along Lakeshore Drive; McCloud River Bridge, which is located along Gillman Road; and Didallas Creek Bridge, which is located along Salt Creek Road. A new Antlers Bridge is currently under construction and will accommodate raises of Shasta Dam up to 18.5 feet (Caltrans and Federal Highway Administration 2007).

Every 3 years, the California Department of Transportation (Caltrans) collects traffic at the I-5/Turntable Bay Road and I-5/Bridge Bay Road interchanges for an 8-day period between April and June. Table 20-1 shows the average daily traffic counts for these interchanges in 2003, 2006, and 2009. These data provide a general sense of the amount of traffic accessing the Shasta Lake area from I-5.

Table 20-1. Average Daily Traffic Volume at the I-5/Turntable Bay Road and I-5/Bridge Bay Road Interchanges

Location	Average Daily Traffic Volumes		
	2003	2006	2009
Turntable Bay Road northbound off-ramp	170	210	150
Turntable Bay Road northbound on-ramp	150	150	180
Turntable Bay Road southbound off-ramp	35	40	65
Turntable Bay Road southbound on-ramp	65	100	70
Bridge Bay Road northbound off-ramp	310	360	210
Bridge Bay Road northbound on-ramp	60	60	40
Bridge Bay Road southbound off-ramp	85	100	65
Bridge Bay Road southbound on-ramp	350	400	220

Source: Caltrans 2011

Key:
I-5 = Interstate 5

SR 299 is the major east-west route. This route traverses Trinity, Shasta, Lassen, and Modoc counties north of Shasta Dam. SR 44 is another major east-west route farther south that traverses Shasta County near the city of Redding. SR 36, which also runs generally east-west, intersects with SR 99 and I-5, and this route crosses the Sacramento River near the city of Red Bluff.

Between Shasta Dam and Keswick Dam, one vehicular bridge spans the Sacramento River. Between Keswick Dam and Red Bluff Pumping Plant along the Sacramento River, 3 pedestrian bridges, 1 railroad bridge, and 14 vehicular bridges (3 of which are for I-5) span the Sacramento River.

There are 317 bridges in Shasta County, 220 of which have bridge spans of 20 feet or more, making them eligible for Federal aid. Ninety-four bridges are beyond their design lives, functionally obsolete, or structurally deficient (Shasta County RTPA 2010).

Lower Sacramento River and Delta

SR 45 follows the Sacramento River north from SR 113 in Knights Landing, north of Sacramento. I-5 parallels SR 45 and the Sacramento River to the west. On the west side of the Sacramento Valley, SR 29 runs north-south through Napa and Lake counties. East-west highways include SR 20 in Lake County, SR 162 in Glenn County, and SR 36 in Tehama and Trinity counties. Major east-west routes on the east side of the Sacramento Valley include SRs 70, 49, and 88; U.S. Highway 50; and Interstate 80.

The Delta region is served by several major freeways. I-5 and SR 99 run north-south and Interstate 80 and U.S. Highway 50 run east-west through Sacramento. Other highways extend from the cities of Sacramento and Stockton to small cities and towns in the region. New roadways have facilitated growth and

urbanization along their corridors and within the upper watersheds of major inflowing rivers. Local roads in the Delta are often narrow and winding; during peak travel times, traffic in this area often includes slow, oversized farm equipment.

The 2 major north-south freeways in the San Joaquin River area are I-5 and SR 99, which pass through the San Joaquin Valley from Sacramento through Stockton and continue on to Bakersfield and its vicinity. SR 41 runs in a north-south direction south of Fresno. Several east-west routes traverse the San Joaquin River basin: SR 152 is an expressway that connects Los Banos and Chowchilla in Madera County, SR 180 terminates in Yosemite National Park, SR 168 is a primary east-west route in Fresno County, and SRs 190 and 198 are primary routes in Tulare County.

CVP/SWP Service Areas

Numerous freeways and expressways serve portions of the CVP and SWP service areas not discussed above. U.S. Highway 101 extends north and south near the coast from San Luis Obispo south to Los Angeles, and I-5 runs north-south through the Central Valley to Los Angeles and on to San Diego. An extensive, intricate freeway system serves the Los Angeles area. I-10 runs east from Los Angeles to Arizona, while I-8 runs east-west from San Diego to Arizona.

20.1.2 Public Transit

Public transit service in the primary study area is provided by the Redding Area Bus Authority (RABA), which provides fixed-route and demand-responsive (paratransit) service. RABA operates 12 fixed routes within the cities of Redding, Shasta Lake, and Anderson. Shasta County contracts with RABA for a rural commuter bus service. This commuter service offers express transportation into Redding from the outlying community of Burney. The RABA demand/response system provides complimentary transportation to disabled residents of the fixed-route service area. The service area is generally within 0.75 mile of the fixed routes, complying with the minimum mandates of the Federal Americans with Disabilities Act.

Most urban areas in the extended study area provide public transit. These transit systems generally provide both fixed-route and paratransit service. Transit services in the extended study area are not discussed further because they would not be affected by any of the alternatives.

20.1.3 Railroads

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

The UPRR and Western Pacific Railroad both have rail lines serving the vicinity of Shasta Lake and the upper Sacramento River area. The UPRR main line follows the I-5 alignment. Railroad bridges in the area include the Pit River

Bridge (which carries both the railroad and I-5), the Sacramento River Second Crossing Railroad Bridge, and the Doney Creek Railroad Bridge. All three railroad bridges were constructed by Reclamation during the original construction period of Shasta Dam. The Engineering Summary Appendix includes additional information on each of these railroad bridges.

The Pit River Bridge would require relocation or major modifications for Shasta Dam raises greater than about 18.5 feet. The Plan Formulation Appendix provides additional information on the limitations that the existing Pit River Bridge places on potential dam enlargements.

Lower Sacramento River and Delta

UPRR is the main rail line serving the Sacramento River region. The UPRR alignment approximates the alignment of I-5. The Western Pacific rail lines extend farther east through the cities of Marysville and Oroville.

Rail lines serving the Delta are the UPRR; the Western Pacific Railroad; and the Atchison, Topeka, and Santa Fe Railway.

The UPRR and Atchison, Topeka, and Santa Fe lines provide primary rail service connecting the Delta region to the San Joaquin River basin. The alignments of these rail lines generally follow the I-5 alignment through the San Joaquin Valley.

CVP/SWP Service Areas

The UPRR line runs north-south near the coast, from the San Francisco Bay Area through Los Angeles, then southeast toward the Arizona/Mexico border.

20.1.4 Water Navigation

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

The means of water travel and navigation in the primary study area consist of smaller watercraft such as kayaks and canoes, as well as motorboats for fishing, water-skiing, and boating. Shasta Lake is a popular destination for houseboats. A 65-foot-long catamaran provides ferry service to the Shasta Caverns on the east side of the McCloud Arm of Shasta Lake. Water flows and depths in this segment of the Sacramento River limit river navigation to smaller watercraft. Additional information on recreational boating in the primary study area, especially at Shasta Lake, is included in Chapter 18, “Recreation and Public Access.”

Lower Sacramento River and Delta

The Port of Sacramento is located in West Sacramento in the southeastern part of Yolo County. Ship access to the port is provided from San Francisco Bay up the Sacramento River and through the Sacramento Deep Water Ship Channel. San Francisco Bay is approximately 80 nautical miles southwest of the Port of

Sacramento. This route provides direct and unrestricted passage to the port (City of Sacramento 2005).

Two ports are located along the Sacramento River between Sacramento and Walnut Grove. Another commercial port is located on the Sacramento River at Isleton. A commercial port is located near Terminous and two ports are located adjacent to each other on Old and Middle rivers, northeast of Brentwood (CALFED 2000a). The Port of Stockton is on the San Joaquin River. A deep-water ship channel runs from Cache Slough in the Delta to West Sacramento, where the Port of Sacramento is located.

There are no commercial ports or shipping routes on the San Joaquin River upstream from the Port of Stockton.

CVP/SWP Service Areas

The Los Angeles–Long Beach installation on San Pedro Bay is one of the leading ports of California. The growth of Los Angeles led to the creation of its artificial harbors. Other harbors in this area serving commercial shipping are the San Luis Obispo, Santa Barbara, Carpinteria, Port Hueneme, El Segundo, Los Angeles, Long Beach, and San Diego harbors (CALFED 2000b).

20.1.5 Airports

There are four airports in the primary study area: Redding Municipal Airport, Benton Airpark, Shingletown Airport, and Fall River Mills Airport. Redding Municipal Airport, the closest airport to the project site, is located 20 miles southeast of Shasta Dam in Redding. Seaplanes are also permitted to land at Shasta Lake at the Bridge Bay Resort Seaplane Base. More than 120 other airports exist in the extended study area; these airports are not relevant to the environmental analysis and thus are not discussed further.

20.2 Regulatory Framework

20.2.1 Federal

Several statutes and regulations include provisions specific to the interstate system in California and transportation projects in general. Title 23 of the U.S. Code and the Code of Federal Regulations govern highways; the laws for transportation are included in U.S. Code Title 23 and Code of Federal Regulations Title 49.

The following Federal legislative statutes may also apply to surface transportation and transportation aspects of the project:

- Federal Clean Air Act
- Federal Transit Act

- Americans with Disabilities Act
- Civil Rights Act
- Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

The Federal Highway Administration issues directives and policy memoranda in the form of technical advisories, orders, and notices for Federally funded roadway and transit projects in California.

20.2.2 State

Caltrans plans, designs, constructs, and maintains State-owned roadways. Caltrans's standard specifications (Caltrans 2006) establish uniform design and construction procedures for California highways and local roads. The highway design criteria and policies in the standard specifications ensure minimum design, contract, and construction standards for projects.

The primary study area is in Caltrans District 2, headquartered in Redding. Caltrans's Division of Transportation Planning, System Planning Branch, conducts long-range transportation plans in cooperation with local agencies to identify future highway improvements; the Division of Transportation Programming sets priorities for various Federal and State transportation funding programs.

20.2.3 Regional and Local

The circulation elements in the general plans of California cities and counties are concerned with the movement of people and goods. California Government Code Section 65302(b) requires that circulation elements address the general location and extent of existing and proposed major thoroughfares, transportation routes, terminals, and other local public utilities and facilities (Shasta County 2004).

Circulation elements establish goals and policies that pertain to transportation-related activities on city- or county-maintained roads. Most general plans contain circulation goals related to levels of service. "Level of service" describes the efficiency of road segments and intersections in terms of traffic delays. Level of service guidelines address long-term planning objectives rather than temporary conditions related to temporary, short-term traffic delays resulting from construction activities.

Counties in California classify county-maintained roads according to their intended function and linkage to land uses. Major roads are generally defined as primary carriers of intercity and intracounty travel. Collector roads are intended to provide subregional access and circulation by linking major roads with residential streets.

The Shasta County Regional Transportation Planning Agency is the congestion management agency in Shasta County. In 2010, the agency issued the *Regional Transportation Plan for Shasta County* in accordance with California Government Code Section 65080 et seq. and 23 U.S. Code 134–135 et seq. The plan discusses regional transportation issues, problems, and solutions and includes goals and objectives for each transportation mode and area of concern.

The Tehama County Transportation Commission is the regional transportation planning agency. It develops policies and allocates transportation funds in Tehama County. The commission published the 2006 *Tehama County Regional Transportation Plan* and is responsible for updating the plan.

Local agencies administer various transportation-related revenues that are sent directly to the agencies. The funds provide for the planning, design, operation, and maintenance of roadways and bridges. The Federal government provides matching funds under local assistance programs established under the Surface Transportation Improvement Program and Highway Bridge Rehabilitation and Replacement Program.

20.3 Environmental Consequences and Mitigation Measures

This section evaluates the environmental consequences of each project alternative related to traffic and transportation. The methods of evaluation are explained and the assumptions used to conduct the evaluation are listed below, and the criteria used to determine the significance of impacts are described. Mitigation measures are recommended to avoid or reduce any potentially significant impacts to less-than-significant levels.

20.3.1 Methods and Assumptions

Level of service standards are typically used to evaluate long-term (operational) traffic impacts resulting from residential, employment-generating, industrial, and institutional development projects. The SLWRI is not a land use development project. Long-term operation of the project alternatives would not generate additional residential, employment-related, industrial, or institutional vehicular trips (other than an increase in trips from additional recreation use); therefore, this analysis focuses on construction-related traffic effects. Level of service standards were not used in this analysis because such standards are typically used to evaluate long-term traffic congestion resulting from operations under a proposed action.

Figures 20-1a through 20-1g below show the locations of transportation facilities that would be relocated under the project alternatives. Table 20-2 lists the named roads and bridges that would require relocation and identifies the map figure that shows each facility. The facilities that would be relocated under each alternative are described with greater specificity in the associated impact evaluation that follows.

Table 20-2. Named Road and Bridge Facilities that Would Require Relocation Under the SLWRI

Roads and Bridges	Map Figure	CP1	CP2	CP3	CP4/CP4A	CP5
Lakeshore Drive	20-1f	X	X	X	X	X
Doney Creek Bridge	20-1f	X	X	X	X	X
Charlie Creek Bridge	20-1f	X	X	X	X	X
Lower Salt Creek Road	20-1f	X	X	X	X	X
Silverthorn Road	20-1c	X	X	X	X	X
Gillman Road	20-1g		X	X	X	X
McCloud River Bridge	20-1g		X	X	X	X
Salt Creek Road	20-1d		X	X	X	X
Didallas Creek Bridge	20-1d		X	X	X	X

Key:
CP = Comprehensive Plan
SLWRI = Shasta Lake Water Resources Investigation

The following project-related assumptions were used in the analysis of construction-related traffic that would result from needed roadway and bridge relocations and the dam raise:

- The estimated duration of proposed construction activities related to all major features would be 4.5 years for CP1 and 5 years for CP2–CP5. Construction activities would be phased, when feasible; however, some construction activities would occur concurrently.

- Import of fill and construction materials (aggregate, cobble, sand, and concrete) and export of construction waste related to construction of all major facilities would result in 95–177 truck trips per day for 4.5 to 5 years, with a maximum haul route distance of up to 20 miles. Export of vegetation cleared from the primary study area would result in 52–75 round trips per day, with a maximum haul route distance of up to 20 miles for up to 3.5 years.

- The estimated construction labor force for CP1–CP5 would be 300–360 workers per year, resulting in 300–360 daily round trips for 4.5 to 5 years.

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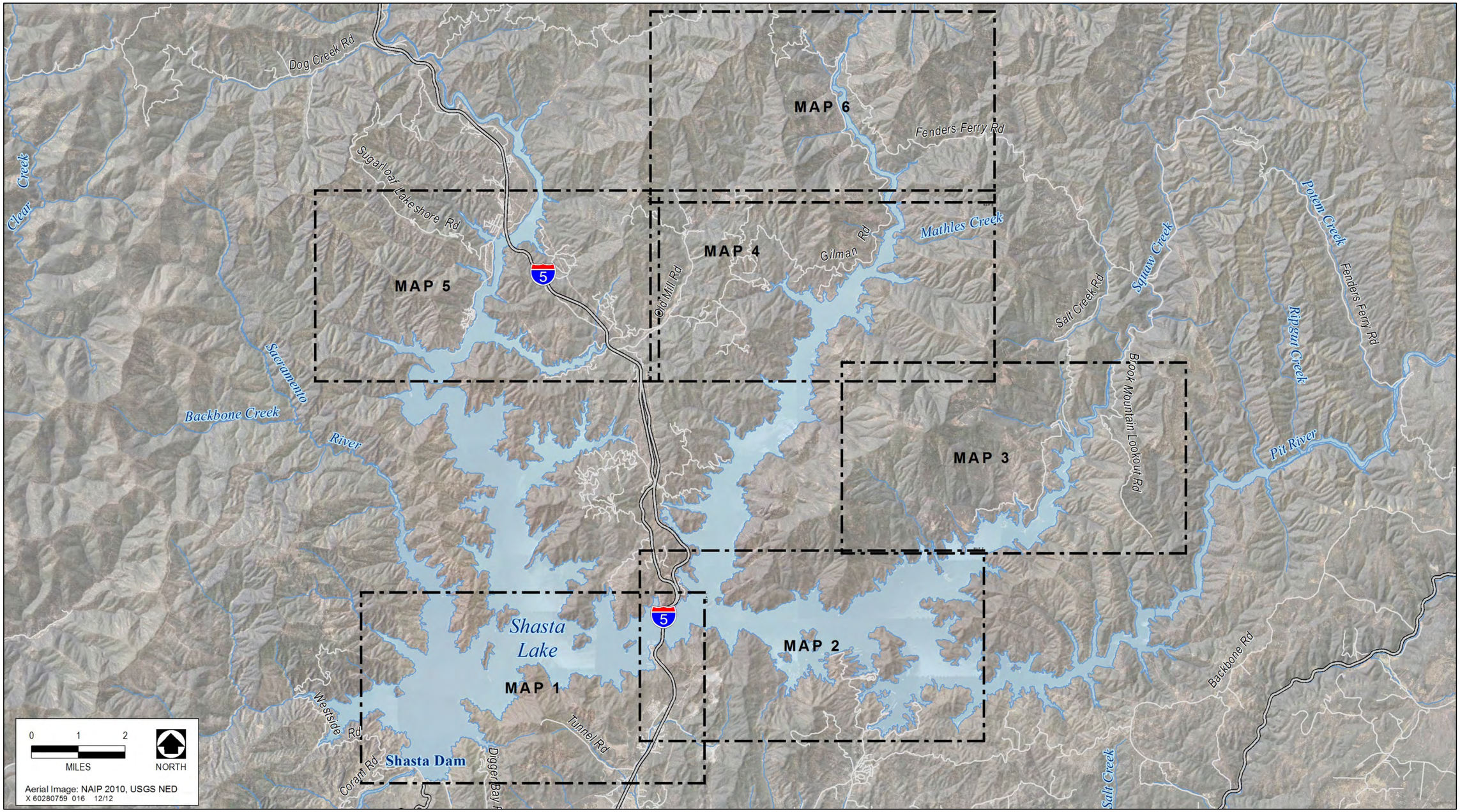

Figure 20-1a. Affected Transportation Facilities – Key to the Sheets

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Figure 20-1b. Affected Transportation Facilities – Map 1

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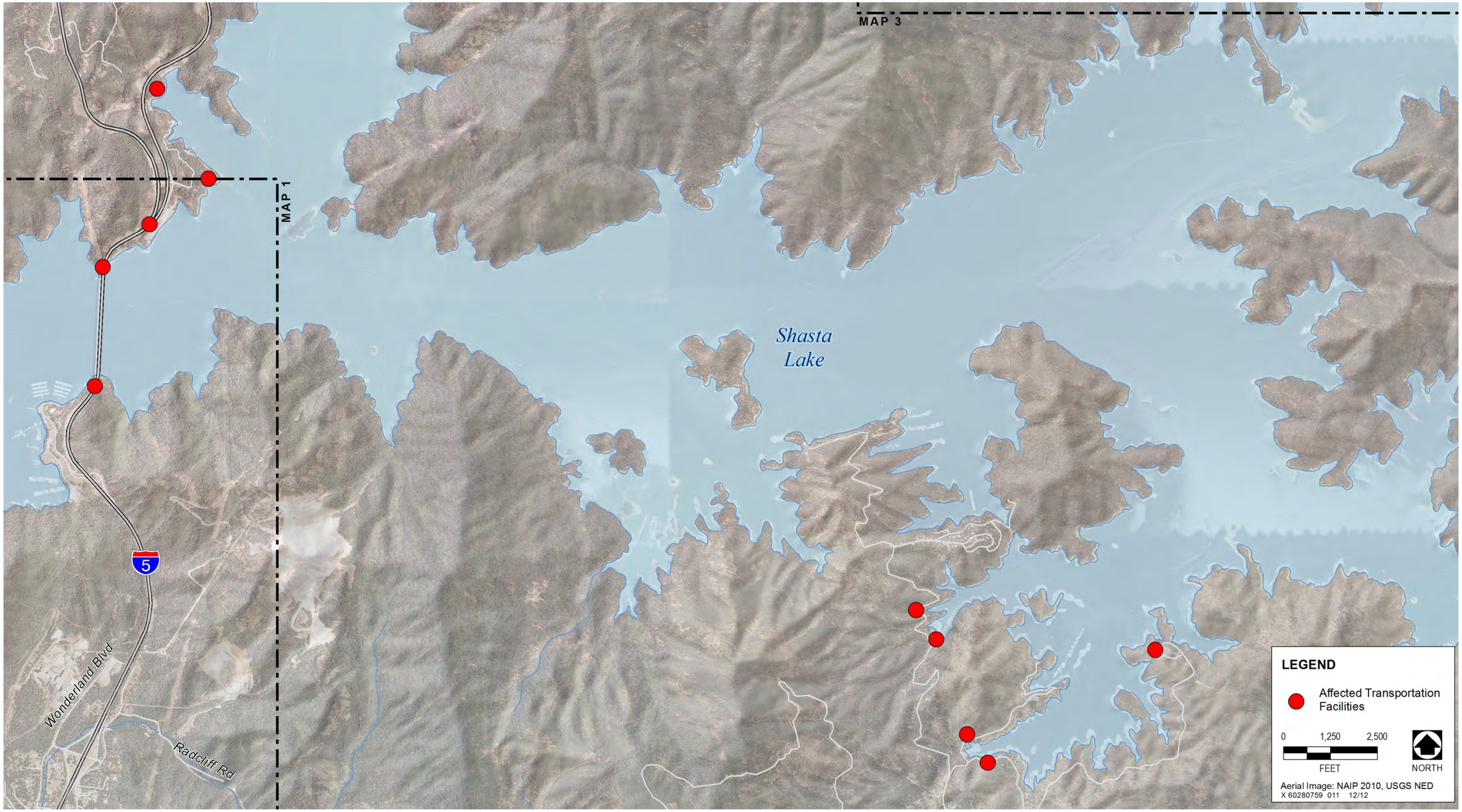

Figure 20-1c. Affected Transportation Facilities – Map 2

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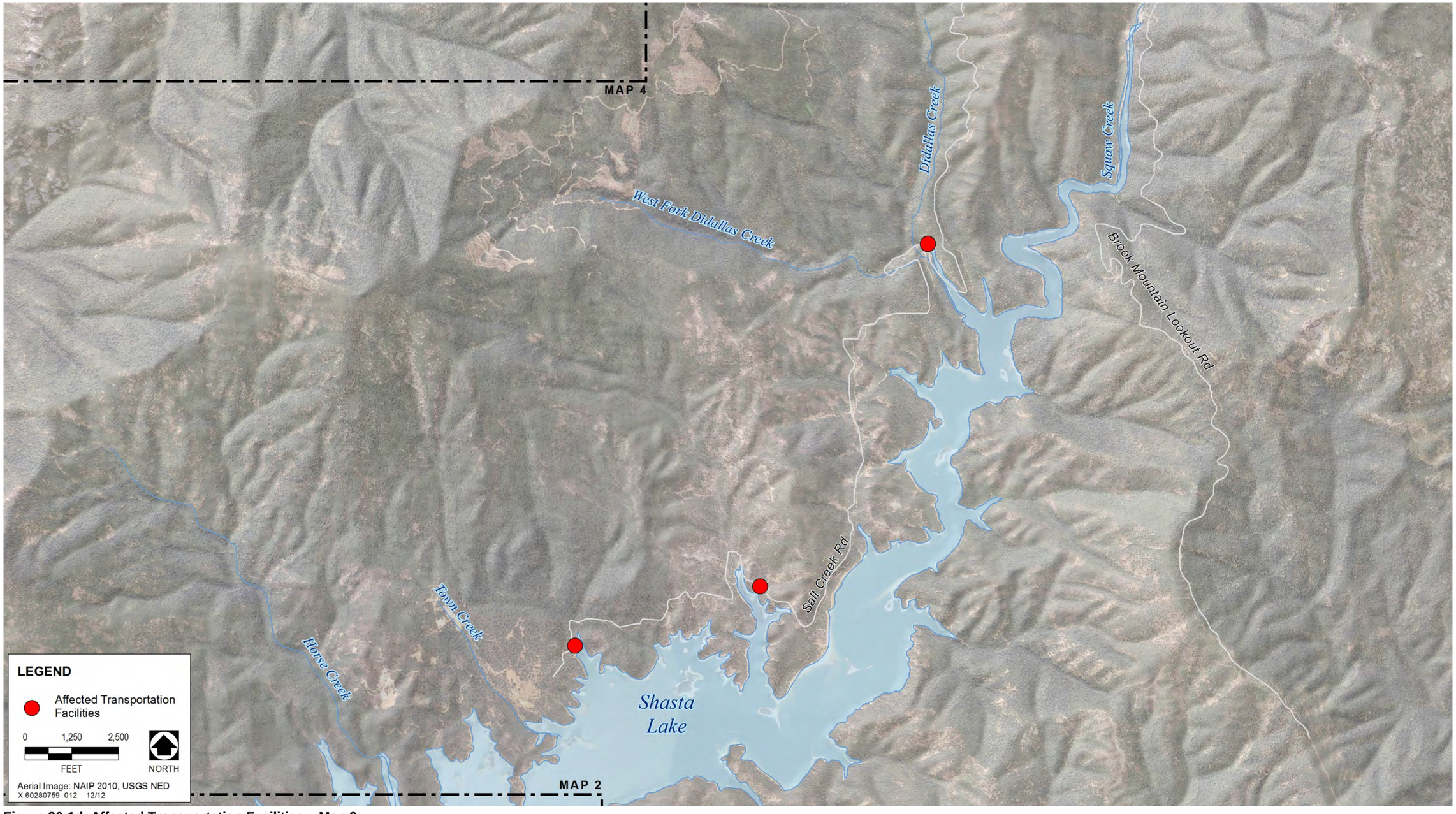

Figure 20-1d. Affected Transportation Facilities – Map 3

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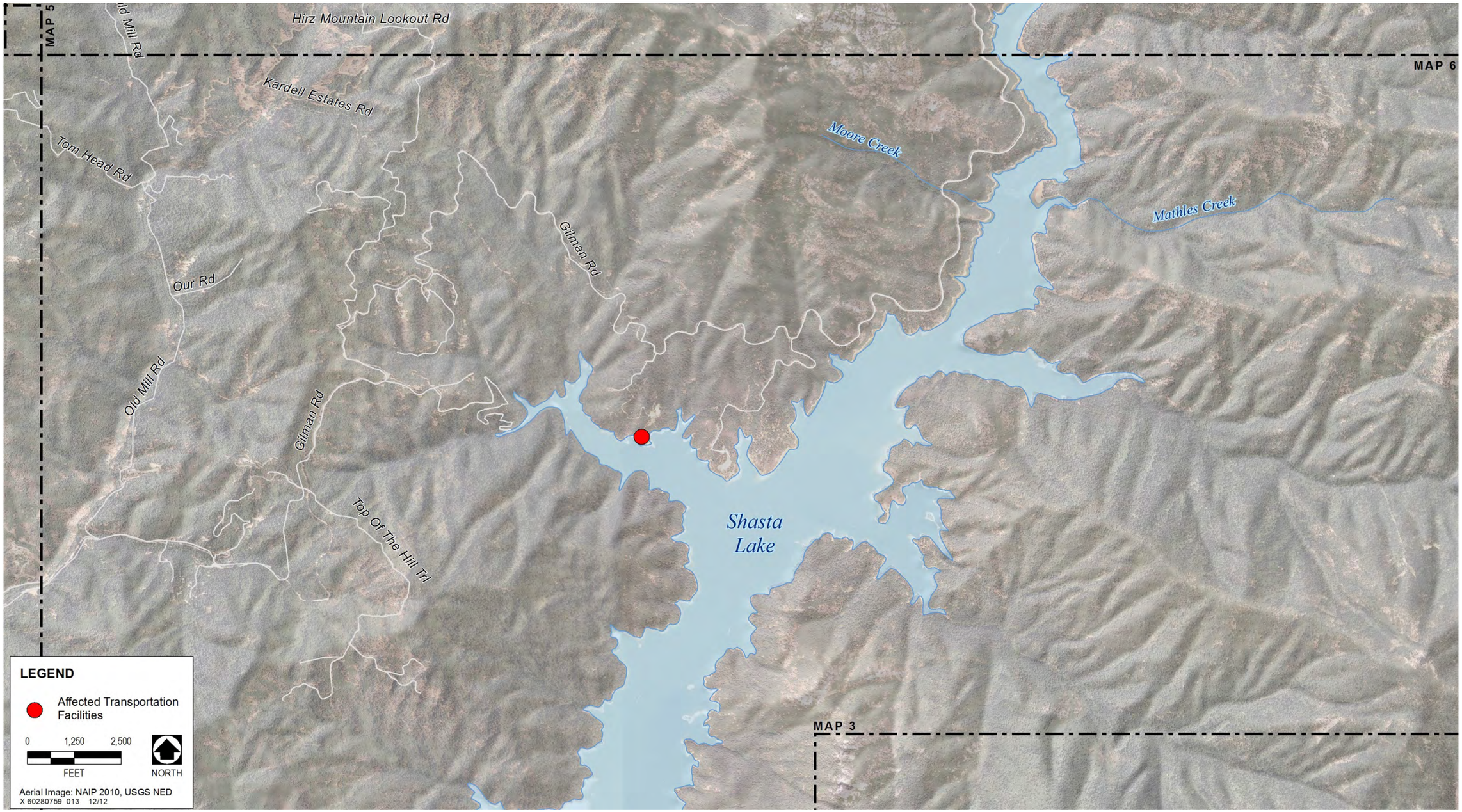

Figure 20-1e. Affected Transportation Facilities – Map 4

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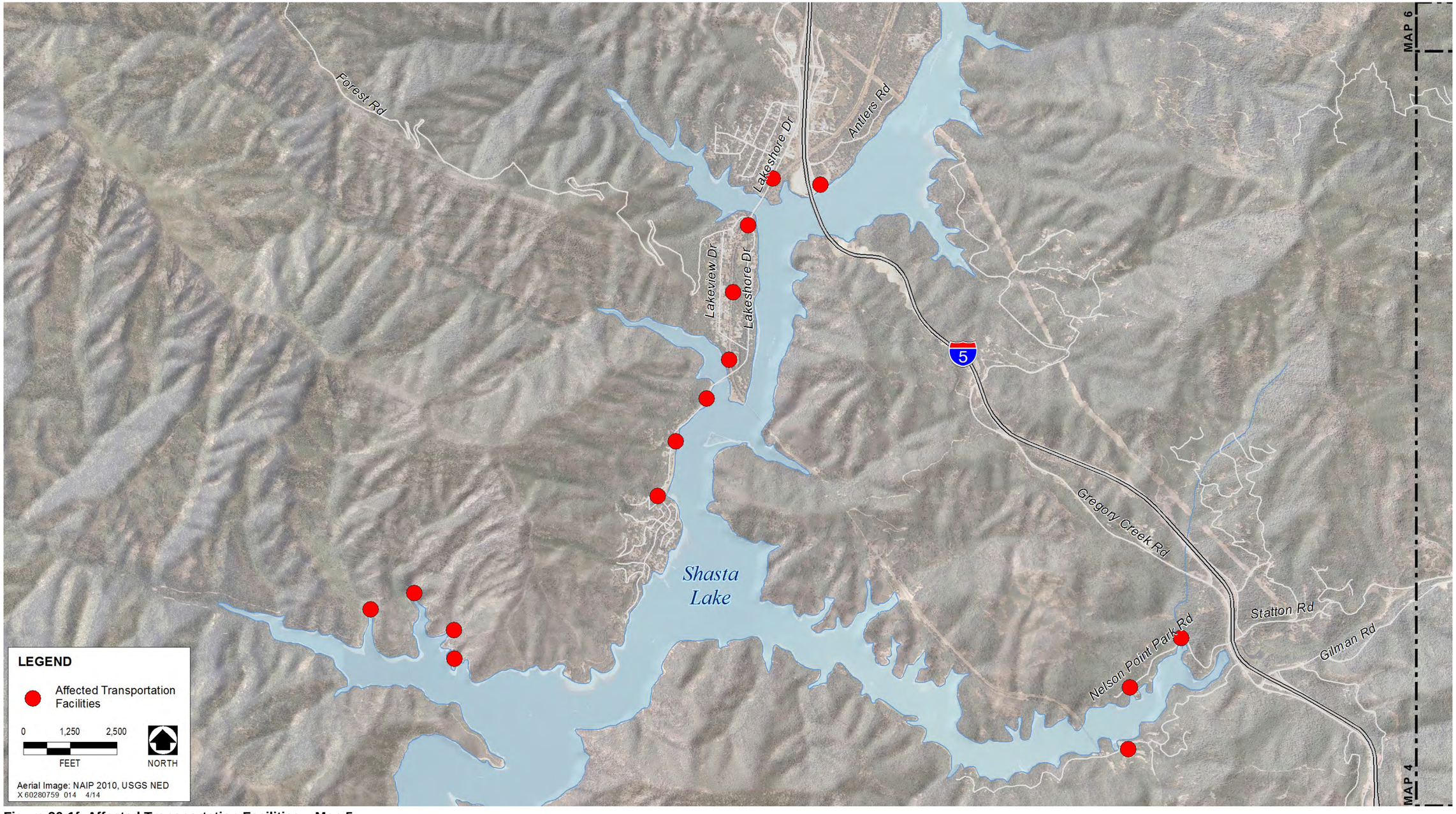

Figure 20-1f. Affected Transportation Facilities – Map 5

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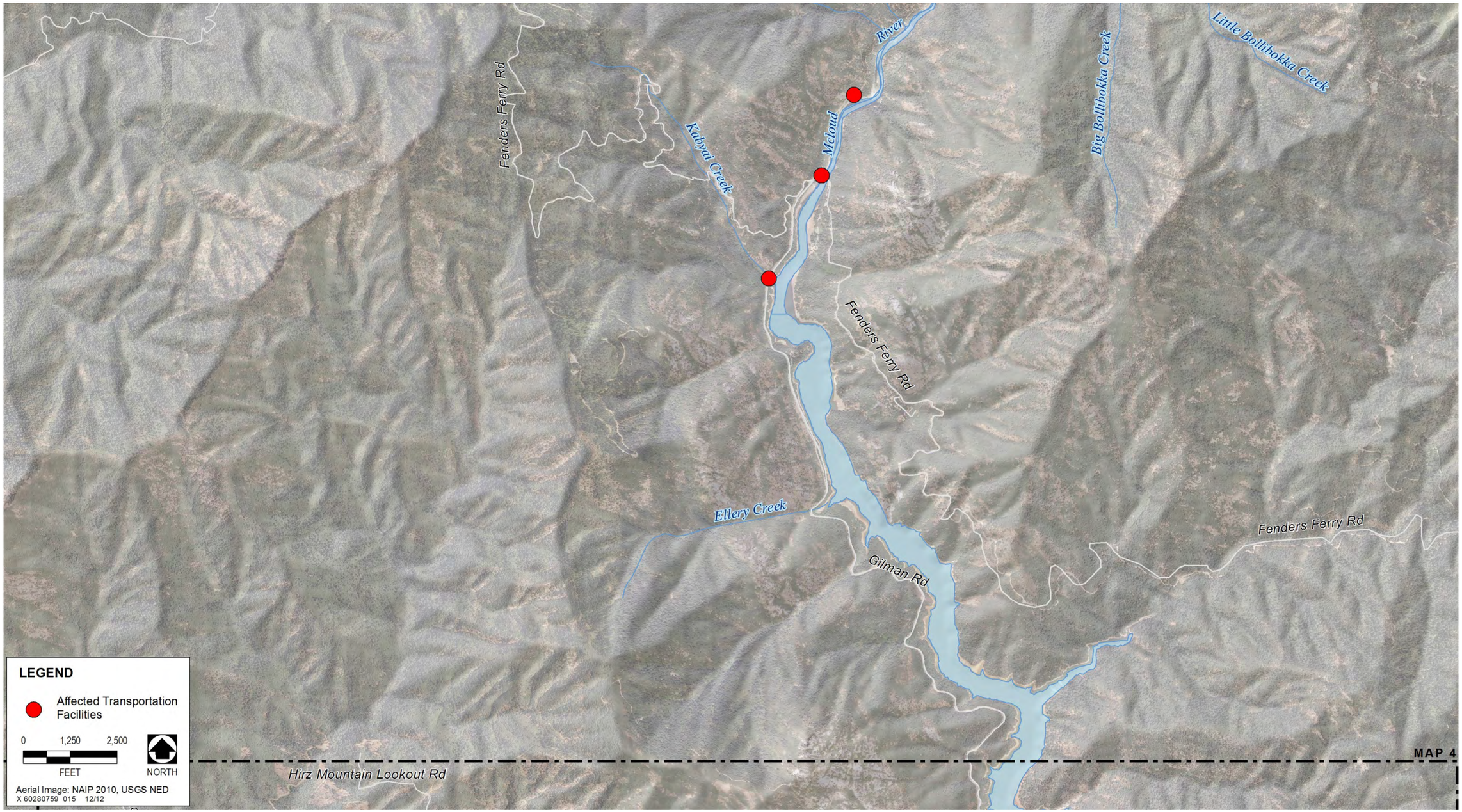

Figure 20-1g. Affected Transportation Facilities – Map 6

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- Existing access roads would be used to the extent feasible during construction. However, should temporary access roads need to be constructed, temporary fill for access would be completely removed after construction is completed.

- Construction would typically occur during daylight hours Monday through Friday, but the construction contractor may extend the hours and may schedule daytime construction work on weekend days with the approval of Reclamation. The average workday would be 8 hours.

- Under CP4, CP4A, and CP5, 5,000–10,000 tons of gravel on average would be installed per year at up to three sites per year. Gravel would be obtained from local commercial sources in Redding, and would result in up to 18 truck trips per day, with a maximum haul route distance of up to 40 miles. Under CP4, CP4A, and CP5, gravel augmentation would continue to occur annually for an additional 5 years, for a total construction period of 10 years.

- Under CP4, CP4A,and CP5, restoration at up to 6 restoration sites would result in up to 25 haul trips per day for approximately 1 month.

- The increase in long-term recreational opportunities and additional visitor days would generate an approximate average of 158 one-way trips per day to Shasta Lake and its tributaries under CP1, 238 one-way trips per day under CP2, 364 one-way trips per day under CP3, 658 one-way trips per day under CP4 or CP4A, and 311 one-way trips per day under CP5.

20.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with 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 EIS 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)) to less-than-significant levels.

Thresholds for determining the significance of transportation and traffic effects were based on the environmental checklist form in Appendix G of the State CEQA Guidelines and Federal, State, and local guidance. These thresholds consider the context and intensity of the environmental effects as required under NEPA.

Impacts of an alternative on transportation and traffic would be significant if project implementation would do any of the following:

- Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation, including mass transit and nonmotorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit

- Conflict with an applicable congestion management program, including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways

- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks

- Substantially increase hazards as a result of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)

- Result in inadequate emergency access

In accordance with NEPA, the methods for determining the significance of effects on traffic and transportation are based on the intensity of the effect within the context of the existing transportation facility.

The following screening criterion is recommended by the Institute of Transportation Engineers (ITE) (1989) for assessing the effects of construction projects that create temporary traffic increases. To account for the large percentage of heavy trucks associated with typical construction projects, ITE recommends a threshold level of 50 or more new peak-direction trips. Therefore, an alternative would cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system, and thus would result in a significant effect related to traffic and transportation, if it would result in 50 or more new truck trips during the a.m. peak hours or the p.m. peak hours. The a.m. peak hours are between 7 and 9 a.m. and the p.m. peak hours are between 4 and 6 p.m.

20.3.3 Topics Eliminated from Further Consideration

Several categories of effects would not result from the No-Action Alternative or any of the action alternatives. These categories are described below. An analysis of potential effects in applicable categories for the No-Action Alternative and action alternatives follows this discussion.

None of the airports (Redding Municipal, Benton Airpark, Shingletown, and Fall River Mills) in the primary study area are located near the project site; therefore, project construction and operation would not affect air traffic patterns. In addition, the project would not affect the ability of seaplanes to land at Bridge Bay Resort Seaplane Base. For these reasons, air traffic patterns are not discussed further in this analysis.

None of the alternatives would interfere with RABA services or affect transit service. Therefore, transit is not discussed further in this analysis.

None of the alternatives propose any facility that is in conflict with adopted policies, plans, or programs supporting alternative transportation. Therefore, this issue is not discussed further in this analysis.

The alternatives do not propose any changes in land use; however, under the action alternatives there could be minor changes in land uses throughout the study area because of increased water supply reliability. These indirect effects would be extremely minor and spread over a wide geographic area (i.e., throughout the CVP and SWP service areas). Therefore, none of the action alternatives would increase transportation hazards because of incompatible uses. This issue is not discussed further in this analysis.

20.3.4 Direct and Indirect Effects

No-Action Alternative

Under the No-Action Alternative, no improvements to Shasta Dam would be constructed and none of the associated road and bridge relocations would be needed. It is expected that over time, as population and traffic levels increase, roads and bridges would be maintained and improvements would be constructed throughout the study area when needed to ensure safety and meet current engineering-design requirements. Also, growth occurring under the No-Action Alternative would likely be consistent with city and county general plans, resulting in effects on California's transportation network. The effects on and impact conclusions for the primary study area and extended study area are essentially the same.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Trans-1 (No-Action): Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System Traffic levels would not increase above levels anticipated in local general plans and regional transportation plans. This impact would be less than significant.

Under the No-Action Alternative, traffic would be expected to increase compared to existing conditions. Traffic in the primary study area would increase by amounts anticipated in local general plans and regional

transportation plans, and no construction-related truck trips would occur. Planned growth under the No-Action Alternative, including development of residential and recreational uses, has the potential to result in temporary, short-term increases in construction traffic. It is reasonable to assume, however, that necessary improvements to roads, bridges, and other transportation facilities would be made in response to increased traffic levels associated with increased population growth over time. Therefore, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Trans-2 (No-Action): Adverse Effects on Access to Local Streets or Adjacent Uses in the Primary Study Area Access to local streets and adjacent uses would remain generally unchanged. This impact would be less than significant.

Access to local streets and adjacent uses in the primary study area would be maintained under the No-Action Alternative. No adverse construction-related effects on access would occur. Planned growth under the No-Action Alternative has the potential to impede access to local streets and adjacent uses. It is reasonable to assume, however, that road and bridge improvements needed to maintain access would be made in accordance with city and county regulations and policies. For this reason, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Trans-3 (No-Action): Hazards in the Primary Study Area Caused by a Design Feature No design hazards or incompatible uses would be introduced. This impact would be less than significant.

No design hazards or incompatible uses would be introduced in the primary study area under the No-Action Alternative. No construction-related effects would occur. Planned growth under the No-Action Alternative has the potential to introduce design hazards or incompatible uses. It is reasonable to assume, however, that necessary actions would be taken in accordance with city and county policies and design standards. Therefore, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Trans-4 (No-Action): Adverse Effects on Emergency Access in the Primary Study Area Emergency access would remain unchanged. This impact would be less than significant.

Emergency access in the primary study area would remain unchanged under the No-Action Alternative. No construction-related effects would occur. Planned residential and recreation growth under the No-Action Alternative has the potential to affect emergency access during construction of roadway improvements to accommodate that growth. It is reasonable to assume, however, that necessary actions would be taken in accordance with city and county standards. Therefore, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Trans-5 (No-Action): Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area No increase in road degradation would occur because no trucks would transport materials to and from the project site. This impact would be less than significant.

Because construction would not occur under the No-Action Alternative, trucks would not be required to transport construction materials to and from the primary study area. Therefore, road degradation would not increase as a result of construction. Planned growth under the No-Action Alternative has the potential to result in increased truck trips, with the secondary effect of road degradation. It is reasonable to assume, however, that necessary actions would be taken to accommodate planned growth over time. Therefore, this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Trans-6 (No-Action): Temporary Increase in Traffic in the Extended Study Area in Relation to the Existing Traffic Load and Capacity of the Street System Traffic levels would not increase above levels anticipated in local general plans and regional transportation plans. This impact would be less than significant.

This impact is similar to Impact Trans-1 (No-Action) for the primary study area. For the same reasons as described under Impact Trans-1 (No-Action), this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Trans-7 (No-Action): Adverse Effects on Access to Local Streets or Adjacent Uses in the Extended Study Area Access to local streets and adjacent uses would remain generally unchanged because no construction would occur. This impact would be less than significant.

This impact is similar to Impact Trans-2 (No-Action) for the primary study area. For the same reasons as described under Impact Trans-2 (No-Action), this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Trans-8 (No-Action): Hazards in the Extended Study Area Caused by a Design Feature No design hazards or incompatible uses would be introduced. This impact would be less than significant.

This impact is similar to Impact Trans-3 (No-Action) for the primary study area. For the same reasons as described under Impact Trans-3 (No-Action), this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Trans-9 (No-Action): Adverse Effects on Emergency Access in the Extended Study Area Emergency access would remain unchanged. This impact would be less than significant.

This impact is similar to Impact Trans-4 (No-Action) for the primary study area. For the same reasons as described under Impact Trans-4 (No-Action), this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Trans-10 (No-Action): Accelerated Degradation of Surface Transportation Facilities in the Extended Study Area No increase in road degradation would occur because no trucks would transport materials to and from the project site. This impact would be less than significant.

This impact is similar to Impact Trans-5 (No-Action) for the primary study area. For the same reasons as described under Impact Trans-5 (No-Action), this impact would be less than significant. Mitigation is not required for the No-Action Alternative.

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

CP1 consists of raising Shasta Dam by 6.5 feet, which would increase the surface water elevation and acreage of the inundation area. Under CP1, transportation facilities in the proposed inundation area would be relocated to sites outside that area. Transportation facilities include road infrastructure and vehicular bridges. Construction would involve installing bank fortification to preserve road segments and dike/abutment protection for bridge structures that do not require relocation. The construction period would be approximately 4.5 years. As shown in Table 20-2 and Figures 20-1c and 20-1f, the following transportation facilities would need to be relocated to accommodate construction under CP1:

- Four segments of Lakeshore Drive beginning in the Lakeshore area west of I-5, extending south to the Sugarloaf Area and along the Sugarloaf Creek Inlet. Shasta County owns and maintains the first segment extending from the Lakeshore area to the Sugarloaf area, the most populated areas around the lake. The Doney Creek and Charlie Creek bridges in this segment would also require relocation. USFS owns and maintains the segments that extend from the Sugarloaf area along Sugarloaf Creek Inlet. A total of 8,100 feet of Lakeshore Drive would require relocation. No segment of Lakeshore Drive would need to be closed during construction.

- Three road segments in the Turntable Bay area, northeast of the north end of the Pit River Bridge. These road segments are owned and maintained by USFS. The segments provide access to the Shasta Yacht Club. A total of 6,200 feet of roadway would require relocation. Given

the terrain along these segments, these roadways would need to be closed during construction.

- Silverthorn Road and segments of USFS roads in the Jones Valley area, on the south side of the Pit Arm of Shasta Lake. Owned and maintained by Shasta County, Silverthorn Road provides access to a residential area composed of permanent and seasonally occupied dwelling units. A total of 2,000 feet of roadway would be relocated. These roadways would need to be closed during construction.

- Up to 1,260 feet of Lower Salt Creek Road. Owned and maintained by Shasta County, Lower Salt Creek Road provides access to several residences and recreation areas in the Lower Salt Creek Shoreline area. This roadway would need to be closed during construction.

- Additional road segments in the primary study area totaling 230 linear feet. None of these road segments would need to be closed during construction.

- Two railroad bridges with realignment of the railroad tracks between the bridges. Both of the bridges would require modification.

- Relocation of McCloud River Bridge and Didallas Creek Bridge. Modification of Pit River Bridge and Fenders Ferry Bridge.

Potential impacts on access roads to and internal loop roads at campsites and other recreation facilities are evaluated in Chapter 18, “Recreation and Public Access.” Potential impacts from changes in Sacramento River flows due to water operations, that may affect transportation infrastructure (e.g., bridges), are described in Chapter 4, “Geology, Geomorphology, Minerals, and Soils” and Chapter 6, “Hydrology, Hydraulics, and Water Management.”

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Trans-1 (CP1): Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System Construction activities would temporarily increase traffic. This short-term, temporary impact would be potentially significant. In the long term, increased recreational opportunities and visitor days would result in additional traffic on area roadways; however, the long-term impact would be less than significant.

Existing traffic in the primary study area is generated by residents living and working in the area, living in the area and working elsewhere, and living elsewhere and working in the area; and by tourists who come to visit the dam, picnic, hike, camp, fish, and go boating. Because Shasta Lake is a tourist

destination, traffic is seasonally heavier from the middle of spring to the middle of fall (Reclamation 2004).

Project construction activities would require numerous truck trips to move materials to and from the project site, as well as trips in personal vehicles by construction crew members commuting to and from the site. Traffic would temporarily increase on roadways in the primary study area including I-5, Shasta Dam Boulevard, Lake Boulevard, Lakeshore Drive, and other roads during the CP1 construction period. Commute trips by construction workers would add vehicles to the road system during the a.m. and p.m. peak periods. Haul truck trips would increase traffic on designated haul routes during peak and off-peak hours.

Approximately 95 round-trip haul trips per day are anticipated for trucking materials to the dam site over a 4.5-year construction period. Approximately 75 round trips per day are anticipated for trucking materials cleared from the land over the same period. The total number of truck trips, 170 round trips per day, would not exceed the ITE threshold of 50 new truck trips in the a.m. and p.m. peak hours (i.e., 7–9 a.m. and 4–6 p.m.) because the truck trips would be distributed over an 8-hour workday; approximately 21 truck trips would occur during the peak-hour period. This impact would be less than significant.

Up to 300 round trips per day by workers are anticipated. Because various construction activities would occur concurrently, these truck trips would be distributed to multiple locations within the primary study area. However, the total number of worker trips may temporarily exceed the existing traffic loads and capacities on the roads where substantial numbers of workers are located at any one time. This impact would be potentially significant.

Traffic slowdowns may also result from temporary obstruction of roadway access because of lane closures or heavy equipment entering and exiting the road. Most construction would be phased to maintain access to existing roadways and bridges while constructing the relocated roadways and bridges; however, some construction would require lane closures. There would also likely be temporary traffic controls for transport of large material loads to and from the demolition, modification, and relocation sites. Lane closures and traffic slowdowns could occur on a number of roadways and bridges, and circulation patterns would change if detours were to be required during replacement of transportation facilities. Detours may add traffic that could exceed the capacity of the facility being relocated. This impact would be potentially significant.

In the long term, increased recreational opportunities and visitors would increase traffic on area roads by an estimated average of 158 one-way trips per day. These additional trips would be distributed throughout the primary study area to numerous recreational facilities: 6 public boat ramps, 9 commercial marinas, 15 family campgrounds, and various other public and private facilities.

These recreational facilities are distributed around Shasta Lake and can be accessed via numerous roadways. Because these trips would be distributed over a large number of roadways throughout a large area, the additional trips are not expected to exceed the existing traffic loads and capacities of the street system. Growth in the primary study area that is generated through implementation of city and county general plans would increase traffic in the area. The regional transportation planning documents identify roadway projects needed to accommodate expected traffic increases. Therefore, the long-term impact of traffic increases on area roads would be less than significant.

In summary, in the short term, construction activities under CP1 are expected to result in a potentially significant impact on traffic; but in the long term, the impact of traffic increases resulting from expected growth and additional recreational opportunities would be less than significant. Mitigation for this short-term impact is proposed in Section 20.3.5, "Mitigation Measures."

Impact Trans-2 (CP1): Adverse Effects on Access to Local Streets and Adjacent Uses in the Primary Study Area Relocation of transportation facilities would require either road closures and detours or partial road closures, or a combination of both. This temporary direct impact would be potentially significant. Indirect impacts on air quality, noise, and recreation resulting from extended travel lengths, increased traffic near sensitive land uses, and limiting or restricting access to recreational facilities are evaluated in the corresponding chapters of this EIS.

CP1 would raise the elevation and increase the surface acreage of Shasta Lake. Several existing roads and bridges at the lake would require relocation to avoid potential inundation as the elevation of the lake's full pool increases.

It is anticipated that most of the new roadway alignments or bridges would be constructed and connected to existing road facilities before demolition of the existing facilities in the proposed inundation area. In some cases, work in the road relocation areas may require a road closure with detours, lane closures, or a combination of both. Road closures would temporarily impede access to local connector roads and recreational land uses, affecting residents, local recreational and nonrecreational businesses, and visitors to Shasta Lake. This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

Detours and alternate routes resulting from road and bridge relocations could cause longer trip lengths and increase traffic in areas of sensitive land uses. The following potential indirect impacts are evaluated in the corresponding chapters of this EIS:

- Effects on air quality caused by extended trip lengths – Chapter 5, "Air Quality and Climate"

- Effects on sensitive receptors resulting from increased traffic on connector roads caused by detours – Chapter 8, "Noise and Vibration"

- Effects on recreation caused by restrictions to facility access – Chapter 18, "Recreation and Public Access"

Impact Trans-3 (CP1): Hazards in the Primary Study Area Caused by a Design Feature Relocated road segments and vehicular and railroad bridges would be designed to current engineering design standards. This impact would be beneficial.

Road segments, vehicular bridges, and railroad bridges must be designed to current engineering and seismic standards. Current engineering standards ensure that hazards are minimized to the extent practicable. Modernizing bridges to current design standards is a beneficial aspect of CP1. Because relocated road segments and vehicular bridges would be designed to current engineering design standards, design features would not increase hazards but would actually decrease the potential for hazards. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Trans-4 (CP1): Adverse Effects on Emergency Access in the Primary Study Area during Construction Road closures may result in increased response times for emergency vehicles. This direct impact would be potentially significant. Indirect impacts on air quality resulting from extended driving lengths, increased emergency vehicle response times, and potential noise impacts on sensitive receptors are discussed in the respective chapters of this EIS.

As discussed under Impact Trans-2 (CP1), temporary road closures and lane closures would be needed for construction of the relocated road alignments and bridges. Several schools are located near roadways that would be affected by construction, and it is expected that school bus routes could be affected by temporary road closures. Although no emergency response centers are in the immediate area affected by construction, road and lane closures may restrict emergency vehicle access. This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

The following potential indirect impacts are evaluated in the corresponding chapters of this EIS:

- Effects on air quality caused by extended trip lengths – Chapter 5, "Air Quality and Climate"

- Effects on sensitive receptors – Chapter 8, "Noise and Vibration"

- Effects of increased emergency vehicle response times – Chapter 22, "Public Services"

Impact Trans-5 (CP1): Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area during Construction Trucks used to import fill material and export construction waste would accelerate degradation of surface transportation facilities used as haul routes. This impact would be potentially significant.

As noted in the discussion of Impact Trans-1 (CP1), CP1 would generate approximately 170 round trips per day for the length of the 4.5-year construction period. Degradation of road surfaces would result in a significant impact if truck trips associated with the project would substantially shorten the life of the facility so that the owner of the right-of-way (ROW) would need to repair or rehabilitate the road surface before it is scheduled for repair. The significance determination is based on several factors, including the existing condition of road surfaces and the road's normal repair or rehabilitation schedule. Given the total number of anticipated trips and expected weight of the payloads, the impact of CP1 on existing road surfaces in relation to the anticipated utility of the road surfaces would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

Lower Sacramento River and Delta and CVP/SWP Service Areas No effects on traffic or transportation are expected to occur in the lower Sacramento River and Delta or in the CVP/SWP service areas; therefore, potential effects in those geographic regions are not discussed further in this EIS.

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

CP2 consists of raising Shasta Dam by 12.5 feet, which would result in a greater increase in the surface water elevation and acreage of inundation area than under CP1. A larger number of transportation facilities would be relocated under CP2 than under CP1. CP2 would have a 5-year construction period, compared to 4.5 years under CP1. As shown in Table 20-2 and Figures 20-1c, 20-1d, 20-1f, and 20-1g, the following transportation facilities would need to be relocated to accommodate construction under CP2:

- Two segments of Lakeshore Drive in addition to the 4 road segments that would be relocated under CP1, for a total of 6 segment relocations along Lakeshore Drive totaling 13,100 feet. As under CP1, no segment of Lakeshore Drive would need to be completely closed during construction.

- The same 3 road segments in the Turntable Bay area (with a total roadway length of 6,200 feet) that would require relocation under CP1. As under CP1, these roadways would need to be closed during construction.

- Three segments of Gillman Road that run along the west side of the McCloud Arm of Shasta Lake, totaling 1,200 feet. Owned and maintained by Shasta County, the road is used primarily by logging trucks. Gillman Road would need to be closed during construction.

- The same segments of Lower Salt Creek Road. Owned and maintained by Shasta County, Lower Salt Creek Road provides access to several residences and recreation areas in the Lower Salt Creek Shoreline area. As under CP1, this roadway would need to be closed during construction.

- The same segments of Silverthorn Road and other USFS roads in the Jones Valley area that would require relocation under CP1 (with a total roadway length of 2,000 feet). As under CP1, these roadways would need to be closed during construction.

- Four segments of Salt Creek Road that run along the west side of the Squaw Creek Arm of Shasta Lake, totaling 4,300 feet. Salt Creek Road is a dirt and gravel road owned and maintained by USFS. Its primary use is for USFS access. Didallas Creek Bridge crosses one of the segments and would also require relocation under CP2. Salt Creek Road would need to be closed during construction.

- An additional two road segments besides the two other road segments that would be relocated under CP1. The total length of the 4 roadway segments that would be relocated under CP2 is 2,300 feet. As under CP1, none of these road segments would need to be closed during construction.

- Two railroad bridges with realignment of the railroad tracks between the bridges. Both of the bridges would require modification.

- Relocation of McCloud River Bridge and Didallas Creek Bridge. Modification of Pit River Bridge and Fenders Ferry Bridge.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Trans-1 (CP2): Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System Construction activities would temporarily increase traffic. This short-term, temporary impact would be potentially significant. In the long term, increased recreational opportunities and visitor days would result in additional traffic on area roadways; however, the long-term impact would be less than significant.

This impact is similar to Impact Trans-1 (CP1), but the impact would be greater than under CP1, as described below.

Approximately 118 round-trip haul trips per day are anticipated for trucking materials to the dam site over a 5-year construction period. Approximately 56 round trips per day are anticipated for trucking materials cleared from the land over the same period. The total number of truck trips, 174 round trips per day, would not exceed the ITE threshold of 50 new truck trips because the trips would be distributed over an 8-hour workday; approximately 21 truck trips would occur in the a.m. and p.m. peak hours (i.e., 7–9 a.m. and 4–6 p.m.). This is the same number of daily truck trips as under CP1, but these trips would be borne on the transportation network for a longer duration than under CP1; therefore, the impact would be greater than under CP1. Because the ITE threshold would not be exceeded, this impact would be less than significant.

Up to 300 round trips per day by workers are anticipated over a 5-year period under CP2. Because various construction activities would occur concurrently, these truck trips would be distributed to multiple locations within the primary study area. However, the worker trips would occur over a longer construction period than under CP1; therefore, the impact would be greater than under CP1. This impact would be potentially significant.

As under CP1, traffic slowdowns also may result from temporary obstruction of roadway access because of lane closures or heavy equipment entering and exiting the road. Interference would occur over a longer period than under CP1; therefore, the impact would be greater than under CP1. This impact would be potentially significant.

In the long term, under CP2, traffic on roads within the primary study area would increase by an estimated average of 238 one-way trips per day, more than under CP1; however, for the same reasons as described in CP1, this impact would be less than significant.

In summary, in the short term, construction activities under CP2 are expected to result in a potentially significant impact on traffic that would be greater than under CP1; but in the long term, the impact of traffic increases resulting from expected growth and additional recreational opportunities would be less than significant. Mitigation for this short-term impact is proposed in Section 20.3.5, “Mitigation Measures.”

Impact Trans-2 (CP2): Adverse Effects on Access to Local Streets and Adjacent Uses in the Primary Study Area Relocation of transportation facilities would require either road closures and detours or partial road closures, or a combination of both. This temporary direct impact would be potentially significant. Indirect impacts on air quality, noise, and recreation resulting from extended travel lengths, increased traffic near sensitive land uses, and limiting or restricting access to recreational facilities are evaluated in the corresponding chapters of this EIS.

This impact would be similar to Impact Trans-2 (CP1); however, because CP2 would require that more roads be closed for a longer duration than under CP1, the impact would be greater than under CP1. This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures." Potential indirect effects are evaluated in Chapter 5, "Air Quality and Climate"; Chapter 8, "Noise and Vibration"; and Chapter 18, "Recreation and Public Access."

Impact Trans-3 (CP2): Hazards in the Primary Study Area Caused by a Design Feature Relocated road segments and vehicular and railroad bridges would be designed to current engineering design standards. This impact would be beneficial.

This impact would be similar to Impact Trans-3 (CP1); however, CP2 would result in a greater beneficial effect than CP1 because more bridges would be replaced and constructed using current design standards under CP2 than under CP1. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Trans-4 (CP2): Adverse Effects on Emergency Access in the Primary Study Area during Construction Road closures may result in increased response times for emergency vehicles. This direct impact would be potentially significant. Indirect impacts on air quality resulting from extended driving lengths, increased emergency vehicle response times, and potential noise impacts on sensitive receptors are discussed in the respective chapters of this EIS.

This impact would be similar to Impact Trans-4 (CP1). However, the construction period for CP2 would be 5 years, 6 months longer than the construction period for CP1. Because road closures under CP2 would occur for a longer period than under CP1, the impact would be greater under CP2 than under CP1. This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures." Potential indirect effects are evaluated in Chapter 5, "Air Quality and Climate"; Chapter 8, "Noise and Vibration"; and Chapter 22, "Public Services."

Impact Trans-5 (CP2): Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area Trucks used to import fill material and export construction waste would accelerate degradation of surface transportation facilities used as haul routes. This impact would be potentially significant.

This impact would be similar to Impact Trans-5 (CP1). As noted in the discussion of Impact Trans-1 (CP2), CP2 would generate approximately 174 round trips per day for the length of the 5-year construction period. This is similar to the number of round trips per day anticipated under CP1; however, because the construction period for CP2 would be longer than the construction

period for CP1, the impact on road surfaces would be greater under CP2 than under CP1. This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

Lower Sacramento River and Delta and CVP/SWP Service Areas
No effects on traffic or transportation are expected to occur in the lower Sacramento River and Delta or in the CVP/SWP service areas; therefore, potential effects in those geographic regions are not discussed further in this EIS.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival
CP3 consists of raising Shasta Dam by 18.5 feet, which would result in a greater increase in the surface water elevation and acreage of inundation area than would occur under CP1 or CP2. A larger number of transportation facilities would be relocated under CP3 than under CP1 and CP2. CP3 would have a 5-year construction period, compared to 4.5 years under CP1. As shown in Table 20-2 and Figures 20-1c, 20-1d, 20-1f, and 20-1g, the following transportation facilities would need to be relocated to accommodate construction under CP3:

- Two road segments of Lakeshore Drive in addition to the 6 road segments that would be relocated under CP2, for a total of 8 segment relocations along Lakeshore Drive totaling 13,700 feet. Doney Creek Bridge and Charlie Creek Bridge would be relocated. As under CP1 and CP2, no segment of Lakeshore Drive would need to be completely closed during construction.

- The same 3 segments in the Turntable Bay area (with a total roadway length of 6,200 feet) that would require relocation under CP1 and CP2. As under CP1 and CP2, these roadways would need to be closed during construction.

- The same three segments of Gillman Road that would require relocation under CP2. As under CP2, Gillman Road would need to be closed during construction.

- The same segments of Lower Salt Creek Road. Owned and maintained by Shasta County, Lower Salt Creek Road provides access to several residences and recreation areas in the Lower Salt Creek Shoreline area. As under CP1, this roadway would need to be closed during construction.

- An additional three road segments of Silverthorn Road and/or other USFS roads in the Jones Valley area besides the segments that would require relocation under CP1 and CP2. The total length of roadway that would be relocated under CP3 is 3,600 feet. As under CP1 and CP2, these roadways would need to be closed during construction.

- An additional road segment of Salt Creek Road that runs along the west side of the Squaw Creek Arm of Shasta Lake, besides the four roadway segments that would be relocated under CP2. The total length of roadways that would be relocated under CP3 is 5,100 feet. As under CP2, Salt Creek Road would need to be closed during construction.

- Three additional road segments besides the four other road segments that would be relocated under CP1 and CP2. The total length of the 7 roadway segments that would be relocated under CP3 is 3,900 feet. As under CP1 and CP2, none of these road segments would need to be closed during construction.

- Two railroad bridges with realignment of the railroad tracks between the bridges. Both of the bridges would require modification.

- Relocation of McCloud River Bridge and Didallas Creek Bridge. Modification of Pit River Bridge and Fenders Ferry Bridge.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Trans-1 (CP3): Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System Construction activities would temporarily increase traffic. This short-term, temporary impact would be potentially significant. In the long term, increased recreational opportunities and visitor days would result in additional traffic on area roadways; however, the long-term impact would be less than significant.

This impact would be similar to Impacts Trans-1 (CP1) and Trans-1 (CP2), but the impact would be greater than under CP1 or CP2, as described below.

Approximately 168 round-trip haul trips per day are anticipated for trucking materials to the dam site over a 5-year construction period. Approximately 52 round trips per day are anticipated for trucking materials cleared from the land over the same period. The total number of truck trips, 220 round trips per day, would not exceed the ITE threshold of 50 new truck trips because the trips would be distributed over an 8-hour workday; approximately 28 trips would occur during the a.m. and p.m. peak hours (i.e., 7–9 a.m. and 4–6 p.m.). This is a greater number of daily truck trips than under CP1 and CP2, and these daily truck trips would occur for a longer duration than under CP1; therefore, the impact would be greater under CP3 than under CP1 or CP2. Because the number of truck trips during the peak hours would not exceed the ITE threshold, this impact would be less than significant.

Up to 350 round trips per day by workers are anticipated over a 5-year period. Because various construction activities would occur concurrently, these truck trips would be distributed to multiple locations within the primary study area.

However, the total number of worker trips may temporarily exceed the existing traffic loads and capacities on the roads where substantial numbers of workers are located at any one time. The number of worker trips would be greater than under CP1 and CP2 and would occur over a longer construction period than under CP1; therefore, the impact would be greater than under CP1 or CP2. This impact would be potentially significant.

As under CP1 and CP2, traffic slowdowns may also result from temporary obstruction of roadway access because of lane closures or heavy equipment entering and exiting the road. Interference would occur over a longer period than under CP1 or CP2; therefore, the impact would be greater than under CP1 or CP2. This impact would be potentially significant.

In the long term, under CP3, traffic on roads within the primary study area would increase by an estimated average of 364 one-way trips per day, more than under either CP1 or CP2; however, for the same reasons as described in CP1, this impact would be less than significant.

In summary, in the short term, construction activities under CP3 are expected to result in a potentially significant direct impact on traffic that would be greater than under CP1 or CP2; however, the impact of traffic increases resulting from expected growth and additional recreational opportunities would be less than significant. Mitigation for this short-term impact is proposed in Section 20.3.5, "Mitigation Measures."

Impact Trans-2 (CP3): Adverse Effects on Access to Local Streets and Adjacent Uses in the Primary Study Area Relocation of transportation facilities would require either road closures and detours or partial road closures, or a combination of both. This temporary direct impact would be potentially significant. Indirect impacts on air quality, noise, and recreation resulting from extended travel lengths, increased traffic near sensitive land uses, and limiting or restricting access to recreational facilities are evaluated in the corresponding chapters of this EIS.

This impact would be similar to Impacts Trans-2 (CP1) and Trans-2 (CP2); however, because CP3 would require more roads to be closed for a longer duration than under CP1 and CP2, the impact would be greater than under CP1 or CP2. This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures." Potential indirect effects are evaluated in Chapter 5, "Air Quality and Climate"; Chapter 8, "Noise and Vibration"; and Chapter 18, "Recreation and Public Access."

Impact Trans-3 (CP3): Hazards in the Primary Study Area Caused by a Design Feature Relocated road segments and vehicular and railroad bridges would be designed to current engineering design standards. This impact would be beneficial.

This impact would be similar to Impacts Trans-3 (CP1) and Trans-3 (CP2); however, CP3 would result in a greater beneficial effect than CP1 or CP2 because more bridges would be replaced and constructed using current design standards under CP3 than under CP1 or CP2. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Trans-4 (CP3): Adverse Effects on Emergency Access in the Primary Study Area during Construction Road closures may result in increased response times for emergency vehicles. This direct impact would be potentially significant. Indirect impacts on air quality resulting from extended driving lengths, increased emergency vehicle response times, and potential noise impacts on sensitive receptors are discussed in the respective chapters of this EIS.

This impact would be the same as Impact Trans-4 (CP2). This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures." Potential indirect effects are evaluated in Chapter 5, "Air Quality and Climate;" Chapter 8, "Noise and Vibration;" and Chapter 22, "Public Services."

Impact Trans-5 (CP3): Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area Trucks used to import fill material and export construction waste would accelerate degradation of surface transportation facilities used as haul routes. This impact would be potentially significant.

This impact would be similar to Impacts Trans-5 (CP1) and Trans-5 (CP2). As noted in the discussion of Impact Trans-1 (CP3), CP3 would generate approximately 220 round trips per day for the length of the 5-year construction period. This is greater than the number of round trips per day anticipated under CP1 and CP2. In addition, the construction period for CP3 would be longer than the construction period for CP1. Therefore, the impact on road surfaces would be greater under CP3 than under CP1 or CP2. This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

Lower Sacramento River and Delta and CVP/SWP Service Areas No effects on traffic or transportation are expected to occur in the lower Sacramento and Delta area or in the CVP/SWP service areas; therefore, potential effects in those geographic regions are not discussed further in this EIS.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus

CP4 and CP4A consist of raising Shasta Dam by 18.5 feet. The same transportation facilities would be relocated under this alternative as under CP3. CP4 or CP4A would also have an approximately 5-year construction period like CP3, compared to 4.5 years under CP1.

In addition to constructing the dam raise and relocating transportation facilities described for CP3, CP4 and CP4A involve augmenting locations along the Sacramento River with gravel for spawning habitat. As noted previously, gravel augmentation would be conducted at up to 3 of the identified sites annually for a 10-year period, commencing with construction of CP4 or CP4A. The following analysis evaluates, as the maximum-intensity option, gravel augmentation at the three sites located the farthest from Redding where gravel is known to be available from commercial sources. All other combinations of gravel augmentation sites would have lesser impacts than the combination of sites evaluated herein.

In addition to the dam construction, relocation of transportation facilities, and gravel augmentation, CP4 and CP4A include the restoration of riparian, floodplain, and side channel habitat at up to six restoration sites on the upper Sacramento River. These proposed restoration sites are described in Chapter 2, "Alternatives." The sites under consideration for habitat restoration are shown in Figure 2-3.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Trans-1 (CP4 and CP4A): Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System Construction activities for CP4 or CP4A would temporarily increase traffic for CP4 or CP4A. This short-term, temporary impact would be potentially significant. In the long term, increased recreational opportunities and visitor days would result in additional traffic on area roadways; however, the long-term impact would be less than significant for CP4 or CP4A.

This impact for CP4 or CP4A would be similar to but greater than Impacts Trans-1 (CP1), Trans-1 (CP2), and Trans-1 (CP3) because additional haul trips would be required for construction, gravel augmentation, and habitat restoration. Approximately 175 round-trip haul trips per day are anticipated for trucking materials to the dam site over a 5-year construction period. Approximately 53 round trips per day are anticipated for trucking materials cleared from the land over the same period. The total number of truck trips, 228 round trips per day, would not exceed the ITE threshold of 50 new truck trips because the trips would be distributed over an 8-hour workday. Approximately 29 trips would occur during the a.m. and p.m. peak hours (i.e., 7–9 a.m. and 4–6 p.m.). This is a greater number of daily truck trips than under CP1, CP2, and CP3 and these daily truck trips would occur for a longer duration than under CP1; therefore, the impact would be greater than under CP1, CP2, and CP3 for CP4 or CP4A. Because the number of truck trips during the peak hours would not exceed the ITE threshold, this impact would be less than significant for CP4 or CP4A.

Using the Redding Riffle site as the maximum-intensity option in terms of haul truck trips affecting traffic for gravel augmentation, approximately 800 round trips would be made during the September and August construction term under CP4 or CP4A. This is based on placing 19,000 tons of gravel at the site and the capacity of the haul trucks being 25 tons per load. With a total of 44 8-hour workdays (2 months excluding weekends), the number of daily haul trips would be 18 haul trips per day. This would not exceed the ITE threshold of 50 new truck trips in the peak-hour period even if all of the truck trips occurred during the peak-hour period. Distributed over an 8-hour workday, two truck trips would occur during the a.m. peak-hour period and two truck trips would occur during the p.m. peak-hour period.

In addition to the haul trips for gravel augmentation, there would be haul trips for removing approximately 15,650 cubic yards of fill material from up to 6 restoration sites. Haul trucks can carry 14 cubic yards. Therefore, a total of approximately 1,118 haul trips would be required to remove the fill material. With a total of 44 8-hour workdays (2 months excluding weekends), the number of daily haul trips would be 25 haul trips per day. This would add approximately three truck trips in both the a.m. and p.m. peak-hour periods.

Combining the 3 truck trips during the peak-hour period resulting from removing the fill material from 1 or more of the restoration sites with gravel augmentation and the 18.5-foot Shasta Dam raise and related activities, approximately 37 peak-hour trips would occur. This is below the ITE threshold of 50 new truck trips during the a.m. and p.m. peak hours.

In the long term, under CP4 or CP4A, traffic on area roads would increase by an estimated average of 658 one-way trips per day. This is greater than under CP1, CP2, and CP3; however, for the same reasons as described in CP1, this impact would be less than significant for CP4 or CP4A.

In the short term, construction activities under CP4 or CP4A are expected to result in a potentially significant impact on traffic; but in the long term, for the same reasons as described in CP1, the impact of traffic increases resulting from expected growth and additional recreational opportunities would be less than significant.

Therefore, Impact Trans-1 would be less than significant for CP4. Mitigation for this short-term impact is proposed in Section 20.3.5, “Mitigation Measures.”

Therefore, Impact Trans-1 would be less than significant for CP4A. Mitigation for this short-term impact is proposed in Section 20.3.5, “Mitigation Measures.”

Impact Trans-2 (CP4 and CP4A): Adverse Effects on Access to Local Streets and Adjacent Uses in the Primary Study Area Relocation of transportation facilities for CP4 or CP4A would require either road closures and detours or partial road closures, or a combination of both. This temporary direct impact

would be potentially significant. Indirect impacts on air quality, noise, and recreation resulting from extended travel lengths, increased traffic near sensitive land uses, and limiting or restricting access to recreational facilities are evaluated in the corresponding chapters of this EIS.

The impact for CP4 or CP4A would be the same as Impacts Trans-2 (CP2) and Trans-2 (CP3) and similar to but greater than Impact Trans-2 (CP1) because the duration of project construction under CP4 or CP4A would be longer than under CP1. Potential indirect effects are evaluated in Chapter 5, "Air Quality and Climate"; Chapter 8, "Noise and Vibration"; and Chapter 18, "Recreation and Public Access."

This impact for CP4 would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

This impact for CP4A would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

Impact Trans-3 (CP4 and CP4A): Hazards in the Primary Study Area Caused by a Design Feature Relocated road segments and vehicular and railroad bridges would be designed to current engineering design standards for CP4 or CP4A. This impact would be beneficial for CP4 or CP4A.

The impact for CP4 or CP4A would be the same as Impact Trans-3 (CP3) and similar to Impacts Trans-3 (CP1) and Trans-3 (CP2); however, like CP3, CP4 or CP4A would result in a greater beneficial effect than CP1 and CP2 because more bridges would be replaced and constructed using current design standards under CP4 or CP4A than under CP1 or CP2.

This impact for CP4 would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

This impact for CP4A would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Trans-4 (CP4 or CP4A): Adverse Effects on Emergency Access in the Primary Study Area during Construction Road closures may result in increased response times for emergency vehicles. This direct impact would be potentially significant. Indirect impacts on air quality resulting from extended driving lengths, increased emergency vehicle response times, and potential noise impacts on sensitive receptors are discussed in the respective chapters of this EIS.

The impact for CP4 or CP4A would be the same as Impacts Trans-4 (CP2) and Trans-4 (CP3) and similar to Impact Trans-4 (CP1). For the same reasons as described under Impacts Trans-4 (CP2) and Trans-4 (CP3), the impact would be greater under CP4 or CP4A than under CP1. The potential indirect effects of

this impact are evaluated in Chapter 5, “Air Quality and Climate”; Chapter 8, “Noise and Vibration”; and Chapter 22, “Public Services.”

This impact for CP4 would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, “Mitigation Measures.”

This impact for CP4A would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, “Mitigation Measures.”

Impact Trans-5 (CP4 and CP4A): Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area Trucks used to import fill material and export construction waste would accelerate the degradation of surface transportation facilities used as haul routes. This impact would be potentially significant for CP4 or CP4A.

The impact for CP4 or CP4A would be similar to Impacts Trans-5 (CP1), Trans-5 (CP2), and Trans-5 (CP3), but would be greater because gravel augmentation would affect more roadways for a longer duration.

For the same reasons as described under Impact Trans-5 (CP3), the impact for CP4 would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, “Mitigation Measures.”

For the same reasons as described under Impact Trans-5 (CP3), the impact for CP4A would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, “Mitigation Measures.”

Lower Sacramento River and Delta and CVP/SWP Service Areas No effects on traffic or transportation are expected to occur in the lower Sacramento River and Delta or in the CVP/SWP service areas; therefore, potential effects in those geographic regions are not discussed further in this EIS.

CP5 – 18.5-Foot Dam Raise, Combination Plan

CP5 consists of raising Shasta Dam by 18.5 feet. The same transportation facilities would be relocated under this alternative as under CP3, CP4, CP4A, and CP5 would have an approximately 5-year construction period like CP2, CP3, CP4 and CP4A, compared to 4.5 years under CP1.

Like CP4 or CP4A, CP5 involves augmenting locations along the Sacramento River with gravel. The assumptions stated for CP4 and CP4A, gravel augmentation are the same for CP5.

Also like CP4 and CP4A, CP5 would include the restoration of riparian, floodplain, and side channel habitat at up to six restoration sites on the upper Sacramento River These proposed restoration sites are described in Chapter 2, “Alternatives.” The sites under consideration for habitat restoration are shown in Figure 2-3.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact Trans-1 (CP5): Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System Construction activities would temporarily increase traffic. This short-term, temporary impact would be potentially significant. In the long term, increased recreational opportunities and visitor days would result in an additional 311 one-way trips on area roadways, similar to CP3; however, for the same reasons as described in CP1, the long-term impact would be less than significant.

This impact would be similar to but greater than Impacts Trans-1 (CP1), Trans-1 (CP2), Trans-1 (CP3), and Trans-1 (CP4 and CP4A) because very limited additional construction-related trips associated with enhancements to shoreline and tributary aquatic habitat and recreational trails would be needed and 10 more workers per year than under CP4 or CP4A. For the same reasons as described under Impact Trans-1 (CP3) and Trans-1 (CP4 and CP4A), the impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, “Mitigation Measures.”

Impact Trans-2 (CP5): Adverse Effects on Access to Local Streets and Adjacent Uses in the Primary Study Area Relocation of transportation facilities would require either road closures and detours or partial road closures, or a combination of both. This temporary direct impact would be potentially significant. Indirect impacts on air quality, noise, and recreation resulting from extended travel lengths, increased traffic near sensitive land uses, and limiting or restricting access to recreational facilities are evaluated in the corresponding chapters of this EIS.

This impact would be the same as Impacts Trans-2 (CP2), Trans-2 (CP3), and Trans-2 (CP4 and CP4A), but greater than Impact Trans-2 (CP1) because the duration of project construction would be longer. This impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, “Mitigation Measures.” Potential indirect effects are evaluated in Chapter 5, “Air Quality and Climate”; Chapter 8, “Noise and Vibration”; and Chapter 18, “Recreation and Public Access.”

Impact Trans-3 (CP5): Hazards in the Primary Study Area Caused by a Design Feature Relocated road segments and vehicular and railroad bridges would be designed to current engineering design standards. This impact would be beneficial.

This impact would be the same as Impacts Trans-3 (CP3) and Trans-3 (CP4 and CP4A) and similar to Impacts Trans-3 (CP1) and Trans-3 (CP2); however, like CP3 and CP4, CP5 would result in a greater beneficial effect than CP1 and CP2 because more bridges would be replaced and constructed using current design

standards under CP5 than under CP1 or CP2. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Trans-4 (CP5): Adverse Effects on Emergency Access in the Primary Study Area during Construction Road closures may result in increased response times for emergency vehicles. This direct impact would be potentially significant. Indirect impacts on air quality resulting from extended driving lengths, increased emergency vehicle response times, and potential noise impacts on sensitive receptors are discussed in the respective chapters of this EIS.

This impact would be the same as Impacts Trans-4 (CP2), Trans-4 (CP3), and Trans-4 (CP4 and CP4A) and similar to Impact Trans-4 (CP1). For the same reasons as described under Impact Trans-4 (CP2), the impact would be greater under CP5 than under CP1 and would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

Impact Trans-5 (CP5): Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area Trucks used to import fill material and export construction waste would accelerate degradation of surface transportation facilities used as haul routes. This impact would be potentially significant.

This impact would be similar to Impact Trans-5 (CP4 and CP4A) and greater than Impacts Trans-5 (CP1), Trans-5 (CP2), and Trans-5 (CP3) because gravel augmentation would affect more roadways for a longer duration. For the same reasons as described under Impact Trans-5 (CP4 and CP4A), this impact would be potentially significant. Mitigation for this impact is proposed in Section 20.3.5, "Mitigation Measures."

Lower Sacramento River and Delta and CVP/SWP Service Areas No effects on traffic or transportation are expected to occur in the lower Sacramento River and Delta or the CVP/SWP service areas; therefore, potential effects in those geographic regions are not discussed further in this EIS.

20.3.5 Mitigation Measures

Table 20-3 presents a summary of mitigation measures for potentially significant and significant effects on transportation and traffic.

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 Impact Trans-3 (CP1). Mitigation is provided below for Impact Trans-1 (CP1), Impact Trans-2 (CP1), Impact Trans-4 (CP1), and Impact Trans-5 (CP1) on traffic and transportation. Impacts Trans-6 through Trans-10 are not applicable to CP1.

Table 20-3. Summary of Mitigation Measures for Transportation and Traffic

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Trans-1: Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	LOS before Mitigation	LTS	PS (short term), LTS (long term)	PS (short term), LTS (long term)	PS (short term), LTS (long term)	PS (short term), LTS (long term)	PS (short term), LTS (long term)
	Mitigation Measure	None required.	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Trans-2: Adverse Effects on Access to Local Streets or Adjacent Uses in the Primary Study Area	LOS before Mitigation	LTS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Trans-2: To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Trans-3: Hazards in the Primary Study Area Caused by a Design Feature	LOS before Mitigation	LTS	B	B	B	B	B
	Mitigation Measure	None required.	None needed; thus, none proposed				
	LOS after Mitigation	LTS	B	B	B	B	B
Impact Trans-4: Adverse Effects on Emergency Access in the Primary Study Area	LOS before Mitigation	LTS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Trans-4: To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS

Table 20-3. Summary of Mitigation Measures for Transportation and Traffic (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Trans-5: Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area	LOS before Mitigation	LTS	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Trans-5: Identify and Repair Roadway Segments Damaged by the Project.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Trans-6 (No-Action only): Temporary Increase in Traffic in the Extended Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	LOS before Mitigation	LTS	N/A	N/A	N/A	N/A	N/A
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	N/A	N/A	N/A	N/A	N/A
Impact Trans-7 (No-Action only): Adverse Effects on Access to Local Streets or Adjacent Uses in the Extended Study Area	LOS before Mitigation	LTS	N/A	N/A	N/A	N/A	N/A
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	N/A	N/A	N/A	N/A	N/A
Impact Trans-8 (No-Action only): Hazards in the Extended Study Area Caused by a Design Feature	LOS before Mitigation	LTS	N/A	N/A	N/A	N/A	N/A
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	N/A	N/A	N/A	N/A	N/A
Impact Trans-9 (No-Action only): Adverse Effects on Emergency Access in the Extended Study Area	LOS before Mitigation	LTS	N/A	N/A	N/A	N/A	N/A
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	N/A	N/A	N/A	N/A	N/A

Table 20-3. Summary of Mitigation Measures for Transportation and Traffic (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Trans-10 (No-Action only): Accelerated Degradation of Surface Transportation Facilities in the Extended Study Area	LOS before Mitigation	LTS	N/A	N/A	N/A	N/A	N/A
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	LTS	N/A	N/A	N/A	N/A	N/A

Key:
B = beneficial
CP = Comprehensive Plan
LOS = level of significance
LTS = less than significant
N/A = not applicable
PS = potentially significant

Mitigation Measure Trans-1 (CP1): Prepare and Implement a Traffic Control and Safety Assurance Plan Before construction starts, Reclamation and its primary contractors for engineering and construction will develop a coordinated construction traffic control plan to minimize the simultaneous use of roadways by different construction contractors for worker commute trips, material hauling, and equipment delivery to the extent feasible. The plan will outline phasing of activities and the use of multiple routes to and from off-site locations to minimize the daily amount of traffic on individual roadways. Reclamation will require that the construction contractors implement and enforce the plans throughout the construction periods. In addition, the plan will include the following elements:

- To the extent feasible, require construction contractors to limit truck trips to less than 50 trips per hour on any affected roadway during the morning and afternoon or evening peak-hour periods.
- To the extent feasible, limit the construction work zone to a width that, at a minimum, maintains alternate one-way traffic flow past the construction zone.
- Provide flagger control at construction zones to manage traffic control and flows as necessary.
- Install temporary steel-plate trench crossings, as needed, to maintain reasonable traffic, bicycle, and pedestrian access to homes, businesses, and streets.
- Maintain access for emergency vehicles at all times. Provide advance notification to local law enforcement, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on local roadways.
- Post advance warning of construction activities (for any affected roadways that would be closed or major roadways where lane closures would occur) in the local newspaper(s) and/or coordinate with the local jurisdictions to post such warnings in highly visible locations near the affected roadways.
- Post advance warnings about the potential presence of slow-moving vehicles in construction zones, where needed to reduce potential traffic hazards.
- Place and maintain barriers and install traffic control devices necessary for safety, as specified in Caltrans's *Manual of Traffic Controls for Construction and Maintenance Work Zones* and in accordance with the guidance provided by the affected local jurisdictions.

- Limit the accumulation of project-generated mud or dirt on roadways adjacent to construction areas. The construction contractor will sweep the affected paved roadways (water sweeper with reclaimed water recommended) at the end of each day if substantial volumes of soil material have been carried onto adjacent paved, public roads from construction sites.

- Train construction personnel in appropriate safety measures as described in the plan.

Reclamation will also inform the community at a public hearing about the potential traffic delays and the preparation of the traffic control plan.

Implementation of this mitigation measure would reduce Impact Trans-1 (CP1) to a less-than-significant level.

Mitigation Measure Trans-2 (CP1): To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1 (CP1) Reclamation will implement Mitigation Measure Trans-1 (CP1) as described above to reduce adverse effects of road closures and detours or partial road closures on access to local streets and adjacent uses.

Implementation of this mitigation measure would reduce Impact Trans-2 (CP1) to a less-than-significant level.

Mitigation Measure Trans-4 (CP1): To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1 (CP1) Reclamation will implement Mitigation Measure Trans-1 (CP1) as described above to reduce adverse effects of road closures on access by emergency vehicles.

Implementation of this mitigation measure would reduce Impact Trans-4 (CP1) to a less-than-significant level.

Mitigation Measure Trans-5 (CP1): Identify and Repair Roadway Segments Damaged by the Project The performance standard is to return roadway segments damaged by the project to pre-project conditions. The following measures will be implemented to require that Reclamation provide for the repair of roadways that are degraded as a result of hauling:

- The contractor(s) responsible to Reclamation for delivery of borrow material shall identify all proposed haul routes on a map. The map will identify the owner of the ROWs that are proposed for use as haul routes. The contractor(s) will also prepare a pre-project condition report of the roadway segments to document the roadway conditions before construction.

- The contractor(s) shall notify the owner of the ROW in writing and request conditional approval to use the ROW as a haul route. The

contractor(s) shall submit a copy of the written request to Reclamation for Reclamation's file.

- The contractor(s) shall implement the conditions of approval for use of the haul route ROW. Conditions may include constructing repairs to damaged lengths of roadway. Before commencement of hauling activities, the contractor(s) shall submit a copy of the ROW owner's conditional approval to Reclamation for Reclamation's file.

- Within 90 days after hauling activities are completed (that is the haul route is no longer in use for the project term), the contractor(s) shall submit a project close-out report to Reclamation to document compliance with the conditions of approval. Reclamation will keep the project close-out report on file.

Implementation of this mitigation measure would reduce Impact Trans-5 (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 Impact Trans-3 (CP2). Mitigation is provided below for Impact Trans-1 (CP2), Impact Trans-2 (CP2), Impact Trans-4 (CP2), and Impact Trans-5 (CP2) on traffic and transportation. Impacts Trans-6 through Trans-10 are not applicable to CP2.

Mitigation Measure Trans-1 (CP2): Prepare and Implement a Traffic Control and Safety Assurance Plan This mitigation measure is identical to Mitigation Measure Trans-1 (CP1). Implementation of this mitigation measure would reduce Impact Trans-1 (CP2) to a less-than-significant level.

Mitigation Measure Trans-2 (CP2): To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1 (CP1) This mitigation measure is identical to Mitigation Measure Trans-2 (CP1). Implementation of this mitigation measure would reduce Impact Trans-2 (CP2) to a less-than-significant level.

Mitigation Measure Trans-4 (CP2): To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1 (CP1) This mitigation measure is identical to Mitigation Measure Trans-4 (CP1). Implementation of this mitigation measure would reduce Impact Trans-4 (CP2) to a less-than-significant level.

Mitigation Measure Trans-5 (CP2): Identify and Repair Roadway Segments Damaged by the Project This mitigation measure is identical to Mitigation Measure Trans-5 (CP1). Implementation of this mitigation measure would reduce Impact Trans-5 (CP2) to a less-than-significant level.

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

No mitigation is required for Impact Trans-3 (CP3). Mitigation is provided below for Impact Trans-1 (CP3), Impact Trans-2 (CP3), Impact Trans-4 (CP3), and Impact Trans-5 (CP3) on traffic and transportation. Impacts Trans-6 through Trans-10 are not applicable to CP3.

Mitigation Measure Trans-1 (CP3): Prepare and Implement a Traffic Control and Safety Assurance Plan This mitigation measure is identical to Mitigation Measure Trans-1 (CP1). Implementation of this mitigation measure would reduce Impact Trans-1 (CP3) to a less-than-significant level.

Mitigation Measure Trans-2 (CP3): To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1 (CP1) This mitigation measure is identical to Mitigation Measure Trans-2 (CP1). Implementation of this mitigation measure would reduce Impact Trans-2 (CP3) to a less-than-significant level.

Mitigation Measure Trans-4 (CP3): To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1 (CP1) This mitigation measure is identical to Mitigation Measure Trans-4 (CP1). Implementation of this mitigation measure would reduce Impact Trans-4 (CP3) to a less-than-significant level.

Mitigation Measure Trans-5 (CP3): Identify and Repair Roadway Segments Damaged by the Project This mitigation measure is identical to Mitigation Measure Trans-5 (CP1). Implementation of this mitigation measure would reduce Impact Trans-5 (CP3) to a less-than-significant level.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus

No mitigation is required for Impact Trans-3 (CP4 and CP4A). Mitigation is provided below for Impact Trans-1 (CP4 and CP4A), Impact Trans-2 (CP4 and CP4A), Impact Trans-4 (CP4 and CP4A), and Impact Trans-5 (CP4 and CP4A) on traffic and transportation. Impacts Trans-6 through Trans-10 are not applicable to CP4 or CP4A.

Mitigation Measure Trans-1 (CP4 and CP4A): Prepare and Implement a Traffic Control and Safety Assurance Plan This mitigation measure is identical to Mitigation Measure Trans-1 (CP1). Implementation of this mitigation measure would reduce Impact Trans-1 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Trans-2 (CP4 and CP4A): To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1 (CP1) This mitigation measure is identical to Mitigation Measure Trans-2 (CP1). Implementation of this mitigation measure would reduce Impact Trans-2 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Trans-4 (CP4 and CP4A): To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1 (CP1) This mitigation measure is identical to Mitigation Measure Trans-4 (CP1). Implementation of this mitigation measure would reduce Impact Trans-4 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Trans-5 (CP4 and CP4A): Identify and Repair Roadway Segments Damaged by the Project This mitigation measure is identical to Mitigation Measure Trans-5 (CP1). Implementation of this mitigation measure would reduce Impact Trans-5 (CP4 and CP4A) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is required for Impact Trans-3 (CP5). Mitigation is provided below for Impact Trans-1 (CP5), Impact Trans-2 (CP5), Impact Trans-4 (CP5), and Impact Trans-5 (CP5) on traffic and transportation. Impacts Trans-6 through Trans-10 are not applicable to CP5.

Mitigation Measure Trans-1 (CP5): Prepare and Implement a Traffic Control and Safety Assurance Plan This mitigation measure is identical to Mitigation Measure Trans-1 (CP1). Implementation of this mitigation measure would reduce Impact Trans-1 (CP5) to a less-than-significant level.

Mitigation Measure Trans-2 (CP5): To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1 (CP1) This mitigation measure is identical to Mitigation Measure Trans-2 (CP1). Implementation of this mitigation measure would reduce Impact Trans-2 (CP5) to a less-than-significant level.

Mitigation Measure Trans-4 (CP5): To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1 (CP1) This mitigation measure is identical to Mitigation Measure Trans-4 (CP1). Implementation of this mitigation measure would reduce Impact Trans-4 (CP5) to a less-than-significant level.

Mitigation Measure Trans-5 (CP5): Identify and Repair Roadway Segments Damaged by the Project This mitigation measure is identical to Mitigation Measure Trans-5 (CP1). Implementation of this mitigation measure would reduce Impact Trans-5 (CP5) to a less-than-significant level.

20.3.6 Cumulative Effects

Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences,” discusses overall cumulative impacts methodology related to the action alternatives, including the relationship to the CALFED Bay-Delta Program Programmatic EIS/EIR cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria. Table 3-1, “Present and Reasonably

Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the present and reasonably foreseeable future projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 under Quantitative Analysis would have effects on transportation in the primary study area or have effects in extended study area that contribute to cumulative impacts of the action alternatives since no impacts have been identified in the extended study area. This analysis is based on the projects listed in Table 3-1 under Qualitative Analysis.

The majority of the past, present, and reasonably foreseeable projects are related to the SLWRI through operations of Shasta Dam. The projects in the extended study area are not evaluated further because construction of the SLWRI would not affect transportation facilities in the extended study area. Projects that could influence the local transportation network affected by the SLWRI include implementation of the *Shasta-Trinity National Forest Land and Resource Management Plan, Iron Mountain Mine Restoration Plan, and Mendocino National Forest Land and Resource Management Plan*; and construction of the Antlers Bridge Replacement. The geographic scope of the management plans is vast while the geographic scope of the Antlers Bridge Replacement is relatively limited. Individually and combined, none of these projects would result in significant haul trips that would occur during the peak-hour period. The ITE threshold of 50 trips during the peak-hour period on any particular route is not expected because the actions would be distributed throughout a substantially large study area compared to the area affected by the SLWRI. Another reason that the ITE threshold would not be exceeded is that the forest and mine management and restoration actions would take place over a long period and the Antlers Bridge Replacement would be completed in 2014. Consequently, no significant cumulative adverse effect on transportation or traffic presently exists or would exist under the No-Action Alternative in the primary study area.

Potential impacts of the project alternatives (CP1–CP5) are related to construction activities and increased vehicle trips resulting from increased recreational opportunities at Shasta Lake and its tributaries. Construction impacts would be temporary and short term, and recreational vehicle trips would be permanent and long term.

For the following reasons, implementation of any of the project alternatives (CP1–CP5), when combined with construction traffic for present and reasonably foreseeable actions, would not result in a cumulatively considerable incremental contribution to a significant cumulative adverse effect on localized traffic and circulation. Under CP5, the maximum-intensity alternative, approximately 12 truck trips would be added to the a.m. and p.m. peak hours. These truck trips would not occur simultaneously on the haul routes. They would be distributed

throughout the shoreline region of the lake, gravel augmentation sites (the sites that would change annually), and up to six restoration sites on the Sacramento River. The truck trips for the gravel augmentation and restoration activities would occur during a 2-month period, while the eight peak-hour trips upstream from Shasta Dam would occur over a much longer portion of the construction year. To result in a significant cumulative adverse effect on traffic and circulation, the present reasonably foreseeable future projects would need to generate 38 trips during the a.m. or p.m. peak hour. Because of the large geographic scope and length of time for implementing the present and reasonably foreseeable future projects, it is reasonable that they would not generate peak-hour truck trips that would be 68 percent more than the peak-hour truck trips that would be generated by CP5. Furthermore, the cumulative peak-hour truck trips would not be concentrated at any one road segment or intersection.

For the reasons set forth for adverse effects of construction traffic on localized traffic and circulation problems, construction traffic under any of the project alternatives (CP1–CP5) would not result in a cumulatively considerable incremental contribution to a significant cumulative adverse effect on emergency access.

For potential accelerated degradation of roadways from construction traffic, none of the construction alternatives (CP1–CP5) would result in cumulatively adverse effects. The reason is that the mitigation measure for these alternatives requires physical repair of damaged roadways to pre-project conditions, thereby eliminating the adverse effects of the alternatives. Implementation of Mitigation Measure Trans-5 (CP1) would ensure that the roadways would be equal to or in better condition than under preproject conditions. In addition, roads and bridges that would be relocated under any of the project alternatives would be modernized using current design standards and would likely be replaced before they were scheduled for replacement by the local transportation agencies.

In conclusion, with implementation of any of the project alternatives (CP1–CP5), no significant cumulative adverse effects would occur on traffic and circulation, emergency access, or transportation facilities.

Chapter 21
Utilities and Service Systems

21.1 Affected Environment

This chapter describes the affected environment related to utilities and service systems for the dam and reservoir modifications proposed under SLWRI action alternatives.

Because of the potential influence of the proposed modification of Shasta Dam, and subsequent water deliveries over a large geographic area, the SLWRI includes both a primary and an extended study area. The primary area has been further divided into Shasta Lake and vicinity and upper Sacramento River (Shasta Dam to Red Bluff). The extended study area has been further divided into the lower Sacramento River and Delta and the CVP/SWP service areas.

The utilities and service systems addressed are water supply in the Shasta Lake and vicinity portion of the primary study area, wastewater infrastructure, stormwater drainage and infrastructure, solid waste management, electrical service and infrastructure, natural gas service and infrastructure, and telecommunications infrastructure. Hydropower generation, public services (e.g., fire protection law enforcement, emergency services), roadways and bridges, and recreation are addressed in separate chapters.

The utilities and service systems setting for the Shasta Lake and vicinity portion of the primary study area consists of the portion of Shasta County above Shasta Dam and includes the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). Utilities and service systems are influenced by rugged, mountainous terrain; lakeside communities; and Shasta Lake. The utilities and service systems setting for the upper Sacramento River portion of the primary study area consists of Shasta County below Shasta Dam and Tehama County. Two incorporated cities, Redding and Red Bluff, necessitate urban utilities and service systems needs in the otherwise rural upper Sacramento Valley, which is characterized by rolling hills with mountains to the north, east, and west.

The utilities and service systems setting for the extended study area consists of 21 counties downstream from the Red Bluff Pumping Plant and encompasses all areas served by the CVP and the SWP. A discussion of project impacts on CVP/SWP water supply and overall CVP and SWP management and operations is provided in the EIS, Chapter 6, “Hydrology, Hydraulics, and Water Management,” and in the *Hydrology, Hydraulics, and Water Management Technical Report*.

21.1.1 Water Supply

Shasta Lake and Vicinity

Water supplies for the Shasta Lake and vicinity portion of the primary study area are provided in one of three ways: by a community service area (CSA) run by Shasta County, by a mutual water company, or by an individual or group well. CSA #2 provides water for the Sugarloaf community, and CSA #6 provides water for the Silverthorn community. Fifteen mutual water companies serve the Shasta Lake and vicinity portion of the primary study area. Mutual water companies are cooperative or mutual associations that furnish water to resorts and other developments (Reclamation 2007) (Figure 21-1).

Upper Sacramento River (Shasta Dam to Red Bluff)

Provided below are descriptions of each entity in Shasta County that currently relies on Reclamation to provide a portion of its water supply and the associated Shasta and Trinity River diversions and facilities. This information was taken from the *Final Environmental Assessment for the Long-Term Contract Renewal Shasta and Trinity River Divisions* (Reclamation 2005).

City of Redding (Sacramento River, Spring Creek, Toyon) Before 1941, water service for the City of Redding was provided by the California Water Service Company, which had water rights to the Sacramento River dating from 1886. The City of Redding acquired the local facilities and water rights of the company in 1941 and filed for an additional appropriative water right of 5 cubic feet per second in 1944. Subsequent annexations to the City of Redding's service area consist of the Buckeye County Water District, the Cascade Community Services District, and the Enterprise Public Utility District in 1967, 1976, and 1977, respectively.

The Buckeye zone service area includes two City of Redding pressure zones: Buckeye and Summit City. Approximately half of the Buckeye zone is located within the Redding city limits, and the other half is in an unincorporated area of Shasta County. Approximately one-quarter of the Summit City zone is in an unincorporated area of Shasta County, and three-quarters is in the City of Shasta Lake. The City of Redding currently receives water to its Buckeye zone under a long-term CVP contract with Reclamation (the water comes from Whiskeytown Lake via the Spring Creek tunnel). There are no known groundwater resources within the Buckeye zone service area. During peak-demand periods, supplemental water is pumped from the Sacramento River, then treated and delivered into the Buckeye zone service area. The municipal and industrial (M&I) connections in the Summit City zone are supplied exclusively by water diverted from Shasta Lake via the Toyon pipeline. The water is treated by the City of Shasta Lake and delivered to the Summit City zone.

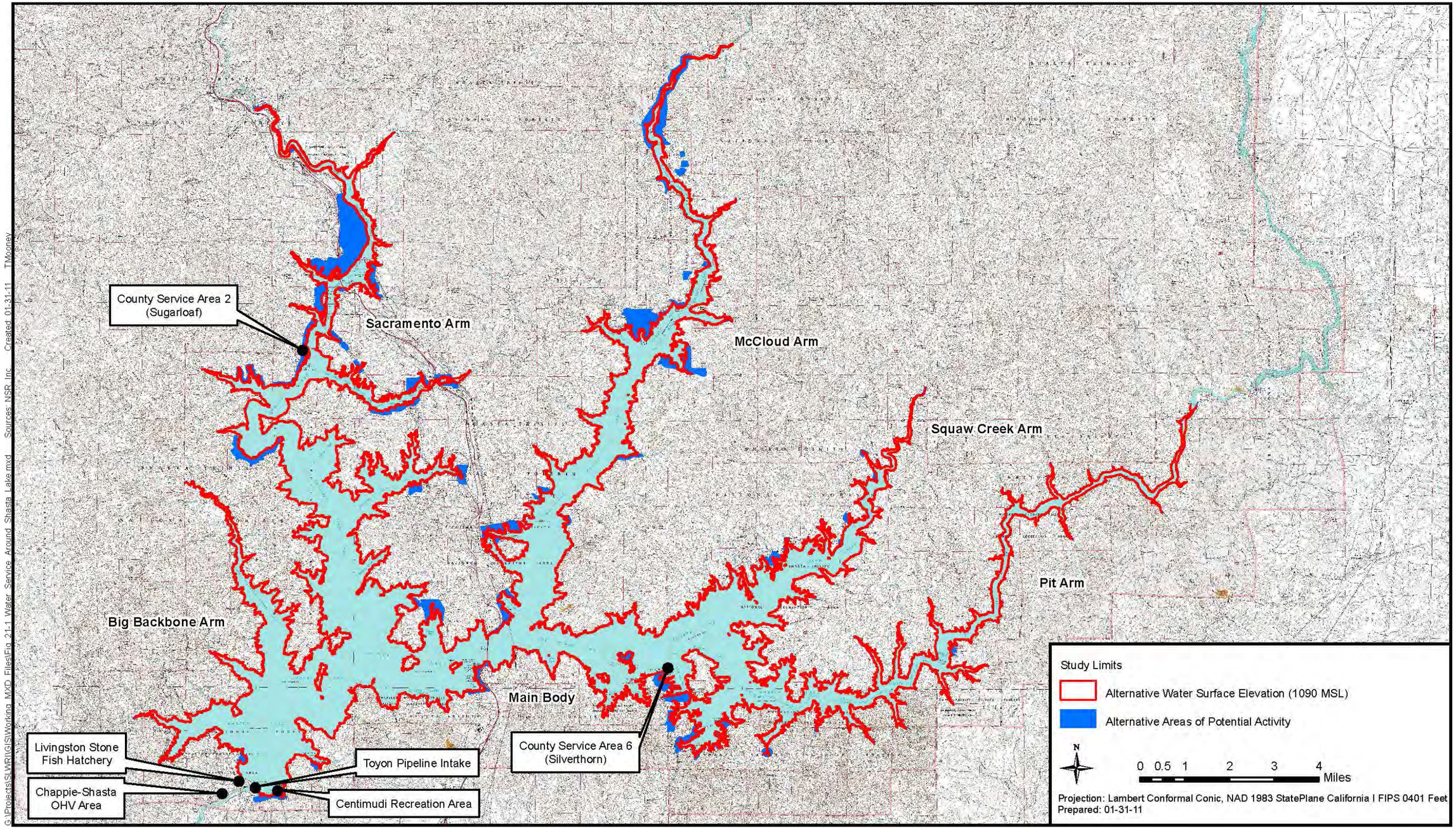

Figure 21-1. Water Service Around Shasta Lake

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The City of Redding has one additional water contract with Reclamation. Redding's 1966 Settlement Contract with Reclamation specifies a base supply and a project water supply. In 2003, the maximum base supply was set at 17,850 acre-feet per year, and the project water supply was set at 3,150 acre-feet per year; since 1995, project water supply entitlements have been increased by 45 acre-feet annually.

Redding's surface-water supply comes from the Sacramento River and Whiskeytown Lake. Sacramento River water is treated at the Foothill Water Treatment Plant (24 million gallons per day (mgd)), and Whiskeytown Lake water is treated at the 7-mgd Buckeye Water Treatment Plant. Redding supplements its surface-water supply with well production capacity from the Redding groundwater basin primarily during peak-demand periods. Currently, 14 wells are operational, providing a total capacity of up to 12 mgd.

Redding provides CVP and non-CVP water service to about 24,709 connections. Connections provide water primarily for M&I uses and a small number of agricultural uses. The city administers 4,179 connections in the Buckeye zone and 58 M&I connections in the Summit City zone.

City of Shasta Lake Water for the City of Shasta Lake comes from Shasta Lake via a pump station at Shasta Dam that has a maximum diversion of 9.3 mgd. Water is pumped from an intake in the face of Shasta Dam through the Toyon pipeline to a storage/treatment facility immediately east of the Shasta Dam compound. From there it is delivered to the City of Shasta Lake (Figure 21-1). An interim contract with Reclamation (Contract No. 4-7-20-W1134-IR10) provides an allocation of 4,400 acre-feet per year from this source. Reclaimed water is also available for industrial and landscaping use. Groundwater use is limited because of low aquifer yields.

Before incorporation, the community water supply and utility services were provided by the Shasta Dam Area Public Utilities District (PUD), which was formed in 1945 to provide a reliable water supply for an area of 3.5 square miles. Originally, the PUD service area was a residential area established to house workers who were constructing Shasta Dam. Reclamation constructed the Toyon pipeline to transport water from Shasta Lake to the PUD in 1948, and the PUD concurrently constructed water storage and distribution systems. The Summit City PUD was annexed in 1978. Before annexation, water was supplied by a series of wells with low and unreliable yields.

The City of Shasta Lake provides water service to 3,800 connections for primarily urban and residential uses, although industrial use has increased over the past decade. The City of Shasta Lake also provides water service to Reclamation's Northern California Area Office.

Bella Vista Water District The Bella Vista Water District (BVWD) is a publicly owned water agency formed in 1957 to serve agricultural irrigation

demands (California Water Code Division 13, Sections 34000–38501). The BVWD service area is located generally east of Redding and south of Shasta Lake. The service area includes the rural communities of Bella Vista and Palo Cedro.

BVWD's primary water source is the Sacramento River. The BVWD supply system consists of the Wintu Pump Station on the Sacramento River and five wells. Water pumped from the river is treated at the district's treatment plant, which provides inline filtration. Distribution facilities include a network of transmission and distribution pipelines, three storage tanks, nine booster pump stations, and pressure-reducing facilities. The major distribution piping was initially constructed by Reclamation but has been expanded over time. The main supply system is still Federally owned, but it was constructed solely for use by BVWD. Both domestic and agricultural users are served through the same distribution system, so all water is treated to meet the higher water quality standards for domestic use. The CVP water that BVWD purchases from the Shasta County Water Agency (SCWA) is described below.

BVWD's original contract allows for up to 24,000 acre-feet per year, which is supplemented with 578 acre-feet per year of CVP water purchased through SCWA. Both of these allotments are subject to reduction during dry years. In the severe drought years of 1991 and 1992, water supplies for M&I were reduced by 25 percent and water for agricultural uses was reduced by 75 percent. Available surface water was supplemented with groundwater from wells located near the southern boundary of the district. These reductions in supply caused severe drought restrictions to be imposed, which have had a continuing impact on district water sales. The supplementary water provided by the wells constitutes about 10 percent of the supply normally available from the Sacramento River and about 15–20 percent of the reduced supply during a severe drought year. The aquifers in the district have limited yield, so it is not practical to greatly increase the production of wells in the district.

Agricultural and irrigation still represent 70–80 percent of the district's water demand. However, most of the service connections are now either domestic or rural residential. BVWD currently has 4,538 residential connections and 615 agricultural connections. Urban uses predominate in the southeast portion of the district where sewage disposal facilities are available. Residential uses, with lot sizes between 1 and 5 acres, are dispersed across the rest of the district. Agricultural uses are almost exclusively confined to the fertile soil along Stillwater Creek and Cow Creek. Pasture represents the bulk of agricultural use, although there is a broad range of other crops.

Centerville Community Services District The Centerville Community Services District (CCSD) was originally formed in September 1959 to supply water for domestic use, irrigation, sanitation, industrial use, fire protection, and recreation (California Government Code, Division 3, Community Services Districts, Section 61000 et seq.). The CCSD service boundary encompasses

11,278 acres in the unincorporated area of Shasta County immediately west of Redding.

The source of the district's water supply is Whiskeytown Lake, a key feature of the Trinity River Division of the CVP. This reservoir covers about 3,250 acres at maximum capacity and provides water storage of about 241 thousand acre-feet. The reservoir regulates the flows of the Clear Creek watershed and the imported flows from the Trinity River, which discharge through the Carr Powerhouse into the reservoir.

Designed and constructed by Reclamation, the district's water system dates back to 1967. Water is diverted to the district through 2 intakes in Whiskeytown Dam, 1 at an elevation of 1,110 feet and the other at an elevation of 965 feet. The ability to select the depth of the diverted water gives CCSD the capacity to draw less turbid water. The water is treated at a 30-mgd-capacity plant located at the base of Whiskeytown Dam. CCSD shares the inline treatment facility with the Clear Creek Community Services District (CCCSD).

Treated water is distributed to the district through an aqueduct that begins at Whiskeytown Dam and terminates at a 250,000-gallon control tank about 8.5 miles south of the dam. This aqueduct, commonly called the Muletown Aqueduct (also Muletown Conduit), consists of about 27,500 feet of 45-inch pipe and 17,400 feet of 42-inch pipe buried along Muletown Road, paralleling Clear Creek. The steel pipe, lined and coated in coal tar, was installed in 1965.

CCSD has a contract with CCCSD that allocates CCSD a 25 percent share of the capacity. CCSD holds 2 contracts with Reclamation for a total allocation of 3,800 acre-feet per year. The first contract, entered into on April 11, 2001, is an assignment contract. This contract permanently assigned 2,900 acre-feet per year of CVP water from SCWA's 5,000 acre-feet per year contract with Reclamation. This contract carries with it those terms and conditions defined in SCWA's contract, which also includes a binding agreement for early renewal. The second contract, entered into on August 11, 2000, is an exchange contract. This contract with Reclamation for 900 acre-feet per year was intended to provide CCSD with substitute project water for its pre-1914 water rights on Clear Creek. The district does not have access to a groundwater supply source.

CCSD currently provides M&I water to 1,125 metered connections that serve a population of approximately 2,850.

Clear Creek Community Services District CCCSD was formed in 1961 and encompasses about 14,314 acres. The facilities were designed and constructed by Reclamation, and CCCSD began operating in 1967. CCCSD is located approximately 10 miles southwest of Redding and 6 miles west of Anderson in southern Shasta County. The district's service area includes the rural areas known as Olinda and Cloverdale. The general area served by the district is commonly known as Happy Valley.

The source and treatment of CCCSD water is the same as those of CCSD water; water from Whiskeytown Lake is treated and diverted to service connections via the Muletown Aqueduct. The distribution system within the district's boundaries consists of approximately 75 miles of pipe ranging in size from 2 inches to 45 inches. Title to the distribution line system was transferred to CCCSD on May 29, 2001.

CCCSD has 1 storage tank along the aqueduct with a capacity of 1 million gallons. A control tank with a 250,000-gallon capacity regulates pressure at the upper elevation of the district. A 32,000-gallon storage tank is located outside of the district boundary at the booster station facility.

The district has developed the first of 3 planned wells, and it has installed 13,800 feet of 18-inch pipeline to connect a groundwater supply to the distribution system. The first well attached to the distribution system (Well #1) became operational in October 1992. Well #1 and the two proposed wells are intended for use only when surface supplies are inadequate to meet emergency demands.

CCCSD currently provides service for approximately 5,817 acres of irrigated agricultural land and approximately 4,000 acres of rural residences receiving M&I water. Approximately 4,497 acres in the district are undeveloped. The majority of the developed agricultural property in the district is ditch or flood irrigated. The balance of irrigation is done by overhead and drip systems.

Shasta Community Services District The Shasta Community Services District (SCSD), located west of Redding, was formed in 1959 to supply water for domestic use and fire protection for the area generally referred to as Old Shasta (Community Services District Laws: California Government Code, Sections 61000–61934). Congress authorized a water system for the area as part of the Trinity River Division of the CVP. Bonds that were issued by SCSD to finance construction of the transmission and distribution systems have been repaid.

A long-term CVP water service contract provides up to 1,000 acre-feet annually. Water is supplied by gravity from Whiskeytown Lake via a turnout on the Spring Creek conduit. The Spring Creek conduit is the only source of supply, and there are only 0.30 million gallons of storage located near the source. Downstream from the turnout, a single transmission main serves as the backbone of the distribution system and most mains are not looped. Historically, SCSD has been vulnerable to disruptions in supply from its Reclamation contract. During the 1991 drought, Reclamation reduced SCSD's allotment by 25 percent to 750 acre-feet per year.

The district currently serves 630 connections. Virtually all of the active land use is residential or municipal, consisting primarily of ranchettes. Wells are not feasible because the district does not lie over an aquifer.

Shasta County Water Agency SCWA was formed in 1957 to develop water resources for Shasta County (Shasta County Water Agency Act (Legislative Act 7580)). SCWA evolved from the Shasta County Department of Water Resources, which organized Shasta County efforts in conjunction with the Trinity River Division of the CVP.

SCWA has assisted with the creation of BVWD, CCSD, CCCSD, and SCSD and helped create CSAs for water and sewer services in Shasta County. The agency also acts as staff to the Redding Area Water Council, a group that works to preserve the quality and quantity of water in the Redding groundwater basin. Funding for SCWA comes from Shasta County property taxes.

Other Shasta and Trinity River Divisions CVP Contractors Three smaller water districts (see below) are served by either the Shasta or Trinity River division of the CVP. The three districts constitute about 1 percent of the CVP long-term contract water supply to the divisions.

Keswick County Service Area The Keswick County Service Area (KCSA), located west of Redding, was formed in 1990 (California Government Code, Sections 25210.1–25250). Previously, KCSA operated as the Keswick Community Services District, which was formed in the early 1960s to supply water for domestic use and fire protection for the town of Keswick and adjacent developed areas (California Government Code Section 61000 et seq.). The district boundary encompasses Keswick Dam and the Spring Creek Diversion Dam; however, these facilities are not served by the district.

Congress authorized a water system for the Keswick area as part of the Trinity Project Act (69 Stat. 719), and the facilities were constructed in 1965. A repayment schedule was established whereby the Federal government would be reimbursed by KCSA for delivery system construction costs. On completion of repayment, ownership of all project facilities was to remain with the Federal government.

The water source for KCSA is Whiskeytown Lake. Water is transported by gravity flow to a turnout on the Spring Creek conduit that is located upstream from the Spring Creek powerhouse. Two storage tanks provide 0.2 million gallons of storage.

A CVP water service contract provides for up to 500 acre-feet annually. KCSA serves about 195 connections, which are concentrated in the town of Keswick. Land served by KCSA is exclusively rural residential properties.

Mountain Gate Community Services District The Mountain Gate Community Services District (MGCSD) was initially formed in 1956 to provide water service for a 2-square-mile area north of the City of Shasta Lake (California Government Code, Section 61000 et seq.). The water source for MGCSD is Shasta Lake. The distribution system consists of 29 miles of pipelines that serve

3,750 acres in MGCSD and Bridge Bay Resort (located between the Sacramento and McCloud arms of Shasta Lake on USFS land).

A CVP water service contract provides 350 acre-feet annually. District water supplies are supplemented by a contract with SCWA that provides 1,000 acre-feet annually. MGCSD also operates three wells that take water from a local aquifer. The wells supply nearly half of MGCSD's total needs. There is no water storage in the district.

MGCSD provides water service to 593 connections and fire protection services for its service area. Although MGCSD primarily provides water for residential uses, it also serves M&I customers.

U.S. Forest Service A memorandum of agreement between USFS and Reclamation provides USFS with up to 10 acre-feet of municipal, industrial, and domestic water diverted from the City of Shasta Lake's water main to supply the Centimudi Recreation Area (Figure 21-1). The Centimudi facilities continue to receive water under this memorandum of agreement.

Livingston Stone National Fish Hatchery The Livingston Stone National Fish Hatchery is located near the foot of Shasta Dam and is managed by USFWS. The hatchery receives its water from the penstocks of Shasta Dam. Water flows through pipes fitted with pressure-reducing valves that pierce manhole covers near the bases of the penstocks. Then the water is routed via a buried pipeline to the hatchery, where it passes through a degassing device, flows through the hatchery, and then returns to the Sacramento River.

Other Users of Lake Water Some of the recreation residences at Campbell Creek and Didallis draw water from the lake for domestic uses. Also, some marinas draw raw water from the lake for washing out boats. Return water drains back into the lake.

Shasta County Water supplies in Shasta County are provided by the CVP, surface water diversions, and groundwater wells. The City of Redding uses groundwater wells for 40 percent of its water supply to supplement the CVP water sources described in the preceding section. Maximum available groundwater production is approximately 19,000 acre-feet per year. Most city groundwater comes from 10 wells located near Redding Municipal Airport, within the Redding groundwater basin. These wells supply a maximum of 16.5 mgd. Four additional wells in the county supply a maximum of 0.7 mgd.

Tehama County Water supplies in Tehama County are provided by CVP, local surface water diversions, and groundwater wells. The recent trend in the county is a shift from reliance on CVP water supplies to groundwater supplies. There are more than 10,000 wells designated for domestic, irrigation, municipal, monitoring, and other uses in the county. CVP deliveries provide 21,300 acre-feet per year; local stream diversions provide 106,300 acre-feet in a normal

water year; and groundwater provides approximately 382,000 acre-feet per year, which represents two-thirds of the county's irrigated water supply.

Red Bluff The City of Red Bluff obtains all of its water from 14 wells. It maintains a 3-million-gallon storage tank used for equalizing storage, fire flow, and emergency storage. The City of Red Bluff is in the process of seeking funding for an additional storage tank similar to the first. The wells produce between 500 and 2,500 gallons per minute, with the majority producing between 800 and 1,000 gallons per minute. Well depths range from 150 to 250 feet.

Other Nearby Uses The Chappie-Shasta Off-Highway Vehicle Area and residential and commercial uses in the community of Coram draw water from local groundwater wells.

Lower Sacramento River and Delta and CVP/SWP Service Areas The overall CVP/SWP water supply discussion describes the environmental setting for water supply for the extended study area. Other water supplies come from local surface water diversions and wells, which serve domestic, irrigation, municipal, and commercial uses. A detailed discussion of the overall CVP and SWP management and operations is provided in EIS Chapter 6, "Hydrology, Hydraulics, and Water Management," and in the *Hydrology, Hydraulics, and Water Management Technical Report*.

21.1.2 Wastewater Infrastructure

Shasta Lake and Vicinity

Wastewater is treated and returned to the natural environment using one of several technical methods with either community or individual on-site disposal systems. Most residential, commercial, and recreational developments located in the Shasta Lake and vicinity portion of the primary study area use on-site septic tank/leachfield systems for wastewater treatment. Typically, individual homes, cabins, or businesses are routed to individual septic systems. Large resorts route septic from several buildings to a single tank/leachfield system. Campgrounds and public restrooms use either septic tank/leachfield systems or vault/pit toilets (Reclamation 2007). Marinas also use booster pumps to lift gray water to upslope leachfield areas. No large wastewater collection or treatment systems are located near Shasta Lake.

The highest concentrations of wastewater facilities near Shasta Lake are located in the Lakeshore and Sugarloaf areas, with a substantial number of facilities in the Bridge Bay, Holiday Harbor, Salt Creek, Campbell Creek, Silverthorn, Jones Valley, Tsasdi Resort, and Digger Bay Marina areas (Figure 21-2). The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum shows detailed maps of the wastewater facilities in the ancillary areas near Shasta Lake (Reclamation 2007).

Upper Sacramento River (Shasta Dam to Red Bluff)

Many areas scattered throughout Shasta and Tehama counties are serviced by individual septic systems. The remaining wastewater treatment systems are a form of community collection, treatment, and disposal. The most common form of community system is the treatment plant, which discharges treated effluent to a storage and irrigation system (land disposal) or, diluted, to a surface watercourse.

Below Shasta Dam, a number of community wastewater systems are operated by the cities of Anderson, Redding, Red Bluff, and Shasta Lake. Several unincorporated communities have community wastewater systems that are operated by CSAs.

Redding operates both the Clear Creek Wastewater Treatment Plant (WWTP) and Stillwater WWTP, both of which discharge treated effluent year round to the Sacramento River. The Clear Creek WWTP is currently permitted by the Central Valley Regional Water Quality Control Board to discharge up to 8.8 mgd of average dry-weather flow into the Sacramento River. The wastewater receives advanced secondary treatment. The Stillwater WWTP receives an average of 2.0 mgd of wastewater, approximately one-third of its design capacity of 6 mgd for average dry-weather flow. The Anderson WWTP discharges year round into the Sacramento River at a location approximately 0.25 mile from the Stillwater WWTP.

The City of Shasta Lake operates a large community wastewater system that is permitted to seasonally discharge treated effluent to surface water, namely Churn Creek; a major goal of the city's capital improvement plan has been to significantly reduce these discharges. Churn Creek eventually discharges to the Sacramento River about 0.5 mile upstream from the Stillwater WWTP.

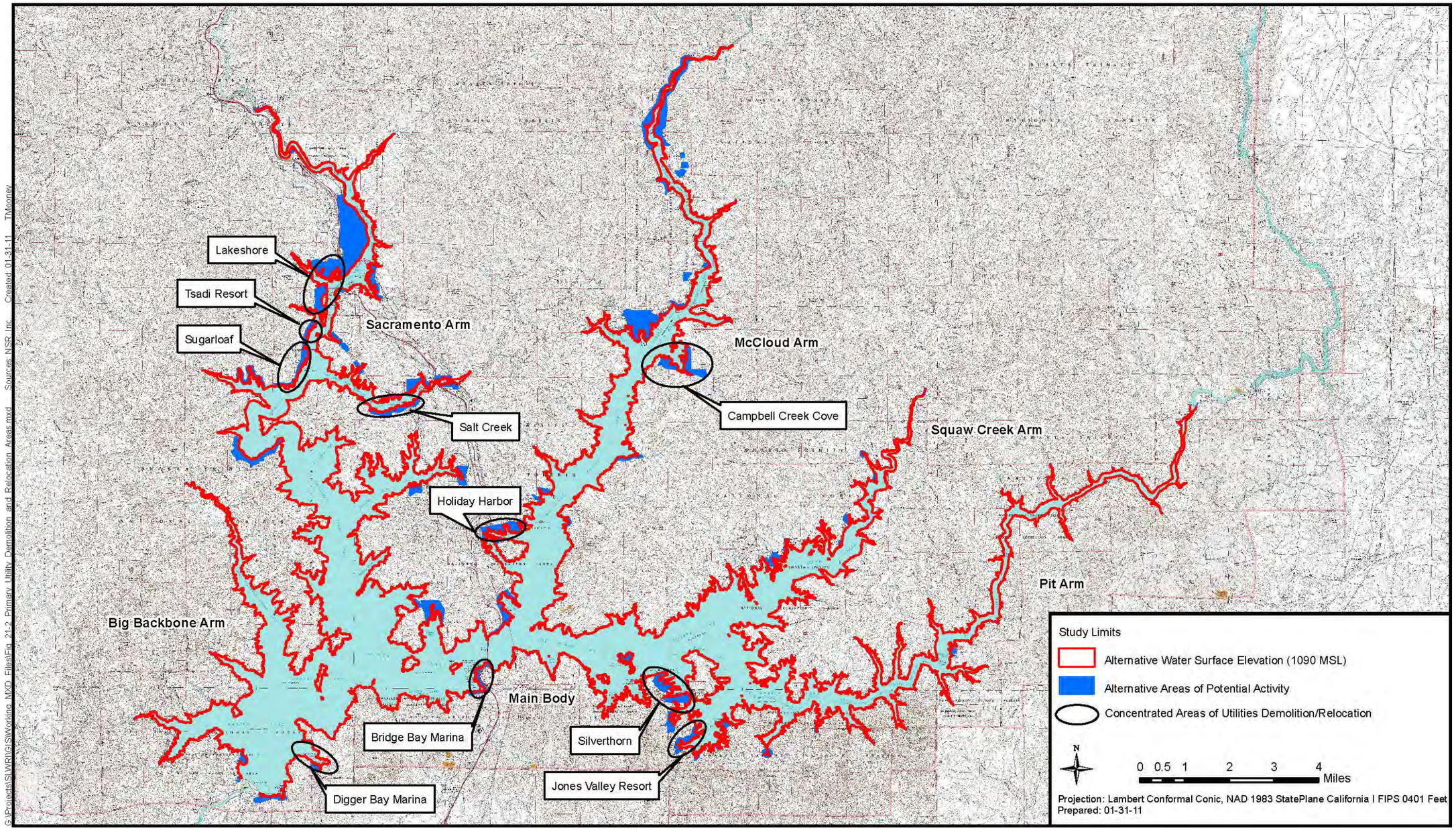

Figure 21-2. Primary Utility Demolition and Relocation Areas

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The Red Bluff WWTP has a treatment capacity of 4.8 mgd and discharges tertiary-treated wastewater by gravity into the Sacramento River at approximately 1.4 mgd. The City of Red Bluff operates a wastewater treatment system at the south end of the city. The Rio Alto Water District provides wastewater treatment services for some portions of the community of Cottonwood. Septic/leachfield systems or seepage pits are used in areas not served by these systems.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Wastewater systems in the extended study area are similar to those discussed for the primary study area. Community wastewater service systems are provided through a collection network of gravity and force main sewer lines operated primarily by local utility agencies. Pump stations and lift stations augment sewer line networks. These conveyance systems terminate at WWTPs that discharge treated effluent to storage and irrigation systems (land disposal) or to surface watercourses where the treated effluent is diluted. Individual on-site wastewater treatment methods are also used where the land is able to accommodate a leachfield/septic tank system.

21.1.3 Stormwater Drainage and Infrastructure

Shasta Lake and Vicinity

Stormwater drainage is primarily a function of the precipitation and runoff characteristics of a watershed. About 6.5 percent (5.8 million acre-feet) of all surface runoff in the state of California originates in Shasta County, representing a substantial portion of the total surface runoff in the Sacramento River system. Runoff in the Shasta Lake and vicinity portion of the primary study area is discharged to the McCloud River, the Sacramento River, and the Pit River, which drain into Shasta Lake. Numerous creeks and small local tributaries also drain into Shasta Lake.

The California Department of Transportation maintains a stormwater drainage system along the Interstate 5 (I-5) corridor. Drainage facilities in developed communities include gutters, swales, ditches, culverts, storm drain inlets, catch basins, storm drainage pipes, and detention basins. Roads also channel stormwater drainage from residences, commercial, and industrial land uses to adjacent lands and stormwater drains.

Upper Sacramento River (Shasta Dam to Red Bluff)

Runoff in the upper Sacramento River portion of the primary study area is discharged to the Sacramento River directly and indirectly via numerous major creeks and small local tributaries in rural and urban areas. Stormwater drainage in undeveloped portions of Shasta and Tehama counties generally consists of natural swales and topographic features.

Stormwater collection systems are present in urban areas and developed communities. Drainage facilities in urban areas include gutters, swales, ditches,

culverts, storm drain inlets, catch basins, storm drainage pipes, canals, detention basins, and pump stations. Roads also channel stormwater drainage from residences and commercial and industrial land uses to adjacent lands and stormwater drains. The Cities of Redding, Anderson, and Red Bluff and the City of Shasta Lake each operate municipal storm drainage systems in the city limits. The California Department of Transportation's I-5 stormwater drainage system continues along I-5 in the upper Sacramento River area.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Stormwater systems in the extended study area are similar to those discussed for the primary study area. Various storm drainage facilities and collection/conveyance systems are located throughout the extended study area. Stormwater facilities and infrastructure are operated primarily by local districts and road departments, and include gutters, swales, ditches, culverts, storm drain inlets, catch basins, storm drainage pipes, canals, detention basins, and pump stations. Treated stormwater is often discharged to rivers, tributaries, and major creeks throughout the extended study area.

21.1.4 Solid Waste Management

Shasta Lake and Vicinity

Contractors, under the auspices of Shasta County, provide solid waste disposal services for the private sector. The Shasta-Trinity National Forest (STNF), Reclamation, and California Department of Transportation use contractors to provide disposal services for facilities on public lands. A number of sites are used to collect solid waste and recyclables, which are later transferred to landfills or recycling centers in the extended study area, primarily in Shasta County.

Upper Sacramento River (Shasta Dam to Red Bluff)

The Shasta County Department of Public Works is responsible for providing solid waste management in unincorporated areas of the county. Three landfills (West Central Landfill, Anderson Landfill, and Twin Bridges Landfill) and 11 collection/transfer stations are currently operating in Shasta County. Shasta County generated 187,909 tons of solid waste in 2006; however, 307,568 tons of solid waste were disposed of in the county during the same period (CIWMB 2008).

In 2006, the 1,200-acre West Central Landfill received approximately 417 tons per day (CIWMB 2008) of nonhazardous waste from residential, commercial, industrial, and agricultural sources. This Class III landfill has a permitted capacity of 7,078,000 cubic yards and a storage area of 107 acres. In 2001, the State of California estimated that the landfill had a remaining capacity of 6,606,000 cubic yards (CalRecycle 2010). Under existing State permits, the landfill has sufficient capacity to accommodate the disposal of solid waste at least until the year 2019. In 2006, the 246-acre Anderson Landfill, a Class III landfill and asbestos-containing waste disposal site, received approximately 426

tons of solid waste per day (CIWMB 2008). This landfill has a permitted capacity of 16,840,000 cubic yards, and in 2008 the State of California estimated that the landfill had a remaining capacity of 11,914,000 cubic yards (CalRecycle 2010). The estimated year of closure is 2055. The Twin Bridges Landfill is a Class II landfill that has ceased accepting solid waste and is undergoing closure (CIWMB 2008).

Tehama County operates the 102-acre Tehama County/Red Bluff Sanitary Landfill, located approximately 2.5 miles northwest of Red Bluff. This landfill, a Class III facility, has a maximum permitted daily capacity of 400 tons (CIWMB 2008). This landfill has a permitted capacity of 5,097,000 cubic yards, and in 2008 the State of California estimated that the landfill had a remaining capacity of 2,149,000 cubic yards (CalRecycle 2010). The estimated year of closure is 2040. The landfill is owned by the Tehama County Sanitary Landfill Association, a joint-powers authority composed of Tehama County and the cities of Red Bluff, Corning, and Tehama. The Tehama County/Red Bluff Landfill Management Agency oversees daily landfill operations at the Tehama County/Red Bluff Landfill and at the Material Recovery Facility. Tehama County/Red Bluff Landfill Management Agency is another joint-powers authority and is composed of Tehama County and the City of Red Bluff. This agency is also responsible for maintaining permits and monitoring environmental compliance at the landfill.

In addition to the landfill and material recovery facilities, Tehama County operates two household hazardous waste facilities, in Corning and Red Bluff, and four transfer stations in the outlying rural areas of Manton, Payne's Creek, Mineral, and Rancho Tehama. There are no facilities authorized to accept commercial hazardous waste within the primary study area.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Solid waste services and infrastructure in the extended study area are similar to those discussed for the primary service area. Urban centers in the extended study area may generate more solid waste than the population centers in the primary study area; however, the mechanisms used for transfer and disposal of the waste are similar. Solid waste facilities, including landfills and transfer stations, provide pickup and disposal services. There are three commercial hazardous waste disposal facilities authorized to accept various types of commercial hazardous waste in the extended study area. These facilities are located in Kings, Kern, and Imperial counties. Only the facility in Kings County is certified to accept materials that contain polychlorinated biphenyls.

21.1.5 Electrical Service and Infrastructure

Shasta Lake and Vicinity

Pacific Gas and Electric Company (PG&E), the City of Redding, and the City of Shasta Lake provide electrical service to Shasta Lake and vicinity. The PG&E service area is part of a larger PG&E territory, which encompasses

70,000 square miles in northern and central California, from Eureka in the north to Bakersfield in the south. Power transmission facilities serving the Shasta Lake and vicinity portion of the primary study area have developed mostly parallel to I-5 and adjacent to developed communities.

Currently, PG&E is capable of providing three-phase power parallel to the I-5 corridor, north to Bridge Bay and south from Lakehead to Turntable Bay. Power lines around Shasta Lake are typically routed overhead on utility poles or towers, although a portion of the lines serving individual businesses, homes, and cabins are routed underground. Power lines serving the Shasta Lake and vicinity portion of the primary study area are frequently attached to bridges when routed over rivers and lake inlets. The voltage of local distribution lines is typically 12 kilovolts (kV), whereas the voltage of high-voltage power transmission lines is typically 60–230 kV. Service to individual homes and businesses is typically 120–480 volts.

The highest concentrations of electrical service facilities near Shasta Lake are in the Lakeshore and Sugarloaf areas, with a substantial number of facilities in the Bridge Bay, Holiday Harbor, Salt Creek, Campbell Creek, Silverthorn, Jones Valley, Tsasdi Resort, and Digger Bay Marina areas (Figure 21-2). The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum shows detailed maps of the electrical service facilities in the ancillary areas near Shasta Lake (Reclamation 2007).

The City of Shasta Lake is located at the heart of the Shasta Division of the CVP. The City of Shasta Lake is the successor utility to the former Shasta Dam Area PUD and serves customer both upstream and downstream from Shasta Dam. The PUD contracted with Reclamation for power in January 1947 to serve electrical energy to residents and businesses. The PUD received 13.8kV service from the Shasta Dam switchyard on a leased-line arrangement. Today, the City of Shasta Lake is a load serving entity and retail distribution provider of electrical energy to more than 4,500 homes and businesses including Digger Bay Marina, the Centimudi Boat Ramp, and the Fisherman’s Point Picnic Area facilities.

Upper Sacramento River (Shasta Dam to Red Bluff)

Electrical service and related infrastructure in the upper Sacramento River portion of the primary study area are similar to those discussed for the Shasta Lake and vicinity portion. The City of Anderson, outlying rural areas of Shasta County, and Tehama County (Red Bluff and Corning) receive electrical service from PG&E.

The City of Shasta Lake owns and operates a looped 115kV system, which delivers energy to two 115/12kV distribution substations that step the voltage down to 12kV for delivery to the end users. The system is managed by the City of Shasta Lake and is assisted by the City of Redding Electric Utility for ancillary services. In total, the City of Shasta Lake’s distribution system has 15

miles of 115kV transmission lines and approximately 67 miles of overhead and underground 12kV distribution lines. The City of Shasta Lake has two points of delivery: one from the Flanagan 230/115kV transmission substation and the other at Keswick Dam switchyard. The City of Shasta Lake has a base resource allocation from the Western Area Power Administration (Western), which delivers energy to the City of Shasta Lake from Shasta and Keswick Dams. The City of Shasta Lake also has a supplemental energy agreement with the City of Redding.

The City of Redding's electric system is managed by the Redding Electric Utility. It receives nearly eight percent of the hydroelectric output from the CVP, which amounts to approximately 30 percent of Redding's annual power supply. Federal hydropower from the CVP is the most cost-effective, renewable, and carbon-free resource currently in Redding's power supply portfolio. The City of Redding owns and operates a looped 115kV system, which delivers energy to eleven 115/12kV distribution substations that step the voltage down to 12 kV for delivery to the city's customers. . In total, Redding's distribution system has 67.3 miles of 115kV local transmission lines and approximately 610 miles of overhead and underground 12kV distribution lines. Delivery of all power from outside the city is made to the Redding Municipal Airport 230/115kV transmission substation and to the Keswick Dam switchyard. Redding jointly owns the airport substation with Western. Western owns and operates the Keswick switching substation and an electrical transmission line that runs north and south along the western side of Redding and the City of Shasta Lake.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Electrical services and infrastructure in the extended study area are similar to those discussed for the primary study area. Power generation and transmission facilities have developed parallel to population centers, power, natural gas, nuclear, oil, hydroelectric, wind, solar, and other technologies used for power production.

Infrastructure in the Sacramento River basin downstream from the Red Bluff Pumping Plant, the American River basin, and the San Joaquin River basin consists primarily of natural gas–fired and hydroelectric generating facilities, transmission lines, substations, and distribution lines. In the Delta, PG&E and Western have developed power transmission lines across Delta islands and waterways. Many of the corridors are within the periphery of the Delta upland areas, including several natural gas–fired plants. There are no power-generating facilities in the central Delta. In other portions of the CVP and SWP service areas, a complex system of electrical generating facilities, substations, and transmission infrastructure exists.

21.1.6 Natural Gas Service and Infrastructure

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

PG&E is responsible for providing natural gas service to the primary study area. Gas is delivered to customers below Shasta Dam, including residents of the cities of Redding, Anderson, and Red Bluff and the city of Shasta Lake. Although the study area is bisected by a large PG&E natural gas pipeline, service varies based on PG&E's distribution system. No natural gas facilities are present in the Shasta Lake and vicinity portion of the primary study area.

The USFS facility at Turntable Bay, the USFS Lakeshore Guard Station, and a number of rural residences and businesses in the primary study area rely on propane for various purposes. Propane is supplied by various local providers to individual on-site tanks. Propane tanks for homes and businesses are portable and are typically leased (Reclamation 2007).

Lower Sacramento River and Delta and CVP/SWP Service Areas

Natural gas services and infrastructure are located throughout the extended study area and are supplied by various energy providers. Pipelines, storage areas, and compressor stations are located in the Sacramento River and San Joaquin River valleys and in the CVP/SWP service areas. Natural gas discovered in the Delta region has been developed into a significant supply source and depot for underground storage. Gas fields, pipelines, and related infrastructure have been developed throughout the CVP/SWP service areas. Natural gas infrastructure is owned by oil and gas companies, public utilities, and various independent leaseholders.

21.1.7 Telecommunications

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Landline telephone service in the primary study area is provided by various commercial communications companies. The majority of the landline facilities are located in county- or city-owned rights-of-way and on private easements. Telecommunications lines are either copper wire or fiber optic cable and are routed overhead on utility poles and underground. Telephone lines are frequently attached to bridges when routed over rivers and lake inlets. There are no transcontinental fiber optic lines in the Shasta Lake and vicinity portion of the primary study area.

In addition to landline service, a large number of communications towers have been constructed throughout the primary study area for cellular phone service. Cellular towers have been erected along major travel corridors to meet emergency service objectives. Cellular service is available, to varying degrees, throughout the service area.

Lower Sacramento River and Delta and CVP/SWP Service Areas
Telecommunications systems in the extended study area are similar to those discussed for the primary study area and are supplied by various providers. Associated infrastructure is located throughout the extended study area and consists of underground fiber optic cable, telephone transmission lines (overhead and underground), and cellular towers owned or leased by telecommunications service providers.

21.2 Regulatory Framework

21.2.1 Federal

Reclamation Act
The 1902 Reclamation Act authorized the Federal government to finance and build water supply projects. The act set up the Reclamation Fund to finance single-purpose irrigation projects in the western United States. Since that time, water supply projects and the financing needed to construct and maintain infrastructure have grown substantially. The act has been amended several times, most recently in 1982 with the passage of the Reclamation Reform Act.

Safe Drinking Water Act
The Safe Drinking Water Act (SDWA) was passed to protect public health by regulating the nation's drinking water supply. The law requires many actions to protect drinking water and its sources: rivers, lakes, reservoirs, springs, and groundwater wells. Originally, the SDWA focused on water treatment as the primary means to provide safe drinking water at the tap. In 1996, amendments to the SDWA expanded the act to include source water protections.

The U.S. Environmental Protection Agency (EPA) is responsible for administering the act. EPA establishes National Primary Drinking Water Regulations for contaminants that may cause adverse public health effects. These regulations set maximum contaminant levels and nonenforceable health goals (called Maximum Contaminant Level Goals) for recognized contaminants.

The SDWA does not regulate private wells that serve fewer than 25 people. However, the act does apply to all public water systems. A public water system is a system that provides water for public consumption that regularly serves at least 25 people or has at least 15 service connections. This includes facilities such as resorts and marinas.

Clean Water Act
The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintaining the

integrity of wetlands. The act regulates discharges of pollutants into the waters of the United States. EPA is responsible for administering waste discharge permits under the National Pollutant Discharge Elimination System. M&I wastewater facilities that discharge effluent into surface waters are required to obtain National Pollutant Discharge Elimination System permits. Large and medium storm sewer systems also require a National Pollutant Discharge Elimination System permit. The stormwater permits often require implementation of a pollution prevention plan to prevent contaminants from reaching surface waters.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) is designed to provide "cradle to grave" control of hazardous waste by imposing management requirements on generators and transporters of hazardous wastes and on owners and operators of treatment, storage, and disposal facilities. The RCRA also applies to the management of nonhazardous solid waste through the municipal solid waste landfill. EPA is responsible for administering the RCRA.

Shasta-Trinity National Forest Land and Resource Management Plan

The STNF Land and Resource Management Plan (LRMP) identifies goals, standards, and guidelines related to utilities and service systems in the STNF. The following public services goals, standards, and guidelines related to the project area were excerpted from the LRMP (USFS 1995).

Facilities Goals

- Provide and maintain those administrative facilities that effectively and safely serve the public and USFS workforce.

Facilities Standards and Guidelines

- Manage, construct, and maintain buildings and administrative sites to meet applicable codes and to provide the necessary facilities to support resource management.

Lands Goals

- Provide for continued use and new development of hydroelectric facilities.

Lands, Special Uses Standards and Guidelines

- Do not approve special use applications if such use can reasonably be accommodated on private land.

- Bury new telephone lines and new or reconstructed power distribution lines less than 35 kV, unless:

  – Visual quality objectives (VQO) can be met without burying,

  – Geologic conditions make burying infeasible, and

  - Burying will produce greater long-term site disturbance.

Whiskeytown-Shasta-Trinity National Recreation Area Management Plan

- Road construction will be restricted to that which is compatible with the purpose of the NRA and to provide essential private land access.
- Road closures will be implemented as opportunities arise to decrease road density and associated wildlife disturbance.
- No additional roads will be constructed for timber harvest.
- Any timber harvest must be consistent with NRA goals and objectives.
- All developments and long-term activities in the NRA will be designed with the intent of meeting VQOs. Those objectives include areas designated as retention, partial retention, and modification.
- Management activities that can be seen from within developed recreation sites will meet a VQO of retention in the foreground and partial retention in the middle ground.
- Best management practices and soil quality standards apply to all management activities.
- Riparian reserve standards and guidelines apply to all management activities within riparian reserves.

U.S. Bureau of Land Management Resource Management Plans

The U.S. Department of the Interior, Bureau of Land Management (BLM) manages a number of public lands adjacent to the Sacramento River corridor downstream from Shasta Dam. The study area falls under two BLM districts (Northern California and Central California) and the resource management plans (RMP) of three BLM field offices: Redding, Ukiah, and Mother Lode (BLM 2006). The purpose of BLM's RMPs is to provide overall direction for managing and allocating public resources in each planning area. The RMP for the Redding field office designates utility corridors as all existing or occupied corridors delineated in BLM's Western Regional Corridor Study of 1986, with the exception of several avoidance areas that include portions of the Sacramento River Management Area. The RMP also states that no additional utility corridors will be permitted in the Sacramento River Management Area, except for a 2-acre aerial communications site on Inks Ridge (BLM 1993).

21.2.2 State

California Water Plan

The California Water Plan provides a framework for water supply planning for the state. It identifies and evaluates existing and proposed statewide demand,

water supply programs, and projects to address the state's water supply needs. DWR is responsible for the preparation of the California Water Plan and the management of the state's surface water and groundwater resources (DWR 2009). DWR also oversees California's SWP and the regulation and protection of dams, assists local agencies in preparing urban water management plans, and reviews the plans to ensure compliance with the Urban Water Management Act.

The State Water Resources Control Board (State Water Board) has broad authority over water rights and regulations for the state. The State Water Board and its nine regional water quality control boards administer water rights and enforce pollution control standards throughout the state. The State Water Board is responsible for granting water rights through an appropriation process following public hearings and requisite environmental review by applicants and responsible agencies. In granting water rights permits, the State Water Board must consider all beneficial uses, including water for downstream human and environmental needs.

Water suppliers must obtain a permit from the California Department of Public Health, Office of Drinking Water, for a community water system, defined as a "public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents of the area served by the system" (42 Code of Federal Regulations Section 300f).

Water Quality Control Plan for the Sacramento and San Joaquin River Basins

The *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan) provides guidance for wastewater and stormwater facilities and development that could affect water quality in the basins. Basin Plan objectives are incorporated into county and city general plans, zoning ordinances, building codes, and subdivision ordinances. The Central Valley Regional Water Quality Control Board is responsible for issuing and enforcing waste discharge requirements, including discharge prohibitions and user reuse requirements for wastewater reclamation projects.

Nonhazardous Solid Waste Disposal Standards

Title 14, Chapter 3, of the California Code of Regulations provides minimum standards for solid waste handling and disposal in California and pertains to nonhazardous solid waste management. The California Department of Resources Recycling and Recovery is a new department in the California Natural Resources Agency that administers the programs formerly managed by the California Integrated Waste Management Board, including the regulation of nonhazardous solid waste facilities in the state.

Hazardous Waste Control Act

The California Hazardous Waste Control Act governs hazardous waste management and cleanup in California (Health and Safety Code, Chapters 6.5–6.98). The act mirrors the RCRA and imposes a "cradle to grave" regulatory

system for handling hazardous waste in a manner that protects human health and the environment. County Environmental Health Departments and California Environmental Protection Agency Certified Unified Program Agencies assume responsibility for enforcing local hazardous waste reporting requirements. Sites that store, handle, or transport specified quantities of hazardous materials are inspected annually. The California Department of Toxic Substances Control, part of the California Environmental Protection Agency, regulates the generation, transportation, treatment, storage, and disposal of hazardous waste under the RCRA and the California Hazardous Waste Control Act.

California Public Utilities Code

The California Public Utilities Code has broad regulatory authority over public utilities in California, which include electrical utilities, mutual water companies, private energy producers, telephone corporations, and railroad corporations. The California Public Utilities Commission is the government body that administers the California Public Utilities Code. The California Public Utilities Commission issued General Order 95 to provide safety standards for construction of power transmission facilities. Furthermore, the California Public Utilities Commission issued General Order 131-D to provide rules related to the planning and construction of electrical generation and transmission/power/distribution line facilities.

21.2.3 Regional and Local

City and County General Plans

The general plans for the counties and cities in the primary and extended study areas contain policies regarding utilities and services systems. Water supply, wastewater treatment, solid waste disposal, and utilities are subjects covered in the general plans and are considered essential public services required by all types and densities of development.

21.3 Environmental Consequences and Mitigation Measures

21.3.1 Methods and Assumptions

Evaluation of potential utility and services system impacts was based on a review of planning documents pertaining to the primary and extended study areas, including the STNF LRMP, California Department of Toxic Substances Control databases, and the general plans for the Cities of Redding and Red Bluff, the City of Shasta Lake, and Shasta and Tehama counties. The analysis also uses an inventory of utilities and service system infrastructure in the primary study area as it relates to the SLWRI.

Effects on water supply in the Shasta Lake and vicinity portion of the primary study area were evaluated based on construction and operational activities that would result from project implementation. It was generally assumed that construction activities associated with modifying Shasta Dam could result in

short-term effects on the delivery of local water supplies if the surface elevation of the reservoir were lowered to accommodate construction. A long-term effect would result if project operation would create a substantial disruption or reduction in the distribution or quantity of water supply.

Impacts on utilities and service systems were evaluated based on the duration and extent to which such services would be affected, as well as the ability of the service provider to continue to provide a level of service that could meet the needs of the public. The evaluation compares the duration of the effect with the service provided, taking into account the ability of the provider to maintain necessary services through alternative means.

Due to the higher cost and increased environmental impacts associated with relocating the utility lines to new rights-of-way, it is assumed that the transmission lines will generally remain along their current alignments. The installation of temporary lines would be required for some facility relocations to maintain operation of the lines during construction.

21.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with 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 EIS 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 State CEQA Guidelines and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative related to utilities and service systems would be significant if project implementation would do any of the following:

- Not comply with published local, State, or Federal statutes, regulations, or standards relating to solid waste
- Exceed permitted landfill capacity with waste generated by the project
- Degrade the level of service of a public utility or services system
- Require relocating utility infrastructure

- Exceed wastewater treatment requirements of the applicable regional water quality control board
- Exceed water supplies available to service the project from existing entitlements and resources, such that new or expanded entitlements would be needed
- Disrupt utilities service to create a public health hazard or extended service disruption
- Require substantial improvements to the infrastructure or level of staffing of a utility or services system to maintain its existing level of service
- Require or result in the construction of new water treatment, wastewater treatment, or stormwater drainage facilities, or the expansion of such existing facilities, the construction of which could cause significant environmental effects

21.3.3 Topics Eliminated from Further Consideration

The action alternatives would increase availability of water supply for water users on the Sacramento River and Delta. Increased water supplies might increase demand for new or expanded WWTPs that discharge to the Sacramento River or Delta. The State Water Board has review, approval, and permitting authority over operation of new or expanded WWTPs, and the environmental effects of approving WWTPs must be evaluated under CEQA. If approved, WWTPs must operate within the limits established in the waste discharge requirements issued by the State Water Board. Although increased water supplies might increase demand for new or expanded WWTPs that discharge to the Sacramento River or Delta, it is speculative to assume that the State Water Board would approve new or expanded WWTPs. Therefore, increased discharge of treated wastewater into the Sacramento River or Delta that is not currently authorized as a result of this project (and that has not already been evaluated under CEQA) is not reasonably foreseeable and is eliminated from further consideration.

21.3.4 Direct and Indirect Effects

Utilities and service system impacts in the primary study area – Shasta Lake and vicinity and upper Sacramento River (Shasta Dam to Red Bluff) – caused by project construction and operation are described below. Only minimal, if any, project-related impacts on utilities and service systems are expected to occur downstream from the Red Bluff Pumping Plant or in the remainder of the extended study area.

No-Action Alternative

Shasta Lake and Vicinity, Upper Sacramento River (Shasta Dam to Red Bluff), Lower Sacramento and Delta, and CVP/SWP Service Areas The

impact discussion for the No-Action Alternative addresses all of both the primary and extended study areas together, because this alternative would not affect utilities in either the primary or extended study area.

Impact Util-1 (No-Action): Damage to or Disruption of Public Utility and Service Systems Infrastructure Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no damage to public utilities infrastructure or temporary disruption of services in the vicinity of Shasta Lake would occur from implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Util-2 (No-Action): Utility Infrastructure Relocation or Modification Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, relocation or modification of existing utilities infrastructure in the vicinity of Shasta Lake would not occur from implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Util-3 (No-Action): Short-Term Increase in Solid Waste Generation Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no solid waste would be generated as a result of implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Util-4 (No-Action): Increases in Solid Waste Generation from Increased Recreational Opportunities Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no solid waste associated with increased recreational opportunities would be generated as a result of implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Util-5 (No-Action): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, increased demand for water treatment and distribution facilities related to increases in water supply would not occur from implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

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

Utilities and service systems impacts would occur primarily in the Shasta Lake and vicinity portion of the primary study area. The majority of impacts

identified would be short-term impacts resulting from the abandonment and relocation of utilities and service systems. Individual utilities or service systems are discussed where project detail is available. However, stormwater, wastewater, solid waste management, and water supply systems are also referred to as service systems when a general reference to all of the systems would be appropriate; and electrical service and infrastructure, natural gas service and infrastructure, and telecommunications service and infrastructure are referred to as utilities when a general reference to all of the utilities would be appropriate.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP1 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP1): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project construction activities could damage public utility and service systems infrastructure, which could result in short-term disruptions of service. Construction activities would occur in areas proposed for utilities or service systems abandonment and relocation. Project implementation could require disruption of public utilities or service systems to accommodate construction activity. This impact would be potentially significant.

The quantity of utility and service systems infrastructure relocation varies for the developed areas in the general vicinity of Shasta Lake. The bulk of the work would be done along the shores of the Sacramento Arm, the most developed portion of Shasta Lake. Utility abandonment and relocation would take approximately 4.5 years. Some service systems construction would occur in the upper Sacramento River portion of the primary study area, primarily at the Shasta Dam compound. Disruptions of utilities service in the upper Sacramento River area could result from project implementation and are discussed below.

Project construction activities associated with abandonment and relocation of utilities and service systems infrastructure could damage existing public utility lines. Excavation activities, vegetation clearing, and heavy equipment operations could accidentally damage utility lines or service system pipes/ditches, which could result in a disruption of public utilities or service systems.

Reclamation inventoried utilities and service systems on lands surrounding Shasta Lake that could be inundated by an increased reservoir elevation. Based on Reclamation’s inventory, a 6.5-foot raise in the level of Shasta Lake would require abandonment and relocation of approximately 31,000 feet (5.8 miles) of power lines and 33,000 feet (6.2 miles) of telecommunications lines. Power and telecommunications facilities that could be inundated and that would require relocation include transmission towers, power poles, underground power and telecommunications lines, above-ground power and telecommunications lines,

and cable lines. Approximately 20 percent of the power transmission facilities that could be inundated would consist of high-voltage power lines; the remaining 80 percent would consist of low-voltage power lines. Numerous individual on-site wastewater systems and stormwater systems (primarily adjacent to roads) would be relocated to areas that would not be affected under CP1 (Figure 21-2). The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum shows detailed maps of the utilities in the ancillary areas that would need to be demolished or relocated (Reclamation 2007).

Disruptions in services resulting from damage to utility lines would likely be localized because the majority of power and telecommunication lines that would require relocation serve the local population around Shasta Lake. Reclamation or project contractors would likely repair potential infrastructure damage immediately after discovery of the damage. Therefore, disruptions of public utilities in the Shasta Lake and vicinity portion of the primary study area would not continue for extended periods of time. However, periodic service disruptions could occur throughout the 4.5-year construction period for CP1, which could inconvenience the local population.

Project construction activities associated with raising Shasta Dam could damage existing public utilities infrastructure and result in disruptions of public utilities service in the primary study area. Activities that could damage public utilities at the dam and result in disruptions of service include drilling activities, heavy equipment operations, and other worksite accidents. As explained above, infrastructure damage would be repaired immediately. If hydropower generation is interrupted at Shasta Dam, repair time could be extended and there would be prolonged impacts on the upper Sacramento River portion of the primary study area.

Public utilities or service systems could be disrupted during construction activities that require a temporary shut-off for safety or mechanical purposes. This effect would be most likely to occur in the Shasta Lake and vicinity portion of the primary study area because of the amount of project construction in that area relating to local utilities and service systems relocation activities. Public utilities and service systems would be relocated such that they would be functional by project completion. Occasional disruptions of public utilities could also occur in the upper Sacramento River area because of construction activities at Shasta Dam that require temporary power outages. Construction activities in the immediate vicinity of the Shasta Dam compound could occasionally affect the treatment and delivery of water to the City of Shasta Lake. This impact would be short term and would continue intermittently until project construction activities were completed. Construction would take approximately 4.5 years.

To minimize potential disruption of service and damage to the utilities and service systems infrastructure, project contractors would follow local, State, and Federal regulations pertaining to utilities and service systems location and

construction. However, the magnitude of the project and number of utilities and service systems requiring relocation make it likely that utilities or service systems could be damaged or services disrupted. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP1): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utilities infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, air quality, water quality, and utilities service. This impact would be potentially significant.

In general, short-term impacts that could result from relocation of utilities infrastructure would be localized (Shasta Lake and vicinity) and could include disruptions caused by noise, traffic, and dust associated with construction activities. Relocation of utilities infrastructure could result in localized long-term impacts related to visual quality, land use, vegetation, transportation, water quality, air quality, noise, and wildlife in the Shasta Lake and vicinity portion of the primary study area; these impacts are discussed in separate EIS chapters. Some utilities infrastructure would also be modified in the upper Sacramento River portion of the primary study area, particularly in the general vicinity of the Shasta Dam compound.

As discussed in Impact Util-1 (CP1), project construction and operation would result in relocation and/or modification of utilities infrastructure at Shasta Dam and in communities in the Shasta Lake and vicinity portion of the primary study area (Figures 21-1 and 21-2). The infrastructure components include water and wastewater service and electrical infrastructure, telephone lines, and cable lines. Proposed infrastructure relocation was based on (1) whether utilities components would be inundated by an increased lake elevation and (2) whether the inundation would warrant relocation or permanent abandonment.

The largest potentially affected residential developments near Shasta Lake are in the Lakeshore and Sugarloaf areas. Recreational facilities (e.g., campgrounds and marinas) would also change substantially. The quantity of services and utilities infrastructure reconstruction would vary around Shasta Lake with an emphasis on the Sacramento, McCloud, and Pit arms as well as the Main Body. Abandonment and relocation of utilities infrastructure would take 4.5 years. The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum shows detailed maps of the utilities in the ancillary areas that would need to be demolished or relocated (Reclamation 2007).

Consistent with Shasta County Development Standards, septic systems within 200 feet of the new full pool waterline or 100 feet downslope of the new full pool waterline would be demolished. Wastewater pipes, septic tanks, vaults/pits, and leachfields would be abandoned in place, and restroom buildings and contents would be removed and taken to an approved landfill. Relocation of

septic systems in the project area would be done in one of two ways: (1) construct new septic systems on the property of the affected home or facility, where feasible; or (2) define a possible localized WWTP alternative for homes that do not meet Shasta County requirements for septic system separation from the lake. The general WWTP would include a pressurized sewer collection system to transport wastewater flows to several centralized package WWTPs. Localized WWTPs would likely be constructed to serve the areas of Salt Creek, Sugarloaf/Tsasdi Resort, Lakeshore (possibly several plants), Antlers Campground, Campbell Creek Cove, Bridge Bay Marina, Silverthorn Resort, and Jones Valley.

WWTP operation can result in undesirable environmental effects. For example, discharge of treated wastewater could affect the water quality of Shasta Lake, pump stations could generate unwanted noise, and the treatment process could generate undesirable odors. The environmental impacts of constructing and operating wastewater treatment facilities are evaluated in the pertinent technical chapters of the EIS.

Power lines and telecommunications lines usually follow parallel alignment and typically use the same power pole. Some of the utility lines serving individual houses, businesses, government facilities, and cabins are routed underground. All transmission towers, power poles, underground power lines, and telecommunications lines that would be inundated under CP1 would need to be removed and relocated.

Low-voltage power lines, telecommunications lines, or power poles located within 50 feet of the CP1 maximum lake elevation would be considered threatened by inundation, and high-voltage power lines and towers located within 100 feet would be considered inundated. Relocation of utilities infrastructure would be consistent with applicable local, State, and Federal requirements.

CP1 would inundate 31,000 feet (approximately 5.8 miles) of power lines and 33,000 feet (about 6.2 miles) of telecommunications lines near Shasta Lake. All associated transmission towers, power poles, underground power lines, telecommunications lines, and cable lines that would be inundated under CP1 would need to be removed and relocated.

Relocation of infrastructure would include vegetation removal, which would result in project impacts. Clearing of vegetation would be required to provide space for utilities structures and to create a safety buffer. Reclamation would clear the appropriate space for utilities infrastructure as provided by local, State, and Federal regulations. Additional space could be cleared to provide the highest level of safety for project operation and maintenance. In addition, Reclamation would apply the National Electric Safety Code, a voluntary safety code followed by the utilities industry, to ensure that relocated infrastructure would operate as safely or safer than existing utilities. Widths of vegetation

clearance would range from 40 to 75 feet. Cleared areas could be wider, depending on site-specific conditions, such as on steep slopes or when tall trees are nearby.

Impacts resulting from vegetation clearing associated with relocation of utilities infrastructure would be minimized where possible. When possible, Reclamation would locate utility corridors in sites that are not heavily forested to minimize vegetation clearing. Where heavily forested areas cannot be avoided for relocation of utilities infrastructure, Reclamation would coordinate vegetation removal with USFS and other landowners/managers to minimize impacts. Reclamation will consider co-locating and undergrounding relocated utility lines to the extent practicable.

Relocation of utilities infrastructure would require additional roads for construction and maintenance of the new facilities. Roads would be constructed in the rights-of-way of the cleared utility lines and would be constructed according to the appropriate jurisdiction's standards (i.e., USFS or Shasta County). New roads serving relocated utilities infrastructure would be located and designed to prevent erosion and avoid geologic hazards.

As discussed in Chapter 20, "Transportation and Traffic," some work in the road relocation areas could require a road closure with detours, lane closures, or a combination of both. Road closures would temporarily impede access to local connector roads and recreational land uses, affecting residents, local recreational and nonrecreational businesses, and visitors to Shasta Lake.

To minimize potential impacts resulting from relocation of utilities infrastructure, Reclamation and project contractors would follow local, State, and Federal regulations pertaining to installation of utilities infrastructure, the STNF LRMP standards and guidelines, and the *Shasta County General Plan* and zoning guidance. Before vacating a street or public service easement, the Shasta County Board of Supervisors must consider applicable consistency with the general plan. Shasta County Streets and Highways Code Section 8313 and California Public Utilities Code Section 12808.5 require cities and counties approving electrical transmission and distribution lines of municipal utilities districts to make a finding concerning the consistency of the lines with the general plan.

Reclamation is committed to funding the demolition and relocation of existing infrastructure and construction of replacement infrastructure, including localized WWTPs that might replace some individual septic systems. Reclamation is also committed to facilitating establishment of community services districts and transferring plant ownership to the districts, which would be responsible for long-term operation and management.

Project implementation would result in relocation or modification of utilities infrastructure. The extent of relocation of utilities infrastructure and/or

modification that would be necessary could result in short-term impacts on noise, traffic, and utilities services; and project implementation could result in long-term impacts on land use, wildlife, water quality, and soils. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP1): Short-Term Increase in Solid Waste Generation Project implementation would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant.

Demolition and construction activities would generate waste materials, including concrete, metal, and other materials from the dam renovation; structural metal, concrete, and wood from demolished bridges and buildings; concrete and asphalt from relocated boat launch facilities; unusable recreation equipment from relocated campgrounds and picnic areas; cables, pumps, wiring, and power towers from utility relocations; and scrap material generated as a byproduct of construction. Demolition and construction waste for CP1 would total about 176,627 cubic yards. Reclamation's contractors would take measures to recycle or reuse demolished materials, such as steel or copper wire, where practical. Therefore, some of the demolition and construction waste would be brought to nearby recycling facilities. Hazardous materials (e.g., asbestos, if found) would be brought to an approved hazardous waste landfill for disposal. Much of the underground utilities and service systems proposed for abandonment would be abandoned in place and would not be removed to a landfill or recycling facility.

Table 21-1 provides a summary of project-generated solid waste for the action alternatives.

Table 21-1. Waste Generated by Project Construction

Feature	Estimated Volume (cubic yards)		
	CP1	CP2	CP3, CP4, CP4A, CP5
Vehicle bridge replacements	10,700	10,700	10,700
Doney Creek UPRR bridge replacement	4,718	4,718	4,847
Sacramento River UPRR second crossing	15,558	15,558	15,558
Pit River Bridge piers 3 and 4 protection	0	0	0
Railroad realignment	2,420	2,420	2,420
Major road relocations	10,980	20,659	23,516
Reservoir area utilities (removals/relocations)	1,364	3,251	4,847
Reservoir area recreation (removals/relocations)	99,240	102,076	132,624
Main dam	2,263	1,553	1,553
Outlet works	388	388	388
Spillway	18,305	16,590	12,765
Temperature control device modification	20	20	20
Powerplant and penstocks	0	0	0
Right wing dam	531	511	511
Left wing dam	8,630	8,630	8,630
Visitor Center replacement	1,510	1,510	1,510
Reservoir area dikes	0	0	0
Pit 7 modifications	0	0	0
Total	176,627	188,584	219,889

Key:
CP = Comprehensive Plan
UPRR = Union Pacific Railroad

Two landfills are currently operational in Shasta County: the West Central Landfill and the Anderson Landfill. The West Central Landfill, in the city of Redding, is the closest facility to Shasta Dam and would likely receive the majority of solid waste generated during construction. This landfill has sufficient permitted capacity to accommodate solid waste disposal needs during construction of the project. CP1 would generate roughly 176,627 cubic yards of solid waste; the West Central Landfill has a remaining capacity of approximately 5 million cubic yards, and the Anderson Landfill has a remaining capacity of approximately 11 million cubic yards. Recycling of demolition and construction waste materials would further reduce the volume of waste disposed at landfills.

Three commercial hazardous waste landfills operate in Southern California. Utilities poles, materials containing asbestos or lead-based paints, and transformers containing polychlorinated biphenyls would be sent to one of these landfills or to another EPA-permitted hazardous waste facility.

Solid waste generation by the project would be a short-term impact. Furthermore, accepting the project waste would not impair solid waste facilities that would serve the project. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP1): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, which could cause incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from implementation of the project. Therefore, this impact would be less than significant.

Implementation of the project could increase and enhance recreational opportunities in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River. Additional recreationists could incrementally increase the amount of solid waste generated. Multiple landfills, including the West Central Landfill, the Anderson Landfill, and the Tehama County/Red Bluff Landfill, are located in the project region and have a substantial amount of available capacity. Private transfer stations are located throughout the region as well. These multiple facilities have adequate capacity for disposal of solid waste generated by implementation of the project (CIWMB 2008). Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP1): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply It is reasonable to assume that the increased water supply expected under this alternative would increase demand for construction and operation of water treatment and distribution facilities within the CVP service area. No information is currently available about future water facilities that might be built in response to the expected increase in water supply. Therefore, it is not possible to evaluate the environmental effects of building and operating such facilities. Such an evaluation would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Util-6 (CP1): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities during construction in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP1): Utility Infrastructure Relocation or Modification Construction would not occur outside of the primary study area; therefore, there

would be no relocation or modification of utilities infrastructure in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP1): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation from construction activities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP1): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities resulting from project implementation would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP1): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply It is reasonable to assume that the increased water supply expected under this alternative would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. No information is currently available about future water facilities that might be built in response to the expected increase in water supply. Therefore, it is not possible to evaluate the environmental effects of building and operating such facilities. Such an evaluation would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

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

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP2 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP2): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project implementation could damage public utilities and service systems infrastructure, which could result in short-term disruptions of service. The potential exists for construction activities to damage or interfere with utilities and service systems infrastructure, and thus service, during construction operations. Construction activities would occur in areas proposed for abandonment of utilities or service systems, and implementation of relocation projects could require disruption of public utilities or services to accommodate construction activity. This impact would be potentially significant.

This impact would be similar to Impact Util-1 (CP1). An increase in the height of the dam could result in a larger area of inundation and additional infrastructure and service systems construction activities. Construction activities for CP2 would take longer than for CP1 and would extend the duration of impacts resulting from CP2. CP2 would require the relocation of approximately 5,000 more feet of power lines and about 3,000 more feet of telecommunications lines, and would take approximately 6 more months than CP1. Additional service systems would need to be demolished and/or relocated for CP2.

Project implementation could damage public utilities and service systems infrastructure, or result in short-term disruption of utilities and service systems service. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP2): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utilities infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. This impact would be potentially significant.

This impact would be similar to Impact Util-2 (CP1). An increase in the height of the dam could result in a larger area of inundation, which would result in additional relocation or modification of utilities infrastructure compared to Impact Util-1 (CP1). Construction activities for CP2 would take longer than for CP1 and would extend the duration of impacts resulting from CP2. CP2 would require the relocation of approximately 5,000 more feet of power lines and associated transmission facilities and relocation of about 3,000 more feet of telecommunications lines and associated facilities, and would take approximately 6 more months than CP1. Additional vegetation clearing would also be required to accommodate relocation of infrastructure.

Project implementation could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utilities service. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP2): Short-Term Increase in Solid Waste Generation Project implementation would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant.

This impact would be similar to Impact Util-3 (CP1). An increase in the height of the dam would result in a larger area of inundation, which could result in a greater potential for generation of construction waste materials compared to Impact Util-1 (CP1). CP2 would generate roughly 188,584 cubic yards of solid

waste (see Table 21-1). Similar to CP1, the anticipated increase in the amount of solid waste generated during construction of this alternative would still be sufficiently handled by the three local landfills and permitted hazardous waste landfills. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP2): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, which could cause incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from implementation of the project. Therefore, this impact would be less than significant.

This impact would be similar to Impact Util-4 (CP1). An increase in the height of the dam could result in a larger area of inundation, which could result in more recreationists and greater potential for generation of solid waste materials than with Impact Util-1 (CP1). The anticipated increase in the amount of construction waste generated during long-term operation of this alternative is expected to be sufficiently handled by the three local landfills, which have a substantial amount of available capacity. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP2): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP2 would increase demand for construction and operation of water treatment and distribution facilities. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Util-6 (CP2): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities service during construction in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP2): Utility Infrastructure Relocation or Modification Construction would not occur outside of the primary study area; therefore, there would be no relocation or modification of utilities infrastructure in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP2): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation from construction activities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP2): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities resulting from project implementation would occur only in the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP2): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP2 would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

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

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP3 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP3): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project implementation could damage public utilities and service systems infrastructure, which could result in short-term disruptions of service. The potential exists for construction activities to damage or interfere with utilities and service systems infrastructure, and thus service, during construction operations. Construction activities would occur in areas proposed for abandonment and relocation of utilities or service systems. Project implementation could require disruption of public utilities or services to accommodate construction activity. This impact would be potentially significant.

This impact would be similar to Impact Util-1 (CP1). An increase in the height of the dam could result in a larger area of inundation and additional infrastructure and service systems construction activities. Construction activities for CP3 would take longer than for CP1 and would extend the duration of impacts resulting from CP3. CP3 would require the relocation of approximately 8,000 more feet of power lines and about 6,000 more feet of telecommunications lines and would take approximately 6 more months than

CP1. Additional service systems would need to be demolished and/or relocated for CP3 to prevent inundation.

Project implementation could damage public utility and service systems infrastructure, or result in short-term disruption of utility and service systems service. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP3): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utility infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. This impact would be potentially significant.

This impact would be similar to Impact Util-2 (CP1). An increase in the height of the dam could result in a larger area of inundation, which would result in additional relocation or modification of utility infrastructure compared to Impact Util-1 (CP1). Construction activities for CP3 would take longer than for CP1 and would extend the duration of impacts resulting from CP3. CP3 would require the relocation of approximately 8,000 more feet of power lines and associated transmission facilities and about 6,000 more feet of telecommunications lines and associated facilities; CP3 would take approximately 6 more months than CP1 to implement. Additional vegetation clearing would also be required to accommodate infrastructure relocation.

Project implementation could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP3): Short-Term Increase in Solid Waste Generation Project implementation would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant.

This impact would be similar to Impact Util-3 (CP1). An increase in the height of the dam would result in a larger area of inundation, which could result in a greater potential for generation of construction waste materials compared to Impact Util-1 (CP1). CP3 would generate roughly 219,889 cubic yards of solid waste (see Table 21-1). Similar to CP1, the anticipated increase in the amount of solid waste generated during construction of this alternative would still be sufficiently handled by the three local landfills and permitted hazardous waste landfills. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP3): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, creating incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from implementation of the project. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to Impact Util-4 (CP1). An increase in the height of the dam could result in a larger area of inundation, which could result in more recreationists and greater potential for generation of solid waste materials compared to Impact Util-1 (CP1). The anticipated increase in the amount of solid waste generated during long-term operation of this alternative would be handled by the three local landfills and permitted hazardous waste landfills. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP3): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP3 would increase demand for construction and operation of water treatment and distribution facilities. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta/CVP/SWP Service Areas

Impact Util-6 (CP3): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities service during construction in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP3): Utility Infrastructure Relocation or Modification Construction would not occur outside of the primary study area; therefore, there would be no relocation or modification of utilities infrastructure in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP3): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation from construction activities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP3): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities resulting from project implementation would occur only in the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP3): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP3 would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP4 and CP4A addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP4 and CP4A): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project implementation, including gravel augmentation and habitat restoration activities along the upper Sacramento River, could damage public utilities and service systems infrastructure, which could result in short-term disruptions of service. The potential exists for construction activities to damage or interfere with utilities and service systems infrastructure, and thus service, during construction operations. Construction activities would occur in areas proposed for utilities or service systems abandonment and relocation. Project implementation could require disruption of public utilities or services to accommodate construction activity. This impact would be potentially significant for CP4 and CP4A.

This impact would be similar to Impact Util-1 (CP1). The greater increase in the height of the dam for CP4 or CP4A would result in a larger area of inundation and additional infrastructure and service systems construction activities. Construction activities for CP4 or CP4A would take longer than for CP1 and would extend the duration of impacts resulting from CP4 or CP4A. CP4 or CP4A would require the relocation of approximately 8,000 more feet of power lines and about 6,000 more feet of telecommunications lines and would take approximately 6 more months than CP1. Additional service systems would need to be demolished and/or relocated for CP4 or CP4A to prevent inundation.

Project implementation could damage public utility and service systems infrastructure, or result in short-term disruption of utility and service systems service. Therefore, this impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 21.3.5.

Project implementation could damage public utility and service systems infrastructure, or result in short-term disruption of utility and service systems service. Therefore, this impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP4 and CP4A): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utilities infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Gravel augmentation and habitat restoration activities along the upper Sacramento River might also require relocation or modification of utilities infrastructure. This impact would be potentially significant for CP4 or CP4A.

This impact would be similar to Impact Util-2 (CP1). The greater increase in the height of the dam for CP4 or CP4A would result in a larger area of inundation, which would result in additional relocation or modification of utility infrastructure compared to Impact Util-1 (CP1). Construction activities for CP4 or CP4A would take longer than for CP1 and would extend the duration of impacts resulting from CP4 or CP4A. This would require the relocation of approximately 8,000 more feet of power lines and associated transmission facilities and about 6,000 more feet of telecommunications lines and associated facilities; CP4 or CP4A would take approximately 6 more months than CP1 to implement. Additional vegetation clearing would also be required to accommodate infrastructure relocation.

Project implementation could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Therefore, this impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 21.3.5.

Project implementation could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Therefore, this impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP4 and CP4A): Short-Term Increase in Solid Waste Generation Project implementation, including gravel augmentation and habitat restoration activities along the upper Sacramento River, would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant for CP4 or CP4A.

This impact would be similar to Impact Util-3 (CP3), with a very slight increase in solid waste generation related to downstream restoration construction activities.

Therefore, this impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Therefore, this impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP4 and CP4A): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, which could cause incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from project implementation. Therefore, this impact would be less than significant for CP4 or CP4A.

This impact would be similar to Impact Util-4 (CP1). The greater increase in the height of the dam would result in a larger area of inundation, which could result in more recreationists and greater potential for generation of solid waste materials compared to Impact Util-1 (CP1). The anticipated increase in the amount of solid waste generated during long-term operation of this alternative would be handled by the three local landfills and permitted hazardous waste landfills.

This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP4 and CP4A): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP4 or CP4A would increase demand for construction and operation of water treatment and distribution facilities. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration for CP4 or CP4A and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Util-6 (CP4 and CP4A): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities service in the extended study area.

No impact would occur for CP4. Mitigation for this impact is not needed, and thus not proposed.

No impact would occur for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP4 and CP4A): Utility Infrastructure Relocation or Modification No utility infrastructure relocation or modification would occur outside of the primary study area; therefore, there would be no relocation or modification of utilities infrastructure in the extended study area.

No impact would occur for CP4. Mitigation for this impact is not needed, and thus not proposed.

No impact would occur for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP4 and CP4A): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation in the extended study area.

No impact would occur for CP4. Mitigation for this impact is not needed, and thus not proposed.

No impact would occur for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP4 and CP4A): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities resulting from project implementation would occur only in the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area.

No impact would occur for CP4. Mitigation for this impact is not needed, and thus not proposed.

No impact would occur for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP4 and CP4A): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP4 or CP4A would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration for CP4 or CP4A and is, therefore, not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP5 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP5): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project implementation, including gravel augmentation and the habitat restoration activities along the upper Sacramento River, could damage public utilities and service systems infrastructure, which could result in short-term disruptions of service. The potential exists for construction activities to damage or interfere with utilities and service systems infrastructure, and thus service, during construction operations. Construction activities would occur in areas proposed for abandonment and relocation of utilities or service systems. Project implementation could require disruption of public utilities or services to accommodate construction activity. This impact would be potentially significant.

This impact would be similar to Impact Util-1 (CP1) and identical to Impact Util-1 (CP4 and CP4A). Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP5): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utilities infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Gravel augmentation and the habitat restoration activities along the upper Sacramento River might also require relocation or modification of utilities infrastructure. This impact would be potentially significant.

This impact would be similar to Impact Util-2 (CP1) and identical to Impact Util-2 (CP4 and CP4A). Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP5): Short-Term Increase in Solid Waste Generation Project implementation, including gravel augmentation and habitat restoration activities along the upper Sacramento River, would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant.

This impact would be similar to Impact Util-3 (CP4 and CP4A), with a very slight increase in solid waste generation related to enhancement of tributary and warm-water habitat and recreational trails. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP5): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, which could cause incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from implementation of the project. Therefore, this impact would be less than significant.

This impact would be similar to Impact Util-4 (CP1) and identical to Impact Util-4 (CP4 and CP4A). Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP5): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP5 would increase demand for construction and operation of water treatment and distribution facilities. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Util-6 (CP5): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities service in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP5): Utility Infrastructure Relocation or Modification No utility infrastructure relocation or modification would occur outside of the primary study area; therefore, there would be no relocation or modification of utilities infrastructure in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP5): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP5): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities caused by project implementation would occur only in the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP5): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP5 would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

21.3.5 Mitigation Measures

Table 21-2 presents a summary of mitigation measures for utilities and service systems.

Table 21-2. Summary of Mitigation Measures for Utilities and Service Systems

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Util-1: Damage to or Disruption of Public Utility and Service Systems Infrastructure (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Util-1: Implement Procedures to Avoid Damage to or Temporary Disruption of Service.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Util-2: Utility Infrastructure Relocation or Modification (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Util-2: Adopt Measures to Minimize Infrastructure Relocation Impacts.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Util-3: Short-Term Increase in Solid Waste Generation (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Util-4: Increases in Solid Waste Generation from Increased Recreational Opportunities (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 21-2. Summary of Mitigation Measures for Utilities and Service Systems (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Util-5: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	TS	TS	TS	TS	TS
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	NI	TS	TS	TS	TS	TS
Impact Util-6: Damage to or Disruption of Public Utility and Service Systems Infrastructure (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	N/A	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	NI	NI	NI	NI	NI
Impact Util-7: Utility Infrastructure Relocation or Modification (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	N/A	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	NI	NI	NI	NI	NI
Impact Util-8: Short-Term Increase in Solid Waste Generation (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	N/A	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	NI	NI	NI	NI	NI
Impact Util-9: Increases in Solid Waste Generation from) Increased Recreational Opportunities (Lower Sacramento River, Delta, CVP/SWP Service Areas	LOS before Mitigation	N/A	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	NI	NI	NI	NI	NI
Impact Util-10: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	N/A	TS	TS	TS	TS	TS
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	TS	TS	TS	TS	TS

Key:
B = beneficial
LOS = level of significance
LTS = less than significant
N/A = not applicable
NI = no impact
PS = potentially significant
S = significant

No-Action Alternative

No mitigation is required for the No-Action Alternative.

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

No mitigation is required for Impacts Util-3 (CP1) through Util-10 (CP1). Mitigation is provided below for other impacts of CP1 on utilities and service systems.

Mitigation Measure Util-1 (CP1): Implement Procedures to Avoid Damage to or Temporary Disruption of Service To avoid temporary disruption of service, the following measures will be implemented during project construction to ensure that existing utilities infrastructure is not damaged:

- **Permits** – Reclamation will obtain utilities excavation or encroachment permits as necessary before initiating any work with potential to affect utility lines and will include all necessary permit terms in construction contract specifications.

- **Locating Line** – Utility locations will be identified through field surveys and the use of the Underground Service Alert services. Any buried utility lines will be clearly marked before initiation of any ground-disturbing construction activity.

- **Clearing Right-of-Way and Road Access** – If necessary, infrastructure will be removed or reinforced in coordination with all potential service providers known to have, or potentially having, utilities infrastructure in the project area.

- **Response Plan** – The construction contractor will prepare a response plan to address potential accidental damage to utility lines before the start of construction. The plan will identify chain of command rules for notification of authorities and affected businesses and will identify appropriate actions and responsibilities to ensure the safety of the public and workers. The response plan will be circulated to the potentially affected service system providers for review and approval before the start of construction activities. Worker education training in response to such situations will be conducted by the contractor.

Implementation of this mitigation measure would reduce Impact Util-1 (CP1) to a less-than-significant level.

Mitigation Measure Util-2 (CP1): Adopt Measures to Minimize Infrastructure Relocation Impacts For each segment of a utility line that would need to be relocated or modified as a result of project construction and operations, the following measures will be implemented:

- **Permits** – Reclamation will obtain utilities excavation or encroachment permits as necessary before initiating any work associated with modification or relocation of an existing utility line and will include all necessary permit terms in construction contract specifications.

- **Locating and Staking Line** – Locations for relocated utility lines will be identified in coordination with affected service providers. Reclamation will consider co-locating and undergrounding relocated utility lines to the extent practicable. As part of this effort, field surveys will be conducted and the Underground Service Alert services will be used to ensure that there are no conflicts with other existing utility lines. After the alignment of the line has been finalized, a survey will be made to map the route of the line. The results of the survey will be plan and profile drawings, which will be used to spot the poles. After exact positions have been fixed, a stake will be driven to indicate the center of the structure or pole.

- **Clearing Right-of-Way and Road Access** – The right-of-way will be cleared of all obstructions that will interfere with the operation of the power line. A strip of land will be cleared on each side of the centerline of the transmission line by cutting or trimming the trees and brush. All trees and brush should be cut 3 inches or less from the ground line so that the passage of trucks and tractors will not be hindered. The cut trees and brush will be disposed of by chipping or spreading, burning, or hauling away. Disposal of the debris by burning, or otherwise, will be accomplished in accordance with State and local laws and regulations without creating a hazard or nuisance. The right-of-way should be treated with chemical spray to retard the growth of brush or trees that could endanger the operation of the transmission line.

- **Installing Pole Footings and Foundations** – Pole sites will be properly graded in accordance with the specifications. Usually the slope of the grade will not be more than 3:1. All topsoil should be removed before grading the pole location.

- **Utilities Modification Plan** – The construction contractor will prepare a utilities modification and relocation plan before the start of construction. The plan will identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers and include a description of how utilities infrastructure will be modified or relocated and identification of precise alignment where utility lines will be relocated. The plan will be circulated to the potentially affected service system providers for review and approval before the start of construction activities. Worker education training in response to such situations will be conducted by the contractor.

- The contractor will stage utility line modifications and relocations in a manner that minimizes interruption of service.

- In accordance with the STNF LRMP, relocated power lines less than 35 kV and telephone lines on USFS land within the STNF will be buried unless the STNF VQO can be met without burying, geologic conditions make burying infeasible, or burying will produce greater long-term site disturbance.

- **Traffic Control and Safety Assurance Plan** – Reclamation will implement Mitigation Measure Trans-1 as described in EIS Chapter 20, "Transportation and Traffic," to reduce adverse effects of road closures and detours or partial road closures on access to local streets and adjacent uses.

Implementation of this mitigation measure would reduce Impact Util-2 (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 Util-3 (CP2) through Util-10 (CP2). Mitigation is provided below for other impacts of CP2 on utilities and service systems.

Mitigation Measure Util-1 (CP2): Implement Procedures to Avoid Damage to or Temporary Disruption of Service This mitigation measure is identical to Mitigation Measure Util-1 (CP1). Implementation of this mitigation measure would reduce Impact Util-1 (CP2) to a less-than-significant level.

Mitigation Measure Util-2 (CP2): Adopt Measures to Minimize Infrastructure Relocation Impacts This mitigation measure is identical to Mitigation Measure Util-2 (CP1). Implementation of this mitigation measure would reduce Impact Util-2 (CP2) to a less-than-significant level.

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

No mitigation is required for Impacts Util-3 (CP3) through Util-10 (CP3). Mitigation is provided below for other impacts of CP3 on utilities and service systems.

Mitigation Measure Util-1 (CP3): Implement Procedures to Avoid Damage to or Temporary Disruption of Service This mitigation measure is identical to Mitigation Measure Util-1 (CP1). Implementation of this mitigation measure would reduce Impact Util-1 (CP3) to a less-than-significant level.

Mitigation Measure Util-2 (CP3): Adopt Measures to Minimize Infrastructure Relocation Impacts This mitigation measure is identical to

Mitigation Measure Util-2 (CP1). Implementation of this mitigation measure would reduce Impact Util-2 (CP3) to a less-than-significant level.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation is required for Impacts Util-3 (CP4 and CP4A) through Util-10 (CP4 and CP4A). Mitigation is provided below for other impacts of CP4 or CP4A on utilities and service systems.

Mitigation Measure Util-1 (CP4 and CP4A): Implement Procedures to Avoid Damage to or Temporary Disruption of Service This mitigation measure is identical to Mitigation Measure Util-1 (CP1). Implementation of this mitigation measure would reduce Impact Util-1 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Util-2 (CP4 and CP4A): Adopt Measures to Minimize Infrastructure Relocation Impacts This mitigation measure is identical to Mitigation Measure Util-2 (CP1). Implementation of this mitigation measure would reduce Impact Util-2 (CP4 and CP4A) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is required for Impacts Util-3 (CP5) through Util-10 (CP5). Mitigation is provided below for other impacts of CP5 on utilities and service systems.

Mitigation Measure Util-1 (CP5): Implement Procedures to Avoid Damage to or Temporary Disruption of Service This mitigation measure is identical to Mitigation Measure Util-1 (CP1). Implementation of this mitigation measure would reduce Impact Util-1 (CP5) to a less-than-significant level.

Mitigation Measure Util-2 (CP5): Adopt Measures to Minimize Infrastructure Relocation Impacts This mitigation measure is identical to Mitigation Measure Util-2 (CP1). Implementation of this mitigation measure would reduce Impact Util-2 (CP5) to a less-than-significant level.

21.3.6 Cumulative Effects

Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences,” gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, “Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area,” in Chapter 3, lists the projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table

3-1 under Quantitative Analysis would have effects on utilities or service systems in the primary study area or have effects in extended study area that contribute to cumulative impacts of the SLWRI since no impacts have been identified in the extended study area. This analysis is based on the projects listed in Table 3-1 under Qualitative Analysis.

Past, present, and reasonably foreseeable future projects (see Table 3-1) would generate construction-related solid waste. Example projects in the Study Area include the Moody Quarry Flats, Mountain Gate at Shasta Mixed-Use Area Plan, and the Antlers Bridge Replacement. As discussed in Impact Util-3 (CP1–CP5), affected landfills have sufficient capacity to accommodate project-generated solid waste, and are also expected to have sufficient capacity to accommodate reasonably foreseeable development in addition to project waste. Therefore, none of the action alternatives would contribute to cumulative effects related to solid waste disposal.

Implementing the proposed SLWRI alternatives would not have a significant cumulative effect on utilities and service systems in the primary study area. As discussed above, construction activities associated with CP1–CP5 could inadvertently damage utilities and public service systems infrastructure. In addition, utilities and service systems could be temporarily disrupted to accommodate construction activities. These effects would be of greater magnitude and longer in duration with the larger dam raises. Thus, the effects of CP2 would be similar to but greater than those of CP1 and similar to but less than those of CP3–CP5. Although Mitigation Measure Util-1 would reduce these project-level effects, they would not be eliminated. In addition to the projects identified by the City of Shasta Lake (Moody Flats Quarry EIR and Mountain Gate at Shasta Mixed-Use Area Plan EIR) in their comments on the DEIS, there are two present or reasonably foreseeable future actions, the Antlers Bridge replacement and the Iron Mountain Restoration Plan located in the immediate vicinity of Shasta Lake. With respect to projects currently undergoing CEQA review, these projects are still in the planning phase and there is uncertainty as to what if any action alternatives may be selected, therefore they are not considered as reasonably foreseeable. The Antlers Bridge and Iron Mountain project do have the potential to damage or disrupt utilities and public service systems infrastructure. The Antlers Bridge replacement is currently under construction and is expected to be completed in 2015, which is before implementation of any of the action alternatives would begin. With respect to the Iron Mountain Mine Restoration Plan, it is unlikely that this activity would occur simultaneously with the action alternatives. Therefore, construction activities related to implementation of the proposed SLWRI alternatives would not contribute considerably to significant cumulative impacts related to utility impacts.

The effects of CP1–CP5 on utilities and service systems would diminish with distance from the project construction sites and would also not have

cumulatively considerable effects on utilities and public service systems downstream from Red Bluff (i.e., in the extended study area).

Chapter 22
Public Services

22.1 Affected Environment

This section describes the affected environment related to public services for the dam and reservoir modifications proposed under SLWRI action alternatives. The public services addressed are fire protection, emergency services, law enforcement, and schools. Utilities, sewer services, and water supply are analyzed in Chapter 21, "Utilities and Service Systems," of this EIS.

Because of the potential influence of the proposed modification of Shasta Dam and water deliveries over a large geographic area, the SLWRI includes both a primary study area and an extended study area. The primary study area has been further divided into the Shasta Lake and vicinity portion and the upper Sacramento River (Shasta Dam to Red Bluff) portion. The extended study area has been further divided into the lower Sacramento River and Delta portion, and the CVP/SWP service areas portion.

The public services setting for Shasta Lake and vicinity consists of the portion of Shasta County above Shasta Dam. Public services needs in this region are influenced by rugged, mountainous terrain, rural lakeside communities, and Shasta Lake. The public services setting for the upper Sacramento River portion of the primary study area consists of Shasta County below Shasta Dam and Tehama County. Public services needs in this area are influenced by topography and population densities. Four incorporated cities—the Cities of Shasta Lake, Redding, Anderson, and Red Bluff—create an urban setting in the otherwise rural upper Sacramento Valley, which is characterized by rolling hills with mountains to the north, east, and west.

The public services setting for the extended study area consists of 24 counties downstream from Red Bluff and encompasses all areas served by the CVP and the SWP.

Table 22-1 lists the public service providers considered in this EIS.

Table 22-1. Key Public Service Providers

Fire Protection Services
U.S. Forest Service
California Department of Forestry and Fire Protection
Shasta County Fire Department
Tehama County Fire Department
Redding Fire Department
Shasta Lake Fire Protection District
Anderson Fire Protection District
Red Bluff Fire Department
Corning Volunteer Fire Department
Emergency Services
California Highway Patrol
California Office of Emergency Services
Shasta County Sheriff's Office
Tehama County Sheriff's Department
Shasta Area Safety Communications Agency
Shasta Regional Medical Center
Mercy Medical Center Redding
Shasta Community Health Center
St. Elizabeth Community Hospital
Law Enforcement
U.S. Forest Service
U.S. Bureau of Land Management
California Highway Patrol
California Department of Fish and Wildlife
Shasta County Sheriff's Office
Tehama County Sheriff's Department
Red Bluff Police Department
Corning Police Department
Schools
Gateway Unified School District

22.1.1 Fire Protection Services

Fire protection services consist of fire suppression, emergency dispatching, specialized training, fire prevention, fire safety education, and emergency medical response. Chapter 9 (Hazards and Hazardous Materials and Waste) describes the fire risk and provides historic fire data for the primary and extended study areas.

Shasta Lake and Vicinity

The Shasta County Fire Department (SCFD) and the California Department of Forestry and Fire Protection (Cal Fire) respond to nonwildland fires in the Shasta Lake and vicinity portion of the primary study area. The Shasta Lake Fire Protection District (SLFPD) is the first responder in the event of an emergency within the City of Shasta Lake. Nonwildland fires consist of structural, chemical, petroleum, electrical, vehicle, and other fires that involve human-made materials. Cal Fire and USFS are responsible primarily for wildland fires, which consist of fires in vegetated areas such as forests, chaparral, and grassland.

Cal Fire and USFS generally respond according to established jurisdictional boundaries. Under an agreement with the U.S. Department of the Interior, Bureau of Land Management (BLM), Cal Fire provides fire protection resources for lands managed by BLM throughout the primary study area. Additionally, a fire protection agreement between Cal Fire and USFS provides for the sharing of fire protection resources to augment the capabilities of each agency (USFS 1995). In practice, SCFD, Cal Fire, and USFS provide mutual assistance when needed.

The National Interagency Fire Center, located in Boise, Idaho, assists with wildland fire suppression nationwide. The center represents a collaboration among seven Federal agencies: the Bureau of Indian Affairs, BLM, USFS, USFWS, the National Park Service, the National Weather Service, and the Office of Aircraft Services. These agencies work together to coordinate and support wildland fire and disaster operations. Cal Fire and the California Emergency Management Agency (Cal EMA) (formerly Governor's Office of Emergency Services (OES)) work closely with these agencies to manage wildland fire operations.

Upper Sacramento River (Shasta Dam to Red Bluff)

Fire protection services in the upper Sacramento River portion of the primary study area are similar to those in the Shasta Lake and vicinity portion. SCFD and the Tehama County Fire Department (TCFD) are responsible primarily for nonwildland fires, and Cal Fire and USFS respond primarily to wildland fires.

In Shasta County, the Redding Fire Department, SCFD, and Cal Fire have mutual aid agreements to ensure adequate fire protection services and to share resources. Under these agreements, the agencies respond to emergencies in Shasta County that are in adjacent jurisdictions.

Fire departments serving the unincorporated areas of Shasta County include 1 SCFD station that is housed in Redding, 12 community fire districts, and 19 volunteer fire companies. Cal Fire operates several fire stations during the off-season winter months, through an agreement with BLM and local fire departments. The community fire districts operate autonomously; the remaining

fire departments, fire stations, and the Shasta County Fire District fall under the jurisdiction of SCFD.

The Cities of Shasta Lake, Redding, and Anderson are incorporated cities in Shasta County. Fire protection in Redding is provided by the Redding Fire Department, which has 8 fully equipped stations and 72 full-time employees. The SLFPD provides fire protection with the City of Shasta Lake, supported by 3 fire stations with 27 employees. The Anderson Fire Protection District provides service to Anderson and operates 2 fire stations with 15 employees.

Shasta and Tehama counties share fire protection resources along their shared county line, through a mutual aid agreement. Like SCFD, TCFD has mutual aid agreements with local fire protection agencies that operate in the county. One difference between Shasta and Tehama counties is the level of integration with Cal Fire: TCFD is fully integrated with Cal Fire, which administers fire protection services in all unincorporated areas of the county except for the areas covered by the Gerber and Capay fire protection districts.

TCFD provides fire protection services for the residents of Tehama County through a network of 16 fire stations and 15 volunteer fire companies. Five of the stations, Los Molinos, Corning, Bowman, El Camino, and Antelope, are staffed 24 hours a day, year round. The distribution of stations places most residents of Tehama County within 5 road miles of a responding fire station.

Red Bluff and Corning are incorporated cities in Tehama County; both cities provide fire protection services for their residents. Fire protection in Red Bluff is provided by the Red Bluff Fire Department. The Corning Volunteer Fire Department, which employs full-time staff assisted by volunteers, provides fire protection for the incorporated area of Corning.

Other fire protection services in Tehama County include the Gerber Fire Protection District, Lassen Volcanic National Park, Capay Fire Protection District, and Cottonwood Fire Protection District.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Fire protection services in the extended study area are similar to those discussed for the primary study area. However, urban population densities are higher in parts of the extended study area, which influences the types and extent of the fire protection services that are provided. Cities and counties in the extended study area provide fire protection services primarily for nonwildland fires, and Cal Fire and USFS provide fire protection services primarily for wildland fires.

22.1.2 Emergency Services

Emergency services consist of emergency preparation, response, and recovery efforts. Emergencies range from calls for medical assistance to individuals, to large-scale disasters, such as evacuations resulting from wildland fires and floods.

Shasta Lake and Vicinity

The Shasta County Sheriff's Office (SCSO) is responsible for coordinating emergency services on Shasta Lake and in the unincorporated areas of Shasta County upstream from Shasta Dam. Large-scale emergency services are handled by SCSO, in cooperation with the State emergency response network run by Cal EMA. As of 1996, OES (now Cal EMA) had designated emergency service "Operational Areas" for all California counties, cities, and special districts (e.g., school, water, and waste reclamation districts). Shasta Lake and vicinity is located in the Region 3 Operational Area, which consists of 12 Northern California counties. Emergency services providers can be called on to assist with emergencies that occur in their designated region and to assist the Central and South emergency services regions. Cal Fire, USFS, BLM, the Federal Emergency Management Agency, and the American Red Cross also provide assistance in large-scale emergencies.

SCSO provides emergency services, including patrol boats and deputies, at Shasta Lake from a substation at Bridge Bay Marina. Medical aid is provided by Shasta County fire departments and private ambulance companies, including land and air ambulance services, based in the Redding area.

Upper Sacramento River (Shasta Dam to Red Bluff)

Emergency services in the upper Sacramento River area are similar to those described in the previous section. SCSO is responsible for coordinating emergency services in the Shasta County part of the upper Sacramento River area, and the Tehama County Sheriff's Department is responsible for coordinating emergency services in the Tehama County part. Both county agencies coordinate emergency services with Cal EMA and serve as the emergency services headquarters during declared public emergencies.

A number of emergency services agencies in Shasta County have formed a joint-powers agency, called the Shasta Area Safety Communications Agency, to consolidate emergency services related to fire, medical services, and law enforcement. Current participants include the Redding Fire Department, the Redding Police Department, and SCSO. American Medical Response, Redding Medical Center, and Mercy Medical Center in Redding participate in the Shasta Area Safety Communications Agency under a contractual agreement for ambulance services. Emergency medical response is also provided by St. Elizabeth Community Hospital in Red Bluff.

The Tehama County Sheriff's Department is responsible for emergency services coordination in Tehama County. In addition, TCFD responds to some medical emergencies in Tehama County.

The California Highway Patrol (CHP), Northern Division, provides ground and air support for emergencies along the Interstate 5 (I-5) corridor and State highways throughout the primary study area. CHP maintains two A-star helicopters and two Cessna airplanes that are used to assist other agencies with search and rescue, and fire response. In addition, CHP assists with traffic control during emergencies.

Emergency services in the upper Sacramento River area are also supplemented by Cal Fire, USFS, the Federal Emergency Management Agency, and the American Red Cross.

Several hospitals and other facilities in Shasta and Tehama County provide emergency and urgent care services. Shasta Regional Medical Center, Mercy Medical Center Redding, and Shasta Community Health Center are located in Redding and serve the Shasta Lake and Redding areas. St. Elizabeth Community Hospital is located in Red Bluff and serves Tehama County.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Emergency services in the extended study area are similar to those discussed for the primary study area. Cities and counties in the extended study area are primarily responsible for providing emergency services, and they receive assistance from regional, State, and Federal agencies for emergencies that require resources beyond the capability of the local jurisdiction.

22.1.3 Law Enforcement

Law enforcement services consist of crime prevention, investigation, and apprehension of lawbreakers and include duties to keep the peace and protect life and property. Law enforcement agencies often enter into cooperative aid agreements with neighboring or overlapping law enforcement jurisdictions to consolidate resources and facilitate communication.

Shasta Lake and Vicinity

Law enforcement services in the Shasta Lake and vicinity portion of the primary study area are provided by SCSO, CHP, CDFW, BLM, and USFS. In general, the nature of an offense or law enforcement duty establishes jurisdiction. SCSO has primary responsibility for conflicts between people and most violations of State law, CHP handles most traffic violations, CDFW enforces State fish and game laws, and BLM/USFS handle violations of Federal law.

Agencies responsible for law enforcement on Shasta Lake and the surrounding area carry out their duties from several locations. SCSO operates a substation in the City of Shasta Lake with nine assigned deputies and another substation in Lakehead with two resident deputies. Because of the nature and volume of human activity around Shasta Lake, SCSO also maintains a substation at Bridge Bay Marina, located on the main dock above the store. SCSO's boat dock is located on the main dock near the substation. Services provided by SCSO include search and rescue, safety patrol boats, boating safety education, emergency services, and animal control.

USFS and BLM use Federal law enforcement officers with jurisdiction on Federal lands. USFS and BLM do not assume the Sheriff's responsibilities; instead, they enforce the Federal codes that govern public behavior on lands managed by USFS and BLM. The CDFW Northern District enforcement unit is based in Redding and provides law enforcement related to State fish and game laws in Shasta, Trinity, and Tehama counties.

Traffic law enforcement along I-5, State routes, and State highways is provided primarily by the Northern Division of CHP. CHP operates several offices in the primary study area, including offices in Redding and Red Bluff.

Upper Sacramento River (Shasta Dam to Red Bluff)

Reclamation's Security, Safety and Law Enforcement (SSLE) Office, located in Denver, is responsible for protecting the public, Reclamation employees, and Reclamation facilities through the development and implementation of an integrated security, safety, and law enforcement program. The SSLE Office manages security, safety, and law enforcement for Reclamation programs and projects such as Shasta Dam; develops Reclamation-wide policies and guidelines governing these programs; and provides oversight of program execution in Reclamation field offices.

SCSO provides law enforcement services for the unincorporated areas of Shasta County. County law enforcement operations are based in Redding. Sheriff substations are located in Burney, the City of Shasta Lake, and Shingletown. The incorporated cities of Redding and Anderson provide law enforcement services for their residents. USFS and BLM use Federal law enforcement officers with jurisdiction on Federal lands.

The Tehama County Sheriff's Department office is located in Red Bluff. The sheriff is the chief law enforcement officer of Tehama County, with jurisdiction throughout the unincorporated county, the incorporated cities, and State-owned property. The incorporated cities of Red Bluff and Corning provide law enforcement services for their residents.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Law enforcement services in the extended study area are similar to those discussed for the primary study area. Counties maintain sheriff's departments that have jurisdiction within the county boundaries, and incorporated cities maintain police departments that have jurisdiction within the city limits. However, urban population densities are higher in parts of the extended study area, which influences the types and extent of law enforcement services provided. USFS and BLM use Federal law enforcement officers with jurisdiction on Federal lands.

22.1.4 Schools

School districts are autonomous entities responsible for providing educational services for elementary, middle school, and high school students. Districts elect their own governing boards and appoint their own superintendents. County offices of education assist the school districts with administrative and curricular support.

Shasta Lake and Vicinity

No schools are located in the Shasta Lake and vicinity portion of the primary study area. The Gateway Unified School District serves residents in this area and previously operated Canyon Elementary in Lakehead. This school, however, is currently closed.

Upper Sacramento River (Shasta Dam to Red Bluff)

School districts in the upper Sacramento River area serve students in levels kindergarten through grade 12. Shasta County is served by 25 school districts, and Tehama County is served by 21 school districts. The California Community College system provides continuing education services at locations in Shasta County and Tehama County. Simpson University, located in Redding, also provides college-level educational services.

The Gateway Unified School District operates several schools in Shasta County. Mountain Lakes High School (grades 10 through 12) and Shasta Lake Alternative School (kindergarten through grade 12) are located at the northeast corner of the intersection of Lake Boulevard and Shasta Dam Boulevard.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Educational services in the extended study area are similar to those discussed for the primary study area. Cities and counties form school districts to provide educational services for children between 6 and 18 years of age. Numerous community colleges and 4-year colleges and universities are also located in the extended study area. Urban population densities are higher in parts of the extended study area, which influences the variety of educational services provided.

22.2 Regulatory Framework

22.2.1 Federal

Shasta-Trinity National Forest Land and Resource Management Plan
USFS personnel conduct their responsibilities for regulating the use of and protecting national forest lands under Title 36 and sections of Titles 16, 18, and 21 of the Code of Federal Regulations. Public services directives from the Code of Federal Regulations are integrated into the Shasta-Trinity National Forest Land and Resource Management Plan (LRMP), which includes the following topics: fire and fuels management, facilities management, law enforcement, and land management.

The LRMP identifies goals, standards, and guidelines related to public services in Shasta-Trinity National Forest. The following goals, standards, and guidelines related to public services in Shasta-Trinity National Forest have been excerpted from the LRMP (USFS 1995):

Fire and Fuels Goals (LRMP, p. 4-4)

- Achieve a balance of fire suppression capability and fuels management investments that are cost effective and able to meet ecosystem objectives and protection responsibilities.

Fire and Fuels Standards and Guidelines (LRMP, p. 4-17)

- Wildland fires will receive an appropriate suppression response that may range from confinement to control. Unless a different suppression response is authorized in this plan, or subsequent approved plans, all suppression responses will have an objective of “control.”

- All wildland fires, on or threatening private land protected by agreement with the State of California, will receive a “control” suppression response.

- Fire prevention efforts will be designed to minimize human-caused wildfires commensurate with the resource values at risk.

Facilities Goals (LRMP, p. 4-4)

- Provide and maintain those administrative facilities that effectively and safely serve the public and USFS workforce.

Facilities Standards and Guidelines (LRMP, p. 4-17)

- Manage, construct, and maintain buildings and administrative sites to meet applicable codes and to provide the necessary facilities to support resource management.

- Closure of roads and/or selected areas to assist in management of Forest resources may be made by regulatory and/or physical devices on the road for the following purpose[s]: safety, fire, and general administrative purposes.

Law Enforcement Goals (LRMP, p. 4-5)

- Establish priority in law enforcement activities as follows: (a) provide for employee and public safety, (b) protect resources and property, (c) provide for the accomplishment of management objectives, and (d) prevent violation of laws and associated loss and damage.

Law Enforcement Standards and Guidelines (LRMP, p. 4-21)

- Protect the public interest by a thorough and aggressive program of violation prevention, violation detection, investigation and apprehension of violators, and prosecution.

U.S. Bureau of Land Management Resource Management Plan

BLM manages a number of public lands adjacent to the Sacramento River corridor downstream from Shasta Dam. The study area falls under two BLM districts (Northern California and Central California) and the resource management plans (RMP) of three BLM field offices: Redding, Ukiah, and Mother Lode (BLM 2006a). The purpose of BLM's RMPs is to provide overall direction for managing and allocating public resources in each planning area. The RMP for the Redding field office states that any fire occurring on public lands would be suppressed.

22.2.2 State

Standardized Emergency Management Systems

The Standardized Emergency Management Systems law (Government Code Section 8607) directs Cal EMA (formerly OES) to establish, implement, and maintain a coordinated emergency response system. The California Mutual Aid Agreement defines responsibilities and resource sharing between agencies to ensure that adequate resources, facilities, and other support are provided to jurisdictions when their own resources are insufficient to cope with the needs of a given emergency.

California Education Code

The California Education Code provides educational goals and requirements for the educational providers in the state (Title 5 of the California Code of Regulations). It governs school district formation and operation, county board of education authorities and responsibilities, and educational criteria for children between 6 and 18 years of age.

California Fire Plan

The California Fire Plan provides guidance for reducing the risk of wildfire. The following are the basic principles of the fire plan:

- Community involvement
- Community risk assessment
- Development of solutions and implementation of projects

22.2.3 Regional and Local

Shasta County General Plan

The *Shasta County General Plan* (Shasta County 2004) identifies goals, objectives, and policies related to public services in Shasta County. Fire protection and law enforcement services are discussed in the section titled "Fire Safety and Sheriff Protection." Schools are discussed in the section titled "Public Facilities."

Tehama County General Plan Update 2009–2029

The *Tehama County General Plan Update 2009–2029* (Tehama County 2009) identifies goals, objectives, and policies for public services in Tehama County. The public services element of the general plan addresses concerns associated with growth and development as they relate to public services, including schools. The safety element addresses potential dangers and damages associated with fire, floods, earthquakes, landslides, and other hazards.

22.3 Environmental Consequences and Mitigation Measures

22.3.1 Methods and Assumptions

This section addresses potential impacts associated with implementation of the project on the following public services: law enforcement, fire protection, emergency services, and schools. The analysis is based on a review of planning documents applicable to the project area, consultation with various agencies, and field reconnaissance.

22.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with the 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 EIS must be prepared. An environmental document prepared to comply with the CEQA must identify the potentially significant environmental effects of a 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 are based on guidance provided by the State CEQA Guidelines and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative on public services would be significant if project implementation would do any of the following:

- Interfere with emergency services
- Degrade the level of service of a public service
- Require relocating public service facilities
- Require substantial improvements to the facilities or level of staffing of a public service to maintain its existing level of service

22.3.3 Topics Eliminated from Further Consideration

No topics were eliminated from consideration.

22.3.4 Direct and Indirect Effects

No-Action Alternative

The impact discussion for the No-Action Alternative addresses Shasta Lake and vicinity and the upper Sacramento River together because this alternative would not affect land use in any of the primary study area locations. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because the distance from the project area would result in similar impacts.

Shasta Lake and Vicinity, Upper Sacramento River (Shasta Dam to Red Bluff), Lower Sacramento River and Delta, and CVP/SWP Service Areas

Impact PS-1 (No-Action): Disruption of Public Services Under the No-Action Alternative, no new facilities would be constructed in the primary or extended study areas, and no changes in Reclamation's existing facilities or operations would occur that would directly or indirectly result in the disruption of public services in the project area. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

Impact PS-2 (No-Action): Degraded Level of Public Services Under the No-Action Alternative, no new facilities or infrastructure would be constructed in the primary or extended study areas and no changes in Reclamation's existing facilities or operations would occur that would directly or indirectly result in degraded levels of public services in the project area. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

Impact PS-3 (No-Action): Relocation of Public Service Facilities Under the No-Action Alternative, no new facilities would be constructed in the primary or extended study areas and no changes in Reclamation's existing facilities or

operations would occur that would directly or indirectly result in the relocation of public service facilities in the project area. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

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

The impact discussion for CP1 addresses Shasta Lake and vicinity and upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP1): Short-Term Disruption of Public Services Project construction could result in short-term disruption of emergency services response as well as short-term disruption to school bus services throughout the Gateway Unified School District. Short-term traffic delays and access restrictions would require traffic controls and coordination with public services agencies. Although Reclamation would implement measures to lessen short-term disruption of public services, this impact would be potentially significant.

Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies, including food and shelter for emergency crews and public services staff, could also be affected by project implementation because of temporary increases in the work force.

Direct impacts could include disruption of traffic flows and street operations through temporary lane closures, detours, blockages, and restrictions on curbside parking; these impacts could result in delays for emergency services vehicles and school buses traveling through or around construction zones. In addition, project construction could cause short-term interruptions in power and telecommunications services, which could affect emergency response capabilities in the primary study area.

Construction activities that could disrupt emergency services and school bus service in the primary study area include road and bridge replacement, telecommunications facility replacement, power facility replacement, vegetation clearing for utility relocation, structure removal, marina relocation, and emergency services facility relocation. Reclamation estimates that construction activities for CP1 would take 4.5 years.

Routes proposed for transporting construction materials to the dam consist of I-5 and local roads, particularly Shasta Dam Boulevard and Lake Boulevard. These routes are used primarily by Reclamation personnel to access the Shasta Dam facilities, by visitors and tourists, and by residents of the City of Shasta Lake. At this time, no detours or lane closures are proposed for the portions of Shasta Dam Boulevard and Lake Boulevard that serve the City of Shasta Lake. Road closures would likely be required adjacent to the facilities in the immediate vicinity of Shasta Dam and Reclamation's Northern California Area Office.

The Gateway Unified School District covers Shasta Lake and vicinity and portions of the upper Sacramento River area. Project construction could result in traffic delays and the need to reroute local traffic to ensure public health and safety. School bus routes could be temporarily affected by road closures and detours during project construction in communities around Shasta Lake.

Several roads around Shasta Lake would be affected by infrastructure, utility, and marina relocation activities. These activities could require road closures, detours, or traffic restrictions.

Emergency supplies and resources that could be affected by project implementation include food, shelter for emergency crews and local residents, and public services staff and equipment. Project construction activities are located within commuting distance of Redding, where ample food and shelter are available in emergencies. The Cal EMA network could supplement local emergency services staffing and equipment levels. However, Cal EMA may not be able to provide assistance when wildfires in the state require Cal EMA resources.

Construction activities at Shasta Dam and various locations surrounding Shasta Lake could affect emergency response capabilities throughout Shasta County (i.e., in a portion of the upper Sacramento River area) because the areas share emergency services resources and responsibilities.

In summary, project construction could result in short-term disruption of school bus services throughout the Gateway Unified School District. Short-term traffic delays and access restrictions would require traffic controls and coordination with public services agencies. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP1): Degraded Level of Public Services Project implementation could temporarily degrade local public resources. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services would not be substantially degraded by construction activities, this impact would be potentially significant.

Project implementation could result in short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. The relocation of infrastructure combined with possible consolidation of recreational facilities (e.g., USFS administrative facilities, campgrounds, boat ramps, marinas) could result in changing demands for public services. Project construction activities proposed around Shasta Lake could require local, State, and Federal agencies to change the locations of some public services, which could affect the areas where the public services are currently located.

Project implementation could also result in degraded levels of public services in the upper Sacramento River portion of the primary study area because the Shasta Lake area and parts of the upper Sacramento River area share public services. Project construction activities at Shasta Lake could require the use of public services resources that could be needed simultaneously for public services assistance in the upper Sacramento River area.

Reclamation estimates that CP1 would take 4.5 years to complete. Public services levels that are increased as a result of the project would return to pre-project levels once construction activities were completed. However, project implementation could temporarily degrade local public resources. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP1): Relocation of Public Services The project would require relocation of some public service facilities in the Shasta Lake and vicinity portion of the primary study area. No public services facilities in the upper Sacramento River portion of the primary study area would need to be relocated. This impact would be less than significant.

The Whiskeytown-Shasta-Trinity National Recreation Area is managed by USFS, which has several facilities throughout the reservoir area. Two USFS facilities would be inundated and thus would require relocation or replacement. The work station located in the Lakeshore area would be inundated by raising Shasta Dam and would have to be relocated to an area above the new full pool. The new facility would contain all of the features that exist at the current facility. The inundated facility would be demolished and hauled to waste. At Turntable Bay, another USFS facility would be inundated by the raising of Shasta Dam. Additional space at Turntable Bay would allow for the facility to be relocated on fill in the current location. Also, the SCSO substation and dock at the Bridge Bay Marina could need to be relocated within the marina complex. Reclamation would construct the replacement facilities before abandonment and demolition of the existing facilities, thereby ensuring that levels of public services provided by these facilities would not be adversely affected by the relocation process. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact PS-4 (CP1): Short-Term Disruption of Public Services Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. The northern end of the extended study area would be more than 30 miles from the nearest project construction activities. Emergency services providers with mutual aid agreements that could be called on to assist with emergencies resulting from project activities are located in the primary study area. Project construction activities in the primary study area that could disrupt public services would be too far removed from the extended study area to disrupt emergency services or law enforcement serving areas south of Red Bluff. Project implementation would not disrupt school bus service in the extended study area because school districts located in the extended study area would not operate school bus routes in or near project construction activities. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP1): Degraded Levels of Public Services Construction activities are not expected to affect public service levels in the extended study area. Existing facilities, personnel, and equipment in the extended study area could provide short-term assistance for project-related public services needs without degrading public services levels in the extended study area. This impact would be less than significant.

The northern end of the extended study area would be more than 30 miles from the nearest project construction activities. Public services providers with mutual aid agreements that could be called on to assist with law enforcement, fire suppression, or other emergencies resulting from project activities are located in the primary study area. Project construction activities around Shasta Lake are too far removed from the extended study area to disrupt public services below Red Bluff. Public services providers located in the extended study area could be called on by Cal EMA to assist with large-scale emergencies in the primary study area that resulted from project implementation. However, existing facilities, personnel, and equipment in the extended study area would be adequate to maintain current levels of service while providing assistance to the primary study area.

Indirect impacts on public services in the extended study area could result from traffic accidents associated with the transport of project materials and workers. Some project materials and workers could originate in the extended study area, requiring northbound travel to the primary study area. At this time, Reclamation estimates that the project would employ 350 workers. Project-related travel that would likely occur on I-5, the railway, or via air transport is not anticipated to result in accidents in the extended study area that would require significant response from law enforcement, fire protection, or emergency services providers; however, the fact that traffic accidents resulting from project-related travel could occur in the extended study area means that the possibility of

travel-related accidents would exist. Existing facilities, personnel, and equipment in the extended study area are expected be adequate to maintain current levels of service while providing assistance for any such accidents.

Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP1): Relocation of Public Services Facilities Project implementation would not result in the relocation of public services facilities in the extended study area. Therefore, public services in the extended study area would not be affected by relocation of public services facilities. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

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

The impact discussion for CP2 addresses Shasta Lake and vicinity and the upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP2): Short-Term Disruption of Public Services Project construction could temporarily disrupt transportation and circulation patterns, which could affect emergency services response and school bus service. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded by construction activities, this impact would be potentially significant.

Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near the relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity of Shasta Lake, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies (e.g., food, shelter for emergency crews, public services staff) could also be affected by project implementation.

Impacts related to short-term disruption of emergency services that would result from implementing the 12.5-foot dam raise (CP2) are similar to those identified for the 6.5-foot dam raise (Impact PS-1 (CP1)). However, the duration of the impacts would be longer for CP2 because construction activities associated with

the 12.5-foot dam raise would take more time than under the 6.5-foot dam raise. The 12.5-foot dam raise would require significantly more concrete and is anticipated to take 6 more months to construct than the 6.5-foot dam raise (CP1).

The increased amount of infrastructure demolition and relocation activity associated with CP2 would also require more time than under CP1. More structures would need to be demolished and relocated, and additional power and telecommunication lines would need to be relocated. Additional septic systems and wells would also require demolition and relocation, and 20 additional road segments would need to be realigned for CP2. The increased construction activity in the Shasta Lake and vicinity portion of the primary study area under CP2 would extend the duration of potential disruption to emergency services and school bus service in that area. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP2): Degraded Levels of Public Services Project implementation could cause short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services would not be substantially degraded, this impact would be potentially significant.

Project implementation could result in short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. The relocation of infrastructure combined with possible consolidation of recreational facilities (e.g., campgrounds, boat ramps, marinas) could result in changing demands for public services. Project construction activities proposed around Shasta Lake could require local, State, and Federal agencies to change the locations of some public services, which could affect the areas where the resources are currently located.

This impact would be similar to Impact PS-2 (CP1). However, the impacts would last longer for CP2 than CP1 because more time would be needed to complete project construction under the 12.5-foot dam raise. Reclamation estimates that CP2 would take 5 years to complete. Project implementation could temporarily degrade local public services. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP2): Relocation of Public Services Facilities This impact would be similar to Impact PS-3 (CP1). Facility relocation would not degrade levels of public services when the public service agencies relocated to their new facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact PS-4 (CP2): Short-Term Disruption of Public Services This impact would be similar to Impact PS-4 (CP1). Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP2): Degraded Levels of Public Services This impact would be similar to Impact PS-5 (CP1). Project construction activities are not expected to affect public services levels in the extended study area. Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP2): Relocation of Public Services Facilities This impact would be identical to Impact PS-6 (CP1). Project implementation would not result in the relocation of public service facilities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

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

The impact discussion for CP3 addresses Shasta Lake and vicinity and the upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP3): Short-Term Disruption of Public Services Project construction could temporarily disrupt transportation and circulation patterns, which could affect emergency services response and school bus service. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded by construction activities, this impact would be potentially significant.

Construction activities associated with enlarging Shasta Dam and the related infrastructure (e.g., road relocations, bridge replacements) near the dam and near the relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies (food, shelter for

emergency crews, public services staff) could also be affected by project implementation.

This impact would be similar to Impact PS-1 (CP1). However, the impact would last longer for CP3 because construction activities associated with the 18.5-foot dam raise would take more time than for the 6.5-foot dam raise. Reclamation estimates that the 18.5-foot dam raise would take 5 years. The 18.5-foot dam raise would require significantly more concrete and is anticipated to take 6 more months to construct than the 6.5-foot dam raise (CP1). The increased amount of infrastructure demolition and relocation activity associated with CP3 would also require more time than for CP1. Almost twice as many structures would need to be demolished and relocated, and additional power and telecommunication lines would require removal and relocation. Additional septic systems and wells would be abandoned and relocated, and 25 more road segments would be realigned. The increased construction activity at Shasta Dam and in the surrounding area would extend the time of potential disruption to emergency services. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP3): Degraded Levels of Public Services Project implementation could cause short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded, this impact would be potentially significant.

Project implementation could result in short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. The relocation of infrastructure, combined with possible consolidation of recreational facilities (e.g., campgrounds, boat ramps, marinas), could result in changing demands for public services. Project construction activities proposed around Shasta Lake could require local, State, and Federal agencies to change the locations of some public services, which could affect the areas where the public services are currently located.

This impact would be similar to Impact PS-2 (CP1). However, the impact would last longer for CP3 than for CP1 because more time would be needed to complete project construction for the 18.5-foot dam raise. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP3): Relocation of Public Services Facilities This impact would be similar to Impact PS-3 (CP1). Facilities relocation would not degrade levels of public services while the public services agencies are relocating to new

facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas
Impact PS-4 (CP3): Short-Term Disruption of Public Services This impact would be similar to Impact PS-4 (CP1). Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP3): Degraded Levels of Public Services This impact would be similar to Impact PS-5 (CP1). Project construction activities are not expected to affect public services levels in the extended study area. Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP3): Relocation of Public Services Facilities This impact would be identical to Impact PS-6 (CP1). Project implementation would not result in the relocation of public services facilities in extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

The impact discussion for CP4 and CP4A addresses Shasta Lake and vicinity and the upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)
Impact PS-1 (CP4 and CP4A): Short-Term Disruption of Public Services
Project construction could temporarily disrupt transportation and circulation patterns, which could affect emergency services response and school bus service. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded by construction activities, this impact would be potentially significant for CP4 and CP4A.

This impact would be similar to Impact PS-1 (CP3). Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near the relocation sites for

utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity of Shasta Lake, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies (e.g., food, shelter for emergency crews, public services staff) could also be affected by project implementation. In addition, gravel augmentation and the habitat restoration activities along the upper Sacramento River would slightly, but not substantially, increase the potential for short-term disruption of public services in the primary study area.

This impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 22.3.5.

This impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP4 and CP4A): Degraded Levels of Public Services Project implementation could cause short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded, this impact would be potentially significant.

This impact would be similar to Impact PS-2 (CP3). Project implementation could result in short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. The relocation of infrastructure, combined with possible consolidation of recreational facilities (e.g., campgrounds, boat ramps, marinas), could result in changing demands for public services. Project construction proposed around Shasta Lake could require local, State, and Federal agencies to change the location of some public services, which could affect the areas where the public services are currently located. In addition, gravel augmentation and the habitat restoration activities along the upper Sacramento River would slightly, but not substantially, increase the potential for degradation of public services.

This impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 22.3.5.

This impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP4 and CP4A): Relocation of Public Services Facilities This impact would be similar to Impact PS-3 (CP1). Facilities relocation would not

degrade levels of public services while the public services agencies are relocating to new facilities.

This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact PS-4 (CP4 and CP4A): Short-Term Disruption of Public Services This impact would be similar to Impact PS-4 (CP1). Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. Therefore no impact would occur for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP4 and CP4A): Degraded Levels of Public Services This impact would be similar to Impact PS-5 (CP1). Project construction activities are not expected to affect public services levels in the extended study area. Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area.

This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP4 and CP4A): Relocation of Public Services Facilities This impact would be identical to Impact PS-6 (CP1). Project implementation would not result in the relocation of public services facilities in the extended study area. No impact would occur for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

The impact discussion for CP5 addresses Shasta Lake and vicinity and the upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP5): Short-Term Disruption of Public Services Project construction could temporarily disrupt transportation and circulation patterns, which could affect emergency services response and school bus service.

Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded by construction activities, this impact would be potentially significant.

This impact would be similar to Impact PS-1 (CP3). Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies (e.g., food, shelter for emergency crews, public service staff) could also be affected by project implementation. In addition, gravel augmentation and the habitat restoration activities along the upper Sacramento River would slightly, but not substantially, increase the potential for short-term disruption of public services in the primary study area. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP5): Degraded Levels of Public Services Project implementation could cause short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded, this impact would be potentially significant.

This impact would be similar to Impact PS-2 (CP3). Project implementation could result in short-term degradation of levels of public services, including impacts on law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. Project construction activities proposed around Shasta Lake could require local, State, and Federal agencies to change the location of some public services, which could affect the areas where the public services are currently located. In addition, gravel augmentation and the habitat restoration activities along the upper Sacramento River would slightly, but not substantially, increase the potential for degradation of public services. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP5): Relocation of Public Services Facilities This impact is similar to Impact PS-3 (CP1). Facilities relocation would not degrade levels of public service while the public service agencies are relocating to new facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact PS-4 (CP5): Short-Term Disruption of Public Services This impact would be similar to Impact PS-4 (CP1). Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP5): Degraded Levels of Public Services This impact would be similar to Impact PS-5 (CP1). Project construction activities are not expected to affect public services levels in the extended study area. Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP5): Relocation of Public Services Facilities This impact would be identical to Impact PS-6 (CP1). Project implementation would not result in the relocation of public services facilities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

22.3.5 Mitigation Measures

Table 22-2 presents a summary of mitigation measures for public services.

Table 22-2. Summary of Mitigation Measures for Public Services

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact PS-1: Disruption of Public Services (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure PS-1: Coordinate and Assist Public Services Agencies.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact PS-2: Degraded Level of Public Services (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure PS-2: Provide Support to Public Services Agencies.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact PS-3: Relocation of Public Service Facilities (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 22-2. Summary of Mitigation Measures for Public Services (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact PS-4: Short-Term Disruption of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact PS-5: Degraded Levels of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact PS-6: Relocation of Public Services Facilities (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI

Key:
CP = Comprehensive Plan
CVP = Central Valley ProjectLOS = level of significance
LTS = less than significant
NI = no impact
PS = potentially significant
SWP = State Water Project

No-Action Alternative

No mitigation measures are required for the No-Action Alternative.

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

No mitigation is required for Impacts PS-3 (CP1) through PS-6 (CP1). Mitigation is provided below for impacts of CP1 related to short-term disruption of public services (PS-1) and degraded levels of public services in the primary study area (PS-2).

Mitigation Measure PS-1 (CP1): Coordinate and Assist Public Services Agencies Reclamation will coordinate all proposed road closures, detours, and traffic control measures with the (SCSO) and Tehama County Sheriff's Office, which are the designated Cal EMA (formerly OES) headquarters for the primary study area.

Reclamation will appoint a public liaison to communicate construction schedules, road closures, and project activities to the public. The liaison will organize and conduct public meetings for the purpose of communicating project information. The liaison will meet with all affected public services agencies to coordinate public meetings and information exchanges.

Reclamation will obtain all necessary permits and/or authorizations from public services agencies for matters requiring agency approval and/or cooperation.

Reclamation will meet with public services agencies to determine traffic controls for infrastructure, utility, and structure relocation.

Reclamation will develop and implement a monitoring plan to track the effectiveness of this mitigation measure, and will make adjustments, if necessary.

Traffic Control and Safety Assurance Plan Reclamation will implement Mitigation Measure Trans-1 as described in Chapter 20, "Transportation and Traffic," to reduce adverse effects of road closures and detours or partial road closures on access to local streets and adjacent uses.

Implementation of this mitigation measure would reduce Impact PS-1 (CP1) to a less-than-significant level.

Mitigation Measure PS-2 (CP1): Provide Support to Public Services Agencies Reclamation will provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services are not substantially degraded by construction activities. Reclamation will coordinate with affected providers to develop a mutual understanding of the amount and schedule of financial and administrative support required to reduce this impact to a less-than-significant level.

Reclamation will develop and implement a monitoring plan to track the effectiveness of this mitigation measure, and will make adjustments, if necessary.

Implementation of this mitigation measure would reduce Impact PS-2 (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 PS-3 (CP2) through PS-6 (CP2). Mitigation is provided below for the impacts of CP2 related to short-term disruption of public services (PS-1) and degraded levels of public services (PS-2) in the primary study area.

Mitigation Measure PS-1 (CP2): Coordinate and Assist Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-1 (CP1). Implementation of this mitigation measure would reduce Impact PS-1 (CP2) to a less-than-significant level.

Mitigation Measure PS-2 (CP2): Provide Support to Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-2 (CP1). Implementation of this mitigation measure would reduce Impact PS-2 (CP2) to a less-than-significant level.

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

No mitigation is required for Impacts PS-3 (CP3) through PS-6 (CP3). Mitigation is provided below for the impacts of CP3 related to short-term disruption of public services (PS-1) and degraded levels of public services (PS-2) in the primary study area.

Mitigation Measure PS-1 (CP3): Coordinate and Assist Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-1 (CP1). Implementation of this mitigation measure would reduce Impact PS-1 (CP3) to a less-than-significant level.

Mitigation Measure PS-2 (CP3): Provide Support to Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-2 (CP1). Implementation of this mitigation measure would reduce Impact PS-2 (CP3) to a less-than-significant level.

CP4 and CP4A -18.5 Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation is required for Impacts PS-3 (CP4 and CP4A) through PS-6 (CP4 and CP4A). Mitigation is provided below for the impacts of CP4 and CP4A related to short-term disruption of public services (PS-1) and degraded levels of public services (PS-2) in the primary study area.

Mitigation Measure PS-1 (CP4 and CP4A): Coordinate and Assist Public Services Agencies This mitigation measure identical to Mitigation Measure PS-1 (CP1). Implementation of this mitigation measure would reduce Impact PS-1 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure PS-2 (CP4 and CP4A): Provide Support to Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-2 (CP1). Implementation of this mitigation measure would reduce Impact PS-2 (CP4 and CP4A) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is required for Impacts PS-3 (CP5) through PS-6 (CP5). Mitigation is provided below for the impacts of CP5 related to short-term disruption of public services (PS-1) and degraded levels of public services (PS-2) in the primary study area.

Mitigation Measure PS-1(CP5): Coordinate and Assist Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-1 (CP1). Implementation of this mitigation measure would reduce Impact PS-1 (CP5) to a less-than-significant level.

Mitigation Measure PS-2 (CP5): Provide Support to Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-2

(CP1). Implementation of this mitigation measure would reduce Impact PS-2 (CP5) to a less-than-significant level.

22.3.6 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 under Quantitative Analysis would have effects on public services in the primary study area or have effects in extended study area that contribute to cumulative impacts of the SLWRI since no impacts have been identified in the extended study area. This analysis is based on the projects listed in Table 3-1 under Qualitative Analysis.

Past and present projects that could affect public services relate to construction projects, land use developments, dam construction, and recreation development. Projects listed in Table 3-1 that may have a cumulative effect on public services in the primary study area include the Antlers Bridge Replacement, Moody Flats Quarry, and the Iron Mountain Restoration Plan. SLWRI is not expected to have cumulative impacts on public services in the extended study area.

Implementing the proposed SLWRI alternatives would not have a significant cumulative effect on public services in the primary study area. As described above, CP1– CP5 would result in short-term disruption of public services, would degrade the levels of public services provided, and would require the relocation of public services facilities in the primary study area. These effects would be of greater magnitude and duration with the larger dam raises. Thus, effects of CP2 would be similar to but greater than those of CP1, and similar to but less than those of CP3–CP5. Although Mitigation Measures PS-1 and PS-2 would enhance the coordination of public services during project implementation, the adverse effects of CP1–CP5 would not be eliminated, particularly regarding short-term disruption of public services. Only three of the present or reasonably foreseeable future actions, Antlers Bridge Replacement, Moody Flats Quarry, and the Iron Mountain Restoration Plan, are located in the immediate vicinity of Shasta Lake and would have the potential to result in short-term disruption of public services, would degrade the levels of public services provided, or would require the relocation of public services facilities in the primary study area. The Antlers Bridge replacement is currently under construction and is expected to be completed in 2015, before any of the action alternatives would begin. With respect to the Iron Mountain Mine Restoration

Plan, this activity would be unlikely to occur simultaneously with the action alternatives. The Moody Flats Quarry project Draft EIR is currently being prepared by the CEQA Lead Agency, it is uncertain when actions may occur. Therefore, construction activities related to implementation of the proposed SLWRI alternatives would not contribute considerably to significant cumulative impacts on public services.

The effects of CP1–CP5 on public services would diminish with distance from project construction sites, and the alternatives would not have cumulatively considerable impacts on public services downstream from Red Bluff (i.e., in the extended study area).

Chapter 23
Power and Energy

This chapter describes the environmental and regulatory settings of power and energy, as well as environmental consequences and mitigation measures, as they pertain to the SLWRI action alternatives. The discussion of power and energy of the existing conditions and the potential impacts of the program alternatives on power and energy encompass the Pit 7 Powerplant upstream from Shasta Reservoir as well as the CVP/SWP water service areas and associated facilities.

23.1 Affected Environment

Shasta Lake is an integral part of the CVP, and the proposed changes in storage and releases affect system operations throughout the CVP. This change in CVP operations and the dedication of a portion of the storage in Shasta Lake to operate for the SWP affect the operations of the entire SWP system. Locally, the potential changes in operations would likely affect the upstream Pit 7 Powerplant.

The CVP is a multipurpose project with 20 storage facilities, 5 pumping plants, 11 hydroelectric powerplants, and 500 miles of major canals, as well as conduits, tunnels, and related facilities. As mandated, the power generation of the CVP is first dedicated to meeting the project use requirements of the CVP facilities. Because the CVP generates more power than it uses, the excess power is marketed through the Western Area Power Administration (Western).

The SWP is a multipurpose project with 32 storage facilities. Major SWP facilities include 17 pumping plants, 8 hydroelectric powerplants, and 660-plus miles of aqueducts and pipelines. Because the SWP uses more energy than it generates from its hydroelectric facilities, DWR has exchange agreements with other utility companies and has developed other power resources. DWR sells surplus power, when it is available, to minimize the net cost of pumping energy.

For a more in-depth description of the affected environment, see the *Power and Energy Technical Report*.

23.1.1 Shasta Lake and Vicinity

The Shasta Division of the CVP contains Shasta Dam, Lake, and Powerplant, and Keswick Dam, Reservoir, and Powerplant; it captures water from the Sacramento River basin. Shasta Powerplant is located just below Shasta Dam as part of the Shasta Division. Water from the dam is released through five 15-foot penstocks leading to the 5 main generating units and 2 station service units with

a maximum generation capacity of 710 megawatts (MW). Shasta Powerplant is a peaking plant and generally runs when demand for electricity is high. The remaining energy is marketed to customers in Northern California. The 2007 net annual generation of Shasta Powerplant was 1,914,175 megawatt-hours (MWh).

23.1.2 Upper Sacramento River (Shasta Dam to Red Bluff Pumping Plant)

CVP powerplants located downstream from Shasta Reservoir but upstream from the Red Bluff Pumping Plant are Trinity, Lewiston, Judge Francis Carr, and Spring Creek powerplants of the Trinity River Division and Keswick Powerplant of the Shasta Division. The Trinity River Division captures headwaters from the Trinity River basin and diverts surplus water to the Sacramento River.

Trinity Dam stores water from the Trinity River in Trinity Reservoir and makes releases to the Trinity River through Trinity Powerplant. Downstream, Lewiston Dam makes minimum required releases to the Trinity River through Lewiston Powerplant and diverts water into Clear Creek Tunnel and through Judge Francis Carr Powerplant to Whiskeytown Reservoir. Some Whiskeytown Reservoir releases are made through Spring Creek Power Conduit and Powerplant into Keswick Reservoir in the Shasta Division. The remaining releases from Whiskeytown Reservoir are made to Clear Creek. Releases from Keswick Reservoir are made through Keswick Powerplant to the Sacramento River.

Keswick Powerplant belongs to the Shasta Division, is located at Keswick Dam, and has 3 generating units with a total capacity of 117 MW. Keswick Powerplant is a run-of-the-river facility, creating Shasta Powerplant's afterbay and providing uniform flows to the Sacramento River.

23.1.3 Lower Sacramento River and Delta

Two CVP powerplants, Folsom and Nimbus, are located between Red Bluff Pumping Plant and the Delta. Both powerplants belong to the Folsom Unit on the American River.

Folsom Powerplant is a peaking powerplant, located at the foot of Folsom Dam on the north side of the American River. Water from the dam is released through three 15-foot-diameter penstocks to 3 generating units with a maximum capacity of 215 MW. Folsom Dam was constructed by USACE and, on completion, was transferred to Reclamation for coordinated operation as an integral part of the CVP.

Nimbus Dam forms Lake Natoma to act as an afterbay for Folsom Powerplant. It allows dam operators to coordinate power generation and flows in the lower American River channel during normal reservoir operations. Nimbus Powerplant, with 2 units and a maximum capacity of 17 MW, is a run-of-the-river facility and provides station service backup for Folsom Powerplant.

23.1.4 CVP/SWP Service Areas

There are a number of generation facilities and pumping facilities in the greater CVP/SWP service areas, beyond the specific geographies discussed above. These facilities are discussed below.

CVP Generation Facilities

The CVP powerplants located in the CVP south-of-Delta service area include New Melones Powerplant in the New Melones Unit of the CVP East Side Division, and the William R. Gianelli and O'Neill Pumping-Generating Plants in the San Luis Unit of the CVP West San Joaquin Division. The latter two, with dual functions of generating electricity and pumping water, are jointly owned by Reclamation and DWR.

New Melones Dam was completed in 1979, and inundated the original Melones Dam and created New Melones Reservoir on the Stanislaus River. New Melones Powerplant, located on the north bank immediately downstream from the dam, is a peaking plant. The powerplant contains 2 units and a maximum capacity of 383 MW.

The San Luis Unit, part of both the CVP and SWP, was authorized in 1960. Reclamation and the State of California constructed and operate this unit jointly; 45 percent of the total cost was contributed by the Federal government and the remaining 55 percent by the State of California. The joint-use facilities are O'Neill Dam and Forebay, B.F. Sisk San Luis Dam, San Luis Reservoir, William R. Gianelli Pumping-Generating Plant, Dos Amigos Pumping Plant, Los Banos and Little Panoche Reservoirs, and San Luis Canal from O'Neill Forebay to Kettleman City, together with the necessary switchyard facilities. The Federal-only portion of the San Luis Unit includes O'Neill Pumping-Generating Plant and Intake Canal, Coalinga Canal, Pleasant Valley Pumping Plant, and San Luis Drain.

San Luis Reservoir serves as the major storage reservoir, and O'Neill Forebay acts as an equalizing basin for the upper stage, dual-purpose pumping-generating plant. O’Neill Pumping-Generating Plant takes water from the Delta-Mendota Canal and discharges it into the O'Neill Forebay, where the California Aqueduct (SWP feature) flows directly. William R. Gianelli Pumping-Generating Plant lifts water from O'Neill Forebay and discharges it into San Luis Reservoir. During releases from the reservoir, these plants generate electric power by reversing flow through the turbines. Water for irrigation is released into the San Luis Canal and flows by gravity to Dos Amigos Pumping Plant, where the water is lifted more than 100 feet to permit gravity flow to the canal terminus at Kettleman City. The SWP canal system continues to southern coastal areas.

O'Neill Pumping-Generating Plant consists of an intake channel, leading off the Delta-Mendota Canal, and six pumping-generating units, with a total capacity of about 14 MW. Normally, these units operate as pumps to lift water from 45 to

53 feet into O'Neill Forebay; each unit can discharge 700 cubic feet per second (cfs) and has a rating of 6,000 horsepower (hp). Water is occasionally released from the forebay to the Delta-Mendota Canal, and these units then operate as generators.

William R. Gianelli Pumping-Generating Plant, the joint Federal-State facility located at San Luis Dam, lifts water by pump-turbines from O'Neill Forebay into San Luis Reservoir. During the irrigation season, water is released from San Luis Reservoir back through the pump-turbines to the forebay and energy is reclaimed. Each of the eight pumping-generating units has a capacity of 63,000 hp as a motor and 53 MW as a generator. As a pumping plant to fill San Luis Reservoir, each unit lifts 1,375 cfs at a design dynamic head of 290 feet. As a generating plant, each unit passes 2,120 cfs at a design dynamic head of 197 feet.

SWP Generation Facilities

Among the eight SWP hydroelectric powerplants, three powerplants are located in the Lake Oroville vicinity and the remaining in the south-of-Delta area.

Lake Oroville, the SWP's largest reservoir, stores winter and spring runoff from the Feather River watershed and releases water for SWP needs. These releases generate power at three powerplants: Edward Hyatt Pumping-Generating Plant, Thermalito Diversion Dam Powerplant, and Thermalito Pumping-Generating Plant (Oroville Facilities). DWR schedules hourly releases through the Oroville Facilities to maximize the amount of energy produced when power values are highest. Because the downstream water supply does not depend on hourly releases, water released for power in excess of local and downstream requirements is conserved by pump-back operation during off-peak times into Lake Oroville. Energy prices primarily dictate hourly operations for the power generation facilities.

The remaining five SWP powerplants are the jointly owned William R. Gianelli Pumping-Generating Plant, Alamo Powerplant, Mojave Siphon Powerplant, Devil Canyon Powerplant, and Warne Powerplant. They generate about one-sixth of the total energy used by the SWP. Alamo Powerplant uses the 133-foot head between Tehachapi Afterbay and Pool 43 of the California Aqueduct to generate electricity. Mojave Siphon Powerplant generates electricity from water flowing downhill after its 540-foot lift by Pearblossom Pumping Plant. Devil Canyon Powerplant generates electricity with water from Silverwood Lake, with more than 1,300 feet of head, the highest water head[1] in a powerplant in

[1] Potential hydropower generation is a function of the hydraulic net head and rate of fluid flow. The net head is the actual head available for power generation and is used for computing the energy generated. The net head is the gross head minus the head losses due to intake structures, penstocks, and outlet works. The gross or static head is the vertical distance between the tailwater elevation and the forebay water surface elevation (i.e., the height of water in the reservoir relative to its height after discharge). The head losses are generally assumed to be 2 to 10 percent of the gross head, depending on the configuration of the powerhouse structure.

the SWP system. Warne Powerplant uses the 725-foot drop from Peace Valley Pipeline to generate electricity with its Pelton wheel turbines.

CVP Pumping Facilities

CVP pumping plants that move water from the Delta to CVP service areas in the Central Valley include C.W. "Bill" Jones Pumping Plant, O'Neill and William R. Gianelli Pumping-Generating Plants, Dos Amigo Pumping Plant, and SWP Banks Pumping Plant. Reclamation constructed and operates C.W. "Bill" Jones Pumping Plant. Harvey O. Banks Pumping Plant is an SWP facility; however, Reclamation has access to its pumping capacity by use of the Joint Point of Diversion, described in the State Water Resources Control Board's Water Right Decision 1641. The remaining plants, described previously, are joint-use facilities between the two agencies under the San Luis Unit.

C.W. "Bill" Jones Pumping Plant, formerly Tracy Pumping Plant, is a component of the CVP Delta Division. Construction of the plant started in 1947 and was completed in 1951, with an inlet channel, pumping plant, and discharge pipes. Delta water is lifted 197 feet and is carried about 1 mile into the Delta-Mendota Canal. Each of the 6 pumps at C.W. "Bill" Jones Pumping Plant is powered by a 22,500-hp motor and is capable of pumping 767 cfs. The intake canal includes the C.W. "Bill" Jones Fish Screen, which was built to intercept downstream migrant fish to be returned to the main channel, then to resume their journey to the ocean.

Dos Amigos Pumping Plant is a joint CVP/SWP facility, located 17 miles south of O'Neill Forebay on the San Luis Canal. It lifts water 113 feet to permit gravity flow to the terminus of San Luis Canal at Kettleman City. The plant contains 6 pumping units, each capable of delivering 2,200 cfs at 125 feet of head.

SWP Pumping Facilities

Among the SWP pumping plants, plants that historically consumed most of the energy are William R. Gianelli Pumping-Generating Plant (SWP share), Harvey O. Banks Pumping Plant, Dos Amigos Pumping Plant (SWP share), Ira J. Chrisman Pumping Plant, and A.D. Edmonston Pumping Plant.

Harvey O. Banks Pumping Plant is located 2.5 miles southwest of Clifton Court Forebay on the California Aqueduct. The plant is the first pumping plant for the California Aqueduct and the South Bay Aqueduct. It provides the necessary head[2] for water in the California Aqueduct to flow for approximately 80 miles south, past O'Neill Forebay and San Luis Reservoir to Dos Amigos Pumping Plant (another jointly owned facility, as previously described). Harvey O. Banks Pumping Plant initially flows into Bethany Reservoir, where the South Bay

[2] In pumping plants, the design head is the gross head plus the head losses due to intake structures.

Aqueduct truly begins. The design head ranges between 236 and 252 feet and installed capacity is 10,670 cfs with 333,000 hp.

Along the California Aqueduct, Pearblossom, Chrisman, and Edmonston pumping plants historically consumed the highest amount of energy. Pearblossom Pumping Plant lifts water about 540 feet and discharges it 3,479 feet above mean sea level (msl), the highest point along the entire California Aqueduct. Chrisman and Edmonston pumping plants provide 524 and 1,970 feet of lift, respectively, to convey California Aqueduct water across the Tehachapi Mountains.

23.2 Regulatory Framework

There are two categories of regulatory framework for hydropower: Federal regulations for CVP hydroelectric operations, and State regulations for the SWP.

23.2.1 Federal

Reclamation operates the CVP system for the management of floodwater, irrigation and municipal and industrial (M&I) water supply, fish and wildlife enhancement, hydropower generation, recreation, and water quality, under various acts authorizing specific projects and with other laws, permits, and enabling legislation (see the *Hydrology, Hydraulics, and Water Management Technical Report* in the Physical Resources Appendix for details).

The power generated by the CVP is marketed through contracts with Western. Western, created in 1977 under the U.S. Department of Energy Organization Act, markets and transmits electric power throughout 15 western states. Western's Sierra Nevada Customer Service Region (also known as the Sierra Nevada Region) markets and transmits power generated from the CVP and the Washoe Project in excess of CVP use.

The 2004 Marketing Plan for the Sierra Nevada Region specifies the terms and conditions under which Western markets power from the CVP and the Washoe Project that began on January 1, 2005. This marketing plan resulted in the existing power marketing contract between Western and the CVP that expires on December 31, 2024.

23.2.2 State

DWR is currently seeking a new 50-year hydroelectric license from the Federal Energy Regulatory Commission to operate the Oroville Facilities. The Final EIS and Final EIR are available for the general public review. The initial Federal Energy Regulatory Commission license for the Oroville Facilities, issued on February 11, 1957, expired on January 31, 2007. Currently, the Oroville Facilities are operating under a license that was issued by the Federal Energy

Regulatory Commission, effective February 1, 2007, and being renewed each year in anticipation of issuance of the new 50-year license.

23.2.3 Regional and Local

No known regional or local regulations govern power and energy resources.

23.3 Environmental Consequences and Mitigation Measures

The purpose of this section is to provide information about hydropower generation, energy use, and impacts on existing hydropower facilities from the SLWRI study alternatives described in the EIS. Hydropower modeling for the EIS was conducted to identify potential impacts from the SLWRI on hydropower generation and consumption at CVP and SWP facilities, which are operated by Reclamation and DWR, respectively. This section describes the analytical methodology used to calculate, for all alternatives, the hydropower generation and pumping energy required at existing CVP and SWP hydropower facilities. This chapter also describes criteria for determining significant impacts associated with the SLWRI alternatives, and lists those impacts.

23.3.1 Methods and Assumptions

Council on Environmental Quality regulations and the State CEQA Guidelines address NEPA and CEQA requirements for describing the potential environmental consequences of alternatives in an EIS and EIR, respectively. NEPA and CEQA requirements guide the assessments presented in this section. Appendix F of the State CEQA Guidelines addresses energy conservation, and NEPA directs that energy requirements and conservation potential are to be evaluated. This impact assessment is based on quantitative data regarding changes to hydropower resources that could occur under the program alternatives in geographic locales within the study area.

Several modeling tools were used for the SLWRI hydropower analysis. The CalSim-II model was used to simulate project operations and LongTermGen (LTGen), Version 1.18 and State Water Project Power (SWPPower), BST April 2010 Version power tools were used to quantify the hydropower generation and pumping energy associated with each alternative. A spreadsheet postprocessor was used to evaluate impacts to the Pit 7 Powerplant.

Power Modeling Tools

Energy estimates were made using the Benchmark Study Team (BST) power modeling tools LTGen, Version 1.18, and SWP Power, BST April 2010 Version, for CVP and SWP facilities, respectively. LTGen and SWP Power use operations data from CalSim-II simulations to predict energy generation and consumption throughout the CVP and SWP. Methods applied to evaluate power generation are discussed below.

For each alternative, outputs from CalSim-II simulation were input to LTGen and SWP Power, to simulate power generation and consumption throughout the CVP and SWP systems, respectively. These CalSim-II outputs included reservoir releases, conveyance flow rates, and end-of-month reservoir storage data. Both LTGen and SWP Power are monthly models. Their simulation periods are from October 31, 1921 to September 30, 2003.

In LTGen and SWP Power, energy generation is a function of turbine configuration, reservoir release, net head, and duration of generation. Net head is the actual head available for power generation; it is reservoir water surface elevation (a function of storage) minus tailrace elevation (a function of release).

Similarly, the calculation of energy required for pumping in both models is a function of pump configuration, pumping rate, pumping head (i.e., net head with hydraulic losses), and duration of pumping. Detailed descriptions of LTGen and SWP Power are included in Chapter 8 of the Modeling Appendix.

CalSim-II

CalSim-II is the application of the Water Resources Integrated Modeling System software to the CVP/SWP. This application was jointly developed by Reclamation and DWR for planning studies related to CVP/SWP operations. The primary purpose of CalSim-II is to evaluate the water supply reliability of the CVP and SWP at current and/or future levels of development (e.g., 2005 or 2030), with and without various assumed future facilities, and with different modes of facility operations. Geographically, the model covers the drainage basin of the Delta, and CVP/SWP exports to the San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California.

CalSim-II typically simulates system operations for an 82-year period, using a monthly time step. The model assumes that facilities, land use, water supply contracts, and regulatory requirements are constant over this period, representing a fixed level of development (e.g., 2005 or 2030). The historical flow record from October 1921 to September 2003, adjusted for the influences of land use changes and upstream flow regulation, is used to represent the possible range of water supply conditions. Major Central Valley rivers, reservoirs, and CVP/SWP facilities are represented by a network of arcs and nodes. CalSim-II uses a mass balance approach to route water through this network. Simulated flows are mean flows for the month; reservoir storage volumes correspond to end-of-month storage.

Monthly CalSim-II model results are intended to be used for comparative purposes. It is important to differentiate between “absolute” or “predictive” modeling applications and “comparative” applications. In “absolute” applications, the model is run once to predict a future outcome; errors or assumptions in formulation, system representation, data, and operational criteria all contribute to total error or uncertainty in model results. In “comparative” applications, the model is run twice, once to represent a baseline condition (no

project) and a second time with a specific change (project) to assess the change in the outcome due to the input change. In this comparative mode (the mode used for this EIS), the difference between the two simulations is of principal importance. Potential errors or uncertainties that exist in the "no project" simulation are also present in the "project" simulation, such that their impacts are reduced when assessing the change in outcomes.

Spreadsheet Postprocessors

For analysis of impacts from each alternative on generation from the Pit 7 Powerplant, a spreadsheet postprocessor was used in lieu of a model. Since no model was available for Pit 7 Powerplant operations, an evaluation of potential impacts of the SLWRI alternatives, as simulated using CalSim-II on recent historical data, was used instead.

The spreadsheet postprocessor interpolated CalSim-II output for Shasta Reservoir storage to determine the reservoir water surface elevation. The water surface elevations for each alternative were compared to historical Pit 7 Powerplant tailwater elevations, to calculate the change in net head at the Pit 7 Powerplant. Changes in net head at the Pit 7 Powerplant were assumed to be small enough so that turbine/generator efficiencies would be unaffected. For each alternative, the monthly generation was determined by multiplying historical average monthly generation by the ratio of the alternative-reduced net head compared to the historical net head (assumed to be 200 feet, based on historical average) raised to the 1.5 power.

23.3.2 Criteria for Determining Significance of Effects

The thresholds of significance for impacts to power and energy are based on the environmental checklist in Appendix G of the State CEQA Guidelines, as amended. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. An alternative would be considered to have a potentially significant impact on regional hydropower production if the change in the average annual energy generation or consumption (over the 82-year period of simulation) by the CVP/SWP is greater than 5 percent, as shown in Table 23-1.

A threshold of 5 percent was selected as the threshold of significance for hydroelectric generation for several reasons, including seasonal and annual hydrologic variability, short-term operations decisions that may affect water level in storage, and regional power market demands and prices that may dictate hydropower facilities operations. All these factors could contribute to potentially substantial variations in hydropower generation on a monthly or annual basis. As a result, generation variations of less than 5 percent would not be considered significant. Significance statements are relative to both existing conditions (2005) and future conditions (2030), unless stated otherwise.

Table 23-1. Impact Indicators and Significance Criteria for Energy Generation and Usage

Impact Indicator	Significance Criterion
Shasta Powerplant Energy Generation	Decrease in average annual Shasta Powerplant hydropower generation of more than 5 percent.
CVP System Energy Generation	Decrease in average annual CVP system hydropower generation of more than 5 percent.
SWP System Energy Generation	Decrease in average annual SWP system hydropower generation of more than 5 percent.
CVP System Pumping Energy Use	Increase in average annual CVP system pumping energy use of more than 5 percent.
SWP System Pumping Energy Use	Increase in average annual SWP system pumping energy use of more than 5 percent.
Pit 7 Powerplant Energy Generation	Decrease in average annual Pit 7 hydropower generation of more than 5 percent.

Key:
CVP = Central Valley Project
SWP = State Water Project

Shasta Powerplant Energy Generation

Changes in Shasta Powerplant operations due to any of the SLWRI alternatives could directly affect hydropower generation caused by changes in head and flow available for hydropower generation. A significant reduction in energy generation at Shasta Powerplant could require purchase of energy to meet CVP pumping energy demands, or a reduction in power revenue.

CVP System Energy Generation

Changes in CVP operations due to any of the SLWRI alternatives could result in reoperation of other CVP hydropower generation facilities, and could result in a systemwide decrease in CVP hydropower generation. A significant reduction in CVP energy generation could require purchase of energy to meet CVP pumping energy demands, or a reduction in power revenue.

SWP System Energy Generation

Changes in SWP operations due to any of the SLWRI alternatives could result in reoperation of SWP generation facilities, and could result in a systemwide decrease in SWP hydropower generation. A significant reduction in SWP energy generation could require purchase of energy to meet SWP pumping energy demands, or a reduction in power revenue.

CVP Pumping Energy Use

Changes in CVP operations due to any of the SLWRI alternatives could result in changes in operations of the CVP pumping plants. A significant increase in CVP system pumping energy use could require purchase of energy to meet CVP pumping energy demands, or a reduction in power revenue.

SWP Pumping Energy Use

Changes in SWP operations due to any of the SLWRI alternatives could result in changes in operations of the SWP pumping plants. A significant increase in SWP system pumping energy use could require purchase of energy to meet SWP pumping energy demands, or a reduction in power revenue.

Pit 7 Powerplant Energy Generation

The Pit 7 Powerplant is owned and operated by the Pacific Gas and Electric Company. Increases in Shasta Lake water surface elevations could increase the tailwater elevation below the Pit 7 Powerplant, reducing the net head and decreasing generation.

23.3.3 Direct and Indirect Effects

This section describes the environmental consequences of the SLWRI comprehensive plans, and proposed mitigation measures for any impacts determined to be significant or potentially significant. All comprehensive plans are compared to a baseline to allow evaluation of potential impacts. For the existing condition, a 2005 level of development CalSim-II simulation without any Shasta enlargement is used as baseline. Similarly, for the future condition a 2030 level of development CalSim-II simulation, the No-Action Alternative, is used as a baseline. Each of the comprehensive plans where simulated using the same levels of development. This was done so that any changes from the baseline hydropower generation or consumption can be attributed to the alternative. Detailed tables of the monthly energy generation and energy consumption associated with each comprehensive plan are included in Attachment 18 of the Modeling Appendix.

The No-Action Alternative and the SLWRI comprehensive plans are described in the following subsections. Potential effects of the existing condition, No-Action Alternative, and various SLWRI comprehensive plans on energy generation and usage are also described.

No-Action Alternative

Under the No-Action Alternative, the Federal government would take reasonably foreseeable actions, as discussed in Chapter 2, “Alternatives,” but would take no additional action toward implementing a specific plan to help increase anadromous fish survival in the upper Sacramento River, nor would help address the growing water reliability issues in California. Shasta Dam would not be modified, and the CVP would continue operating similar to the existing condition. Changes in regulatory conditions and water supply demands would result in differences in flows on the Sacramento River and in the Delta between existing and future conditions. Possible changes include the following:

- Firm Level 2 Federal refuge deliveries
- SWP deliveries based on full Table A amounts
- Full implementation of the Grassland Bypass Project
- Implementation of salinity management actions similar to the Vernalis Adaptive Management Plan

- Implementation of the South Bay Aqueduct Improvement and Enlargement Project
- Increased San Joaquin River diversions for water users in the Stockton Metropolitan Area after completion of the Delta Water Supply Project
- Increased Sacramento River diversions by Freeport Regional Water Project agencies
- San Joaquin River Restoration Program Full Restoration Flows

This alternative is used as a basis of comparison for future condition comparisons. Table 23-2 summarizes the simulated average annual hydropower generation and energy use for the No-Action Alternative.

Table 23-2. Simulated Average Annual Energy Generation and Use for No-Action Alternative

	Existing (GWh)	No Action (GWh)	Change (GWh)	Percent Change
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,154	3	0%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	4,914	-13	0%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,513	86	2%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,184	-17	-1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,933	333	4%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	529	0	0%

Note: Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (No-Action): Decrease in Shasta Powerplant Energy Generation Simulated annual average Shasta Powerplant energy generation for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be an increase in simulated average annual generation of 3 gigawatt-hour (GWh) (0 percent). This impact would be beneficial. Mitigation is not required for the No-Action Alternative.

Impact Hydro-2 (No-Action): Decrease in CVP System Energy Generation Simulated average annual CVP system energy generation for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be a decrease in simulated average annual energy generation of 12 GWh (0 percent). This impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Hydro-3 (No-Action): Decrease in SWP System Energy Generation Simulated average annual CVP system energy generation for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be an increase in simulated average annual energy generation of 86 GWh (2 percent). This impact would be beneficial. Mitigation is not required for the No-Action Alternative.

Impact Hydro-4 (No-Action): Increase in CVP System Pumping Energy Use Simulated average annual CVP pumping energy use for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be an increase in simulated average annual pumping energy use of 17 GWh (1 percent). This impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Hydro-5 (No-Action): Increase in SWP System Pumping Energy Use Simulated average annual SWP pumping energy use for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be an increase in simulated average annual pumping energy use of 333 GWh (4 percent). This impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Hydro-6 (No-Action): Decrease in Pit 7 Powerplant Energy Generation Simulated average annual Pit 7 Powerplant energy generation for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be no change in simulated average annual energy generation at the Pit 7 Powerplant. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

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

CP1 focuses on increasing water supply reliability and increasing anadromous fish survival. This plan primarily consists of raising Shasta Dam by 6.5 feet, which, in combination with spillway modifications, would increase the height of the reservoir's full pool by 8.5 feet and enlarge the total storage capacity in the reservoir by 256,000 acre-feet. The existing temperature control device (TCD) would also be extended to achieve efficient use of the expanded cold-water pool. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years[3] and critical years, when 70,000 acre-feet and 35,000

[3] Throughout this document, water year types are defined according to the Sacramento Valley Index Water Year Hydrologic Classification unless specified otherwise.

acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP1 would help reduce future water shortages by increasing drought year and average year water supply reliability for agricultural, and municipal and industrial (M&I) deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River. Table 23-3 summarizes the simulated average annual hydropower generation and energy use for CP1.

Table 23-3. Simulated Average Annual Energy Generation and Use for CP1

	Existing (GWh)	CP1 (GWh)	Change		Future (GWh)	CP1 (GWh)	Change	
			(GWh)	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Energy Generation	2,151	2,191	40	2%	2,154	2,194	40	2%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	4,966	39	1%	4,914	4,955	40	1%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,440	13	0%	4,513	4,527	14	0%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,203	3	0%	1,184	1,191	7	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,642	42	1%	7,933	7,979	46	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	524	-4	-1%	529	525	-4	-1%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP1): Decrease in Shasta Powerplant Energy Generation
Simulated average annual Shasta Powerplant energy generation for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual generation under both existing and future levels of 40 GWh (2 percent). In addition to increased hydropower generation, CP1 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP1): Decrease in CVP System Energy Generation
Simulated average annual CVP system generation for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual

energy generation of 39 GWh (1 percent) and 40 GWh (1 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP1): Decrease in SWP System Energy Generation
Simulated average annual SWP system generation for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual energy generation of 13 GWh (0 percent) and 14 GWh (0 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP1): Increase in CVP System Pumping Energy Use
Simulated average annual CVP pumping energy use for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual pumping energy use of 3 GWh (0 percent) and 7 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP1): Increase in SWP System Pumping Energy Use
Simulated average annual SWP pumping energy use for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual pumping energy use of 42 GWh (1 percent) and 46 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP1): Decrease in Pit 7 Powerplant Energy Generation
Simulated average annual Pit 7 generation for CP1 is shown in Table 23-3. Under CP1, the 6.5-foot Shasta Dam raise option, the operating range of net head would decrease from about 173 to 204 feet to about 168 to 193 feet, an approximately 4 percent decrease in net head. Under CP1, there would be a decrease in simulated average annual generation of about 4 GWh (1 percent) and 4 GWh (1 percent) under existing and future levels, respectively. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 Dam and facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

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

As with CP1, CP2 focuses on increasing water supply reliability and increasing anadromous fish survival. CP2 primarily consists of raising Shasta Dam by 12.5 feet, which, in combination with spillway modifications, would increase the height of the reservoir's full pool by 14.5 feet and enlarge the total storage capacity in the reservoir by 443,000 acre-feet. The existing TCD would also be extended to achieve efficient use of the expanded cold-water pool. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 120,000 acre-feet and 60,000 acre-feet,

respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP2 would help reduce future water shortages by increasing drought year and average year water supply reliability for agricultural and M&I deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River. Table 23-4 summarizes the simulated average annual hydropower generation and energy use for CP2.

Table 23-4. Simulated Average Annual Energy Generation and Use for CP2

	Existing (GWh)	CP2 (GWh)	Change		Future (GWh)	CP2 (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,221	70	3%	2,154	2,221	67	3%
Impact Hydro- 2 – Decrease in CVP System Energy Generation	4,927	4,998	71	1%	4,914	4,983	69	1%
Impact Hydro- 3 – Decrease in SWP System Energy Generation	4,427	4,444	17	0%	4,513	4,535	22	0%
Impact Hydro- 4 – Increase in CVP System Pumping Energy Use	1,201	1,206	5	1%	1,184	1,194	10	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,660	60	1%	7,933	8,005	72	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	520	-9	-2%	529	522	-7	-1%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP2): Decrease in Shasta Powerplant Energy Generation
Simulated average annual Shasta Powerplant energy generation for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual generation of 70 GWh (3 percent) and 67 GWh (3 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP2 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the

ability to manage the electric grid in a reliable manner. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP2): Decrease in CVP System Energy Generation
Simulated average annual CVP system generation for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual energy generation of 71 GWh (1 percent) and 69 GWh (1 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP2): Decrease in SWP System Energy Generation
Simulated average annual SWP system generation for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual energy generation of 17 GWh (0 percent) and 22 GWh (0 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP2): Increase in CVP System Pumping Energy Use
Simulated average annual CVP pumping energy use for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual pumping energy use of 5 GWh (1 percent) and 10 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP2): Increase in SWP System Pumping Energy Use
Simulated average annual SWP pumping energy use for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual pumping energy use of 60 GWh (1 percent) and 72 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP2): Decrease in Pit 7 Powerplant Energy Generation
Simulated average annual Pit 7 generation for CP2 is shown in Table 23-4. Under CP2 the operating range of net head would decrease from about 173 to 204 feet to about 168 to 193 feet, an approximately 4 percent decrease in net head. Under CP2, there would be a decrease in simulated average annual generation of about 9 GWh (2 percent) and 7 GWh (1 percent) under existing and future levels, respectively. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

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

CP3 focuses on increasing agricultural water supply reliability while also increasing anadromous fish survival. This plan primarily consists of raising Shasta Dam by 18.5 feet, which, in combination with spillway modifications,

would increase the height of the reservoir's full pool by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet. The existing TCD would also be extended to achieve efficient use of the expanded cold-water pool. Because CP3 focuses on increasing agricultural water supply reliability, none of the increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, with the additional storage retained for water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. Simulations of CP3 did not involve any changes to the modeling logic for deliveries or flow requirements; all rules for water operations were updated to include the new storage but were not otherwise changed. Table 23-5 summarizes the simulated average annual hydropower generation and energy use for CP3.

Table 23-5. Simulated Average Annual Energy Generation and Use for CP3

	Existing (GWh)	CP3 (GWh)	Change		Future (GWh)	CP3 (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,248	97	5%	2,154	2,249	95	4%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	5,025	98	2%	4,914	5,009	95	2%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,429	2	0%	4,513	4,508	-5	0%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,214	13	1%	1,184	1,209	25	2%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,606	6	0%	7,933	7,917	-16	0%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	514	-15	-3%	529	514	-15	-3%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP3): Decrease in Shasta Powerplant Energy Generation
Simulated average annual Shasta Powerplant energy generation for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual generation of 97 GWh (5 percent) and 95 GWh (4 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP3 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the

ability to manage the electric grid in a reliable manner. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP3): Decrease in CVP System Energy Generation
Simulated average annual CVP system generation for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual energy generation of 98 GWh (2 percent) and 95 GWh (2 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP3): Decrease in SWP System Energy Generation
Simulated average annual SWP system generation for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual energy generation of 2 GWh (0 percent) under the existing level and a decrease of 5 GWh (0 percent) under the future level. This impact would be beneficial under the existing level and less than significant under the future level. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP3): Increase in CVP System Pumping Energy Use
Simulated average annual CVP pumping energy use for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual pumping energy use of 13 GWh (1 percent) and 25 GWh (2 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP3): Increase in SWP System Pumping Energy Use
Simulated average annual SWP pumping energy use for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual pumping energy use of 6 GWh (0 percent) under the existing level and a decrease of 16 GWh (0 percent) under the future level. This impact would be beneficial under the existing level and less than significant under the future level. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP3): Decrease in Pit 7 Powerplant Energy Generation
Simulated average annual Pit 7 Powerplant generation for CP3 is shown in Table 23-5. Under CP3 the operating range of net head would decrease to about 156 to 181 feet, an approximate 10 percent reduction in net head. Under CP3, there would be a decrease in simulated average annual generation of 15 GWh (3 percent) under both the existing and future levels. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

CP4 and CP4A focus on increasing anadromous fish survival while also increasing water supply reliability. By raising Shasta Dam 18.5 feet, in combination with spillway modifications, CP4 or CP4A would increase the height of the reservoir full pool by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet. The existing TCD would also be extended to achieve efficient use of the expanded cold-water pool. The additional storage created by the 18.5-foot dam raise would be used to improve the ability to meet temperature objectives and habitat requirements for anadromous fish during drought years and increase water supply reliability.

For CP4, about 378,000 acre-feet of the increased reservoir storage space, would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. Operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as for CP1, with 70,000 acre-feet and 35,000 acre-feet reserved to specifically focus on increasing M&I deliveries during dry and critical years, respectively. CP4 also includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River for fisheries benefit. Table 23-6 summarizes the simulated average annual hydropower generation and energy use for CP4.

Table 23-6. Simulated Average Annual Energy Generation and Use for CP4

	Existing (GWh)	CP4 (GWh)	Change		Future (GWh)	CP4 (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,269	118	5%	2,154	2,273	119	6%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	5,044	117	2%	4,914	5,033	119	2%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,440	13	0%	4,513	4,527	14	0%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,203	3	0%	1,184	1,191	7	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,642	42	1%	7,933	7,979	46	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	513	-16	-3%	529	513	-16	-3%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

For CP4A, about 191,000 acre-feet of the increased reservoir storage space, would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. Operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as for CP2, with 120,000 acre-feet and 60,000 acre-feet reserved to specifically focus on increasing M&I deliveries during dry and critical years, respectively. CP4A also includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River for fisheries benefit. Table 23-7 summarizes the simulated average annual hydropower generation and energy use for CP4A.

Table 23-7. Simulated Average Annual Energy Generation and Use for CP4A

	Existing (GWh)	CP4A (GWh)	Change		Future (GWh)	CP4A (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2151	2261	110	5%	2154	2261	107	5%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	5,037	111	2%	4,914	5,023	109	2%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4427	4444	17	0%	4513	4535	22	0%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,206	5	1%	1,184	1,194	10	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7600	7660	60	1%	7933	8005	72	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	513	-15	-3%	529	514	-15	-3%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP4 and CP4A): Decrease in Shasta Powerplant Energy Generation Simulated average annual Shasta Powerplant energy generation for CP4 is shown in Table 23-6 and in Table 23-7 for CP4A.

Under CP4, there would be an increase in simulated average annual generation of 118 GWh (5 percent) and 119 GWh (6 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP4 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner. This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

Under CP4A, there would be an increase in simulated average annual generation of 110 GWh (5 percent) and 107 GWh (5 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP4A would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner. This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP4 and CP4A): Decrease in CVP System Energy Generation Simulated average annual CVP system generation for CP4 is shown in Table 23-6. Under CP4, there would be an increase in simulated average annual energy generation of 117 GWh (2 percent) and 119 GWh (2 percent) under existing and future levels, respectively. This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual CVP system generation for CP4A is shown in Table 23-7. Under CP4A, there would be an increase in simulated average annual energy generation of 111 GWh (2 percent) and 109 GWh (2 percent) under existing and future levels, respectively. This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP4 and CP4A): Decrease in SWP System Energy Generation Simulated average annual SWP system generation for CP4 is shown in Table 23-6. Under CP4, there would be an increase in simulated average annual energy generation of 13 GWh (0 percent) and 14 GWh (0 percent) under existing and future levels, respectively. This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual CVP system generation for CP4A is shown in Table 23-7. Under CP4A, there would be an increase in simulated average annual energy generation of 17 GWh (0 percent) and 22 GWh (0 percent) under existing and future levels, respectively. This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP4 and CP4A): Increase in CVP System Pumping Energy Use Simulated average annual CVP pumping energy use for CP4 is shown in Table 23-6. Under CP4, there would be an increase in simulated average annual pumping energy use of 3 GWh (0 percent) and 7 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual CVP pumping energy use for CP4A is shown in Table 23-7. Under CP4A, there would be an increase in simulated average annual pumping energy use of 5 GWh (1 percent) and 10 GWh (1 percent)

under existing and future levels, respectively. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP4 and CP4A): Increase in SWP System Pumping Energy Use Simulated average annual SWP pumping energy use for CP4 is shown in Table 23-6. Under CP4, there would be an increase in simulated average annual pumping energy use of 42 GWh (1 percent) under both the existing and future levels. This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual SWP pumping energy use for CP4A is shown in Table 23-7. Under CP4A, there would be an increase in simulated average annual pumping energy use of 60 GWh (1 percent) and 72 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP4 and CP4A): Decrease in Pit 7 Powerplant Energy Generation Simulated average annual Pit 7 Powerplant generation for CP4 is shown in Table 23-6. Under CP4 the operating range of net head would decrease to about 156 to 181 feet, an approximate 10 percent reduction in net head. Under CP4, there would be a decrease in simulated average annual generation of 16 GWh (3 percent) under both the existing and future levels. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual Pit 7 Powerplant generation for CP4A is shown in Table 23-7. Under CP4A the operating range of net head would decrease to about 156 to 181 feet, an approximate 10 percent reduction in net head. Under CP4A, there would be a decrease in simulated average annual generation of 15 GWh (3 percent) under both the existing and future levels. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

CP5 primarily focuses on increasing water supply reliability, anadromous fish survival, Shasta Lake area environmental resources, and recreation opportunities. By raising Shasta Dam 18.5 feet, in combination with spillway modifications, CP5 would increase the height of the reservoir full pool by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet. The existing TCD would be extended to achieve efficient use of the expanded cold-water pool. Shasta Dam operational guidelines would continue essentially

unchanged, except during dry years and critical years, when 150,000 acre-feet and 75,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP5 also includes constructing additional fish habitat in and along the shoreline of Shasta Lake and along the lower reaches of its tributaries; augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River; and increasing recreation opportunities at Shasta Lake. CP5 would help reduce future water shortages by increasing drought year and average year water supply reliability for agricultural and M&I deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River. Table 23-8 summarizes the simulated average annual hydropower generation and energy use for CP5.

Table 23-8. Simulated Average Annual Energy Generation and Use for CP5

	Existing (GWh)	CP5 GWh)	Change		Future (GWh)	CP5 (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,247	96	4%	2,154	2,247	93	4%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	5,021	95	2%	4,914	5,007	93	2%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,449	22	0%	4,513	4,537	24	1%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,207	7	1%	1,184	1,200	16	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,674	74	1%	7,933	8,018	85	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	514	-15	-3%	529	514	-15	-3%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP5): Decrease in Shasta Powerplant Energy Generation
Simulated average annual Shasta Powerplant energy generation for CP5 is shown in Table 23-8. Under CP5, there would be an increase in simulated average annual generation of 96 GWh (4 percent) and 93 GWh (4 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP5 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP5): Decrease in CVP System Energy Generation
Simulated average annual CVP system generation for CP5 is shown in Table 23-8. Under CP5, there would be an increase in simulated average annual energy generation of 95 GWh (2 percent) and 93 GWh (2 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP5): Decrease in SWP System Energy Generation
Simulated average annual SWP system generation for CP5 is shown in Table 23-8. Under CP5, there would be an increase in simulated average annual energy generation of 22 GWh (0 percent) and 24 GWh (1 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP5): Increase in CVP System Pumping Energy Use
Simulated average annual CVP pumping energy use for CP5 is shown in Table 23-8. Under CP5, there would be an increase in simulated average annual pumping energy use of 7 GWh (1 percent) and 16 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP5): Increase in SWP System Pumping Energy Use
Simulated average annual SWP pumping energy use for CP5 is shown in Table 23-7. Under CP5, there would be an increase in simulated average annual pumping energy use of 74 GWh (1 percent) and 85 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP5): Decrease in Pit 7 Powerplant Energy Generation
Simulated average annual Pit 7 Powerplant generation for CP5 is shown in Table 23-8. Under CP5 the operating range of net head would decrease to about 156 to 181 feet, an approximate 10 percent reduction in net head. Under CP5, there would be a decrease in simulated average annual generation of 15 GWh (3 percent) under both the existing and future levels. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

23.3.4 Mitigation Measures

Table 23-9 presents a summary of impacts and mitigation measures for power and energy. No potentially significant impacts have been identified; therefore, no mitigation is required.

Table 23-9. Summary of Impacts and Mitigation Measures – Power and Energy

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Hydro-1: Decrease in Shasta Powerplant Energy Generation	LOS before Mitigation	B	B	B	B	B	B
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	B	B	B	B	B	B
Impact Hydro-2: Decrease in CVP System Energy Generation	LOS before Mitigation	LTS	B	B	B	B	B
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	LTS	B	B	B	B	B
Impact Hydro-3: Decrease in SWP System Energy Generation	LOS before Mitigation	B	B	B	LTS	B	B
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	B	B	B	LTS	B	B
Impact Hydro-4: Increase in CVP System Pumping Energy Use	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Hydro-5: Increase in SWP System Pumping Energy Use	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Hydro-6: Decrease in Pit 7 Powerplant Energy Generation	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Key:
B = Beneficial
CP = Comprehensive Plan
CVP = Central Valley Project
LOS = Level of Significance
LTS = Less than Significant
SWP = State Water Project

23.3.5 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," discusses overall cumulative impacts methodology related to the action alternatives, including the relationship to the CALFED Bay-Delta Program Programmatic EIS/EIR cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," lists the present and reasonably foreseeable future projects considered quantitatively and qualitatively within the cumulative impacts analysis.

Actions which are included quantitatively in this cumulative effects analysis are those that are reasonably foreseeable, including actions with current authorization, secured funding for design and construction, and environmental permitting and compliance activities that are substantially complete. As described in Chapter 2, "Alternatives," Section 2.2, "No-Action Alternative," the NEPA No-Action alternative includes all reasonably foreseeable actions

included quantitatively in the cumulative effects analysis, but excludes effects for project actions. The future with-project conditions combine project actions with the actions included in the No-Action Alternative (2030 baseline). Therefore, quantitative impact assessments for the future with-project conditions presented in this chapter in Section 23.3.3, "Direct and Indirect Effects," also serve as the quantitative impacts assessments for the cumulative effects analysis. A list of projects included in the Final EIS No-Action Alternative and future with-project impact analyses is located in the Modeling Appendix, Chapter 2, Table 2-1.

Past and present projects that have affected power and energy resources in the primary and extended study area include new hydropower projects, FERC hydropower relicensing projects, regulatory actions, and fisheries flow requirements. Projects which do not meet the parameters of reasonably foreseeable for inclusion in this quantitative cumulative effects analysis but which may have past, present, or reasonably foreseeable cumulative impacts in combination with the proposed project may be included in the cumulative impacts analysis qualitatively. Projects and actions considered include, but are not limited to, the San Joaquin River Restoration Program, Bay Delta Conservation Plan (BDCP), Yuba Salmon Forum Fish Passage Program, Increased Hydropower Generation Capacity at Lewiston Dam, PG&E Pit River 3,4 and 5 Hydroelectric Projects License Implementation, PG&E McCloud and Pit Rivers 6 and 7 FERC relicensing projects and the DWR Oroville Facilities FERC Relicensing.

The effects of climate change on operations at Shasta Lake could potentially result in changes to power and energy. As described in the Climate Change Modeling Appendix, climate change could result in higher reservoir releases in the winter and early spring due to an increase in runoff during these times. Similarly, climate change could result in lower reservoir inflows and Sacramento tributary flows during the late spring and summer due to a decreased snow pack. This reduction in inflow and tributary flow could result in Shasta Lake storage being reduced due to both a reduced ability to capture flows and an increased need to make releases to meet downstream requirements.

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

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP1. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. Additionally, several of the projects listed in Table

3-1 would have an impact on energy generation and energy use, such as the BDCP and various FERC relicensing projects. CP1 has an overall net negative energy value; therefore CP1 would make a cumulatively considerable incremental contribution to a significant cumulative impact on energy consumption and generation.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP1 would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP1 having a significant cumulative impact.

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

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP2. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. However, CP2 has a net beneficial impact on energy consumption and energy generation and therefore would not have a cumulatively considerable incremental contribution to the significant cumulative impact.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP2 would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP2 having a significant cumulative impact.

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

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the

Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP3. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. However, CP3 has a net beneficial impact on energy consumption and energy generation and therefore would not have a cumulatively considerable incremental contribution to the significant cumulative impact.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP3 would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP3 having a significant cumulative impact.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP4 or CP4A. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. However, CP4 and CP4A have a net beneficial impact on energy consumption and energy generation and therefore would not have a cumulatively considerable incremental contribution to the significant cumulative impact.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP4 or CP4A would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP4 or CP4A having a significant cumulative impact.

CP5 – 18.5-Foot Dam Raise, Combination Plan

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP5. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. However, CP5 has a net beneficial impact on energy consumption and energy generation and therefore would not have a cumulatively considerable incremental contribution to the significant cumulative impact.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP5 would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP5 having a significant cumulative impact.

Chapter 24
Environmental Justice

24.1 Affected Environment

24.1.1 Minority and Low-Income Populations

The environmental setting of a project area can be viewed from both a geographic perspective and a human perspective. The physical environment provides a geographical context for the populations to be evaluated in this EIS. The human perspective encompasses race, ethnic origin, and economic status of affected groups.

The intent of an environmental justice evaluation under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations* (1994), is to identify communities and groups that meet environmental justice criteria, and suggest strategies to reduce potential adverse impacts of projects on affected groups.

In its guide to environmental justice under NEPA, the Council on Environmental Quality (CEQ) (1997) encourages agencies to consider all of the following groups in the scoping process:

- Religious organizations
- Newspapers, radio, and other media
- Civic associations
- Minority business associations
- Environmental and environmental justice organizations
- Legal aid providers
- Homeowners’, tenants’, and neighborhood watch groups
- Federal, State, local, and tribal governments
- Rural cooperatives
- Business and trade organizations

- Community and social service organizations
- Universities, colleges, vocational, and other schools
- Labor organizations
- Civil rights organizations
- Local schools and libraries
- Senior citizens' groups
- Public health agencies and clinics

Shasta Lake and Vicinity

This section reviews minority and low-income communities situated near the reservoir, and those that directly depend on it for social, economic, cultural, historic, occupational, recreational, or other needs deemed significant by these communities.

County-level data are used for this analysis given the large size of the project impact area comprised largely of rural areas and the fact that localized areas within the counties are not likely to differ appreciably in their minority and low-income population makeup. For example, the closest incorporated city to Shasta Dam within Shasta County is the City of Shasta Lake. Shasta Lake's percentage of minority (nonwhite) residents in 2010 was 13.9 percent, compared to 16.6 percent for the county as a whole, and the percentage of low-income residents in Shasta Lake was 20.5 percent compared to 15.5 percent for the county as a whole.

Table 24-1 depicts a historically white population in Shasta County that is slowly diversifying and income levels consistently below the statewide average, resulting in relatively higher poverty rates among all ethnic groups. In 2010, the population of Shasta County was approximately 16.6 percent minority (nonwhite) and approximately 17.7 percent low-income, compared to statewide populations of 42.4 percent minority and 15.5 percent low-income. The slightly higher local poverty rate is not meaningfully greater than the statewide rate.

Lakehead-Lakeshore Community The Lakehead-Lakeshore community is located along Shasta Lake's northernmost reach, the Sacramento River Arm. Lakehead, an unincorporated seasonal community of approximately 1,500 residents (U.S. Census Bureau 2010a), is adjacent to Interstate 5 and includes typical services found near a major interstate highway. Lakehead provides a variety of campgrounds, boat ramps, and marinas. The Lakehead community includes low-income and minority residents and workers who could be affected by project construction and changes in outdoor recreation patterns resulting from the project.

Tourism and Outdoor Recreation Industry Shasta Lake and its vicinity are recreation destinations that draw visitors from throughout California. Most facilities in the area depend on Shasta Lake to draw visitors and customers. The tourism and outdoor recreation service industries are included in this discussion because this group includes a community of lower-paid service workers that could be affected by project actions related to Shasta Dam. A change in recreation opportunities could affect employment and revenue patterns, as well as social and recreational opportunities for minority or low-income residents. With the exception of Lakehead, the settlement and recreation-related development along Shasta Lake falls within unincorporated Shasta County. Residents and workers are dispersed throughout Shasta County, and affected minority and low-income communities are reflected in demographic data for Shasta County as shown in Table 24-1.

Table 24-1. Ethnicity, Income, and Poverty Trends in Shasta and Tehama Counties and California

Topic	Shasta County	Tehama County	State of California
Race/Ethnicity			
White, 2010	153,726	51,721	21,453,934
White, 2000–2010 (% change)	5.4	8.8	6.4
Black or African American, 2010	1,548	406	2,299,072
Black or African American, 2000–2010 (% change)	26.4	27.7	1.6
American Indian, including Alaskan Natives, 2010	4,950	1,644	362,801
American Indian, including Alaskan Natives, 2000–2010 (% change)	9.3	41.3	8.8
Asian or Pacific Islander, 2010	4,662	732	5,005,393
Asian or Pacific Islander, 2000–2010 (% change)	37.0	47.9	31.2
Two or more races (total), 2010	7,846	2,702	1,815,384
Two or more races (total), 2000–2010 (% change)	38.6	42.3	12.9
Hispanic Origin (any race), 2010	14,878	13,906	14,013,719
Hispanic Origin (any race), 2000–2010 (% change)	65.3	56.8	27.8

Table 24-1. Ethnicity, Income, and Poverty Trends in Shasta and Tehama Counties and California (contd.)

Topic	Shasta County	Tehama County	State of California
Income/Poverty			
Median Household Income, 2000	$34,335	$31,206	$47,493
Median Household Income, 2010	$42,931	$39,392	$59,641
% Change, 2000–2010	25.0	26.2	25.5
% of Individuals Below Poverty Level, 2000	15.4	17.3	14.2
% of Individuals Below Poverty Level, 2010	17.7	19.5	15.5
% Change, 2000–2010	2.3	2.2	1.3
% of Children (< 18) Below Poverty Level, 2000	21.0	24.0	19.0
% of Children (< 18) Below Poverty Level, 2010	23.4	27.9	21.6
% Change, 2000–2010	2.4	3.9	2.6

Sources: U.S. Census Bureau 2002a, 2002b, 2002c, 2009a, 2010b

Areas of Native American Concern As described in Chapter 14, "Cultural Resources," the Sacramento River and its major tributaries, particularly the Pit and McCloud rivers, were the focus of intensive Native American occupation during historic times, with a variety of religious, economic, historic, and other values identified here for Native American groups. Ten groups, including those listed by the Native American Heritage Commission, represent Native American interests in the study area. They include Grindstone Indian Rancheria, Paskenta Band of Nomlaki Indians, Pit River Environmental Council, Pit River Tribe of California, Redding Rancheria, Shasta Nation, United Tribe of Northern California, Inc., Winnemem Wintu Tribe, Wintu Educational and Cultural Council, and the Wintu Tribe of Northern California.

The Winnemem Wintu have identified important localities within the study area, many of which are locations where ceremonies are regularly conducted. Along the McCloud River, these include Children's Rock, Coyote Rock, Dekkas Rock, doctoring pools near Nawtawaket Creek, Eagle Rock and Samwel Cave, Hirz Bay, *Kaibai* village, North Gray Rocks, Puberty Rock, Saddle Rock, and *Watawacket* village and spiritual area. Along the Sacramento River, important localities include the Antlers area, Delta area, Doney Creek, Gregory Creek, LaMoine area, Packers Bay, Pollard's area, middle Salt Creek, and Sims area. The Winnemem Wintu have strong traditional and contemporary connections with the land, and their ongoing use of many archaeological and religious sites is fundamental to the well-being of their culture, particularly the education of their youth.

The Winnemem Wintu have also documented the location of some 155 ancestral villages within the Shasta Lake area. At least 81 village locations are known along the lower McCloud River and lower Pit River. An additional 73 villages are known to have existed on the east side of the Sacramento River. These village locations once contained between one and 30 houses each, some had associated cemeteries and each had a power place. Some of these villages are already under the waters of Shasta Lake, while others are just above the current Shasta Lake water level. The Winnemem Wintu have estimated that 120 of the known villages are still accessible (above the current high-water line).

Members of the Pit River Madesi Band stated that 22 ethnographic villages and associated burial grounds are located within the existing reservoir and proposed reservoir areas. One tribal member also noted that several Traditional Cultural Properties (TCP) exist within the Pit 6 and Pit 7 Dam areas.

Upper Sacramento River (Shasta Dam to Red Bluff)

Many social and public services are provided and a range of resource-dependent cultural activities take place in the cities of Shasta Lake, Redding, Anderson, Cottonwood, and Red Bluff. Each of these communities could be affected during project operation as a result of improved flood protection, enhanced water supply reliability, and increased recreational opportunities and spending related to improved salmonid habitat. Redding and Shasta County may be most affected because local residents, businesses, public services, and fiscal resources likely would also be affected by construction-related spending and activities.

Groups affected by the project could include minority and low-income populations such as transient and seasonal workers, Native American and Hispanic/Latino populations, and low-income water and electric utility customers. In 2010, the population of Tehama County was approximately 18.0 percent minority (nonwhite) and 19.5 percent low-income, compared to statewide populations of 42.4 percent minority and 15.5 percent low-income (Table 24-1). Poverty levels in Shasta and Tehama counties were exceeding statewide levels in 2010.

These groups often share the need for a reliable income and low costs of living, access to steady jobs, the need to protect the profitability of businesses that affect their personal income, access to high-quality public services, access to affordable and diverse housing, and a desire to enjoy a high quality of life.

Minority and low-income populations in the upper Sacramento River portion of the primary study area, many of which are employed by local agricultural operations, are especially susceptible to changes in employment opportunities. Changes in water and power supply reliability or delivery costs can have a major effect on the cost of living and on the operating costs and financial health of local businesses and employers. Changes in the frequency and duration of flooding along the Sacramento River and in the Delta also could affect agricultural operations and business owners and employees.

Lower Sacramento River and Delta

As discussed in Chapter 16, "Socioeconomics, Population, and Housing," this portion of the extended study area includes Red Bluff, the largest city in Tehama County with a population of 13,825 in 2010, and nine counties to the south. In 2010, the population of those nine counties totaled 4,226,027 (DOF 2010). The minority population of the nine counties was 42.6 percent overall, which is approximately the same as the statewide populations of 42.4 percent. Glenn County had the lowest proportion of minority populations, while Sacramento and San Joaquin counties had the highest proportion (U.S. Census Bureau 2010c). In 2010, poverty levels in the region ranged from 10 percent to 20 percent, with low-income populations exceeding the 15.5 percent state poverty level in Butte, Glenn, Sacramento, San Joaquin, and Yolo counties (U.S. Census Bureau 2009b).

Regional employment and labor trends are generally consistent with statewide trends. In 2010, approximately 15.6 percent of the labor force in the nine-county area was unemployed, compared to 7.7 percent statewide (U.S. Census Bureau 2009b). Butte, Colusa, Sacramento, San Joaquin, Solano, and Sutter counties registered higher unemployment rates than California as a whole. The counties with the highest unemployment rates in 2010 were characterized by greater dependence on the agricultural industry and less industrial diversity. Five of the six counties with unemployment rates above the statewide average maintained more than 60 percent of their land mass in agricultural production. Unemployment rates tend to be higher in rural areas than in urban areas because farm work is typically seasonal or temporary.

The lower Sacramento River region becomes increasingly urbanized as the river flows past the city of Sacramento and toward the Delta. Along its course, the river passes through low-density agricultural and suburban metropolitan areas and near high-density centers of commerce and culture such as Sacramento. In the Delta, a complex network of highways and urban infrastructure is integrated with canals, dikes, and levees. Heavily engineered water control and conveyance systems have promoted and sustained a successful agriculture industry and protected the region against damaging floods.

CVP/SWP Service Areas

The CVP and SWP service areas include 36 of California's 58 counties, accounting for 91 percent (38,648,090 residents) of California's population in 2010 (DOF 2010). Minority groups have been steadily increasing and such ethnic diversification is expected to continue. As shown in Table 24-1, the population of individuals in California identifying themselves as Asian–Pacific Islander or multiracial experienced double-digit population growth, while those identifying themselves as Black or African American experienced the least amount of growth between 2000 and 2010 (U.S. Census Bureau 2010b). Hispanics are the most numerous minority group in California, and many members of this ethnic group work on farms that receive some or all of their

water from the CVP. In general, rural agricultural counties have smaller minority populations than urban counties.

Poverty levels for both individuals and children increased slightly between 2000 and 2010. The percentage of people below the poverty level is expected to follow national and statewide economic trends. Generally, poverty rates tend to be higher in rural counties than in urban counties. Despite these differences, each of California's major urban areas has pockets of low-income neighborhoods with high poverty (and unemployment) rates. Minority and low-income communities that might be affected by the project include communities adjacent to construction projects, gateway and service communities providing support to construction-related activities, and low-income customers of water and power utilities who might experience higher rates as a result of costs of project-related system improvements.

These residents and workers may be most vulnerable to increases in CVP water and power costs and, conversely, would benefit from improved flood protection and CVP water and power supply reliability. Central Valley farm workers and other workers employed by businesses in the region that supply goods and services to agricultural operations also could benefit.

24.2 Regulatory Framework

24.2.1 Federal

Executive Order 12898

The purpose of Executive Order 12898 (part of which is excerpted in the introduction to this chapter) is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from Federal actions and policies on minority and/or low-income communities. This order requires lead agencies to evaluate impacts on minority or low-income populations during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by Federal agencies.

In addition to the direction referenced above, Executive Order 12898 includes the following requirements:

- Each Federal agency shall conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin. *(Section 2-2)*

- Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public. *(Section 5-5(c))*

In addition, the presidential memorandum accompanying the executive order states that "(e)ach Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA of 1969."

Two documents provide some measure of guidance to agencies required to implement Executive Order 12898. The first is *Environmental Justice Guidance Under the National Environmental Policy Act* (December 1997), published by CEQ. The second document, the *Final Guidance for Incorporating Environmental Justice Concerns* (April 1998) published in the U.S. Environmental Protection Agency's NEPA Compliance Analysis, serves as a guide for incorporating environmental justice goals into preparation of the EIS under NEPA. These documents provide specific guidelines for assessing environmental justice effects associated with a proposed Federal project.

24.2.2 State

There are no State plans, policies, regulations, or laws related to environmental justice applicable to the project. However, Senate Bill 115 (Chapter 690, Statutes of 1999), signed into law in 1999, defined environmental justice in statute and established the Governor's Office of Planning and Research as the coordinating agency for State environmental justice programs (California Government Code, Section 65040.12). This law further required the California Environmental Protection Agency to develop a model environmental justice mission statement for boards, departments, and offices within the agency by January 1, 2001 (Public Resources Code, Sections 72000–72001). The purpose of this program is to inform decision-makers by providing guidance on environmental justice issues.

24.2.3 Regional and Local

There are no regional or local plans, policies, regulations, or laws related to environmental justice applicable to the project.

24.3 Environmental Consequences and Mitigation Measures

This section describes the potential environmental consequences of the project alternatives as they relate to environmental justice. This analysis relies on demographic data provided in the *Socioeconomics, Population, and Housing Technical Report* and incorporates that information as necessary to describe potential effects on minority and low-income communities.

24.3.1 Methods and Assumptions

According to CEQ and U.S. Environmental Protection Agency guidelines established to assist Federal and State agencies, a minority population is present in a project area if (1) the minority population of the affected area exceeds 50 percent, or (2) the minority-population percentage of the affected area is meaningfully greater than the minority-population percentage in the general population or other appropriate unit of geographic analysis. By the same rule, a low-income population exists if the project area consists of 50 percent or more people living below the poverty threshold, as defined by the U.S. Census Bureau, or is meaningfully greater than the poverty percentage of the general population or other appropriate unit of geographic analysis.

The CEQ guidance indicates that when agencies determine whether environmental effects are disproportionately high and adverse, they are to consider whether there is or would be an impact on the natural or physical environment (as defined by NEPA) that would adversely affect a minority population or low-income population.

None of the published guidelines define the term “disproportionately high and adverse,” but CEQ includes a nonquantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population (CEQ 1997).

The following population characteristics are considered in this analysis:

- Race and ethnicity
- Per-capita income as it relates to the poverty level

The relevant demographic data were obtained from the U.S. Census Bureau and the California Department of Finance. Data are presented at the county level to accommodate the geographic size of each portion of the study area.

In this analysis, a county is considered to have a minority population if its nonwhite population is greater than 50 percent or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50 percent, or is meaningfully greater than the general population (average statewide poverty level). Based on these criteria, Shasta and Tehama counties are not considered environmental justice communities. Within the lower Sacramento and Delta area, minority populations exceed 50 percent in Colusa, Sacramento, San Joaquin, Solano, Sutter, and Yolo counties. Although the minority population in the lower Sacramento River and Delta area is projected to exceed 50 percent by 2020, the 63.8 percent representation would not be meaningfully greater than the statewide minority population, which is projected to be 62.5 percent. Within the CVP and SWP service areas, there are some low-income populations; however, these areas are so expansive that they are

considered synonymous with the entire state of California for environmental justice purposes.

Native American Outreach

Public and stakeholder coordination meetings were conducted on behalf of Reclamation with Native American tribal groups whose traditional territories overlap the primary study area. Seven tribal groups were invited to an information meeting held on April 4, 2007, in Redding, California. The purpose of the meeting was to provide general information about the project, initiate Section 106 consultation with groups desiring to participate in the project, and introduce Elena Nilsson as the Native American Tribal Coordination study lead. Invitations were sent to the Grindstone Rancheria, Paskenta Rancheria, Pit River Tribe, Redding Rancheria, Shasta Nation, Winnemem Wintu, and the Wintu Tribe and Toyon-Wintu Center. The meeting was attended by representatives from the Winnemem Wintu and the Madesi Band of the Pit River Tribe.

Between August 2007 and March 2008, nine meetings were held with Native American groups whose traditional territories overlap with the primary study area. These included meetings and/or workshops with groups and individuals representing major tribes and/or extended family groups in the Shasta/Redding area regarding potential effects on cultural resources from a plan to enlarge Shasta Dam. The purposes of the meetings were to solicit, clarify, and document major concerns and issues regarding the project, and to establish a preferred method/approach to maintaining effective communication during the remainder of the project study and in future endeavors. Five groups participated in these meetings: Grindstone Indian Rancheria (one meeting), Paskenta Band of Nomlaki Indians (one meeting), Pit River Tribe (three meetings), Shasta Nation (one meeting), and Winnemem Wintu (three meetings).

24.3.2 Criteria for Determining Disproportionately High and Adverse Effects

To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population.

24.3.3 Topics Eliminated from Further Consideration

No topics related to environmental justice that are included in the significance criteria listed above have been eliminated from further consideration. All relevant topics are analyzed below.

Effects on sites considered sacred by local Native American communities in the upper Sacramento River portion of the primary study area and the lower Sacramento River and Delta and CVP and SWP service areas have been eliminated from further discussion. No impacts on these resources are anticipated as a result of changes in Shasta Dam operations (i.e., storage and release scenarios). Furthermore, any construction activities near sites considered sacred by local Native American communities would require mitigation as stated in Chapter 14 "Cultural Resources," including compliance with Section 106 of the National Historic Preservation Act (NHPA). As a result, no disproportionately high and adverse effects on Native American populations would be expected; therefore, potential effects related to this topic in these geographic regions are not discussed further in this EIS.

24.3.4 Direct and Indirect Effects

No-Action Alternative

Shasta Lake and Vicinity

Impact EJ-1 (No-Action): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake Communities at Shasta Lake and in the vicinity would remain below minority and low-income thresholds as they relate to environmental justice. Adverse construction-related impacts would be avoided, and construction-related employment opportunities and gains within local economies would not be realized. Existing adverse effects on minority or low-income populations do not constitute a disproportionately high and adverse impact. No disproportionately high and adverse effects on minority or low-income populations would occur.

Shasta County would maintain its steady population growth under the No-Action Alternative. Between 1990 and 2010, the population increased by 25.3 percent, with total population projected to reach 196,087 by 2020 (DOF 2010, 2012). The minority (nonwhite) population, including the Winnemem Wintu Tribe and other Native Americans, is projected to account for 16.6 percent of the total population in Shasta County in 2020, slightly more than the current 14.3 percent representation, but less than the 62.5 percent minority population projected statewide for 2020.

As described in Table 24-1, the poverty level in Shasta County increased by 2.3 percent during 2000 to 2010, and unemployment rates in Shasta County were mostly steady during 2000 to 2010, fluctuating between 6.0 and 8.1 percent. However, the poverty and unemployment rates are expected to decrease as the economy recovers. Employment opportunities continue to be provided in the region by major employment sectors such as trade, transportation, and utilities; government; educational, and health services; and leisure and hospitality industries (see Chapter 16, "Socioeconomics, Population, and Housing"). Professional and business services and education and health services are

projected to be the leading growth industries in Shasta County; these are also the top two anticipated growth industries statewide. No disproportionately high or adverse impacts on minority or low-income communities are anticipated under the No-Action Alternative. Mitigation is not required for the No-Action Alternative.

Impact EJ-2 (No-Action): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake Shasta Dam would not be enlarged; no infrastructure would be removed, modified, or relocated; and no changes in Reclamation's Shasta Lake operations would occur. No disproportionately high and adverse effects on Native American populations would occur.

Under the No-Action Alternative, Shasta Dam would not be enlarged; no infrastructure would be removed, modified, or relocated; and no changes in Reclamation's Shasta Lake operations would occur. Therefore, there would be no effect on several locations in the vicinity of Shasta Lake that are considered sacred by local Native American communities. No disproportionately high and adverse effects on Native American populations would occur. Mitigation is not required for the No-Action Alternative.

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact EJ-3 (No-Action): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area Communities in the upper Sacramento River portion of the primary study area would remain below minority and low-income thresholds for environmental justice. The No-Action Alternative would not cause long-term operational changes; therefore, communities adjacent to the Sacramento River would not be affected by long-term changes to environmental and recreational conditions. Construction-related gains within this area would not be realized. Existing adverse effects on minority or low-income populations would not be disproportionately high and adverse. No disproportionately high and adverse effects on minority or low-income populations would occur.

Tehama County would maintain its steady population growth under the No-Action Alternative. Between 1990 and 2010, the population increased by 27.2 percent, with total population projected to reach 68,769 by 2020 (DOF 2010). The minority (nonwhite) population is projected to account for 31 percent of the total population in Tehama County in 2020, an increase of nearly 7 percent from the current 23.9 percent level, but less than the 62.5 percent minority population projected statewide for 2020.

As described in Chapter 16, "Socioeconomics, Population, and Housing," during 2000 to 2010, the poverty level in Tehama County increased by 2.2 percent and unemployment rates in Tehama County fluctuated between 6.4 and 8.8 percent. Tehama County is similar to neighboring Shasta County in employment and income trends, and dominant employment sectors. Projected

growth industries differ between the two counties, however; Tehama County is projected to experience economic growth in construction and information services (see Chapter 16, "Socioeconomics, Population, and Housing"). These sectors are the third and fifth largest anticipated growth areas statewide.

Because the No-Action Alternative would not change existing or projected future conditions, it would not have a disproportionately high or adverse effect on minority or low-income communities. Mitigation is not required for the No-Action Alternative.

Lower Sacramento River and Delta

Impact EJ-4 (No-Action): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Some communities within the lower Sacramento River and Delta portion of the extended study area contain minority and low-income populations above environmental justice thresholds; however, continuing the existing and projected future conditions under the No-Action Alternative would not affect those populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

The lower Sacramento River and Delta portion of the extended study area includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, and Yolo counties. In 2010, the population of the nine-county region was 4,226,027. This number is expected to grow by 47.5 percent to 6,294,088 by 2020 (DOF 2010, 2012). The minority (nonwhite) population is projected to account for 63.8 percent of the total population in the lower Sacramento River and Delta area by 2020, with minority populations exceeding 50 percent in Colusa, Sacramento, San Joaquin, Solano, Sutter, and Yolo counties. Although the minority population in the lower Sacramento River and Delta area is projected to exceed 50 percent by 2020, the 63.8 percent representation would not be meaningfully greater than the statewide minority population, which is projected to be 62.5 percent.

In 2010, poverty levels in the nine-county region ranged from 10 percent to 20 percent, with low-income populations exceeding the 15.5 percent statewide poverty level in Butte, Glenn, Sacramento, San Joaquin, and Yolo counties (U.S. Census Bureau 2009b). Employment and labor trends in the lower Sacramento River and Delta portion of the extended study area are generally consistent with statewide trends. In 2010, approximately 15.6 percent of the labor force in the nine-county area was classified as unemployed, compared to a statewide total of 7.7 percent. Butte, Colusa, Sacramento, San Joaquin, Solano, and Sutter counties registered higher unemployment rates than the state as a whole in 2010. Generally, the counties with the highest unemployment rates in 2010 were characterized by greater dependence on the agricultural industry and less industrial diversity. Five of the six counties with unemployment rates above the statewide average maintained more than 60 percent of their land mass in

agricultural production. Unemployment rates tend to be higher in rural areas than in urban areas because farm work is typically seasonal or temporary.

The lower Sacramento River and Delta portion of the extended study area has some low-income populations and some counties with a higher unemployment rate than the statewide average. However, the No-Action Alternative would not change the existing or projected future conditions. Therefore, the No-Action Alternative would not have disproportionately high and adverse effects on minority or low-income populations. Mitigation is not required for the No-Action Alternative.

CVP/SWP Service Areas

Impact EJ-5 (No-Action): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas

Some communities within the CVP and SWP service areas contain minority and low-income populations above environmental justice thresholds; however, adverse effects on CVP and SWP customers within these communities do not constitute a disproportionately high and adverse impact. Continuing the existing and projected future conditions under the No-Action Alternative would not affect these populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

The CVP and SWP service areas are so expansive that they may be considered synonymous with the entire state of California for environmental justice purposes. Together, the CVP and SWP service areas include 36 of California's 58 counties, accounting for 91 percent (39 million residents) of California's population in 2010. The state's population has increased by almost 30 percent since 1990 and is projected to increase by approximately 32 percent to more than 51 million people by 2020 (DOF 2010). Continued ethnic diversification is expected. Minority groups have been steadily increasing their proportion of the state population. The population of individuals in California identifying themselves as Asian–Pacific Islander or multiracial experienced double-digit population growth, while those identifying themselves as Black or African American experienced the least amount of growth between 2000 and 2010 (U.S. Census Bureau 2010b). Hispanics are the most numerous minority group in California, and many members of this ethnic group work on farms that receive some or all of their water from the CVP. In general, rural agricultural counties have smaller minority populations than urban counties.

Poverty levels for both individuals and children in California increased slightly between 2000 and 2010. The percentage of people below the poverty level in Shasta County is expected to follow national and statewide economic trends. Generally, poverty rates tend to be higher in rural counties than in urban counties. Despite these overall differences, each of the state's major urban areas has pockets of low-income neighborhoods with high poverty rates.

California's total labor force increased just over 2 percent from 2002 to 2005, adding between 100,000 and 200,000 individuals each year. Between 2004 and 2005, the labor force increased by approximately 188,000 individuals. This was the largest annual increase over the 4-year period. California's total labor force exceeded 18.8 million in 2010. The state's unemployment rate was lowest in 2000 (5.0 percent), and has been increasing since 2003. Unemployment in 2010 registered at 7.7 percent, greater than the state's 2001 unemployment rate of 5.4. This observed increase in the unemployment rate at the state level has coincided with similar national employment trends. Like poverty, unemployment rates tend to be lower in urban areas than in rural areas of the state; however, high unemployment rates are often found in low-income neighborhoods of major urban centers.

Although the CVP and SWP service areas have some low-income populations, the No-Action Alternative would not change the existing or projected future conditions. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation is not required for the No-Action Alternative.

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

Shasta Lake and Vicinity

Impact EJ-1 (CP1): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake
Communities adjacent to the project construction site may experience temporary or short-term adverse environmental effects because of construction activities and changes in project conditions and operations. However, neither construction-related nor operational effects would disproportionately affect minority or low-income populations in the vicinity of Shasta Lake. Increased employment and income opportunities could also result from project construction activities, and would not be disproportionately distributed among minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

Under this alternative, the dam would be raised by 6.5 feet over a 4.5-year construction period. Residents near Shasta Dam, as well as others who may commute or otherwise travel near construction sites, would be exposed to a range of potentially adverse environmental and public health effects over a 4.5-year construction period (see Engineering Summary Appendix). Temporary and/or short-term adverse noise, visual, and air quality effects could result; in addition, motorists could be delayed, and access to recreation opportunities or local businesses could be temporarily reduced. Negative health effects could also result if hazardous materials were to be accidentally released into the environment during construction.

Nonwhite individuals, including the Winnemem Wintu Tribe and other Native Americans, accounted for 16.6 percent of Shasta County's total population in 2010, well below the 50 percent threshold for a minority population. This percentage is also substantially less than the 2010 statewide nonwhite population of 42.4 percent. Likewise, the poverty rate in Shasta County was 17.7 percent in 2010, well below the 50 percent threshold and slightly greater than the 15.5 percent statewide poverty rate. Therefore, the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Therefore, minority and low-income populations would not be disproportionately affected by these adverse effects.

Increased employment and income opportunities may result from construction under CP1, which could benefit minority and low-income populations. Project construction under CP1 could increase the number of jobs available, or could improve business conditions and incomes for workers who are already employed by businesses that would directly or indirectly benefit from project-related construction spending. The project would require a labor force of 300 people drawn directly from the Shasta Lake area. Most (85 percent) of the construction materials and supplies would be purchased in the vicinity; these materials and supplies would constitute 60 percent of total construction costs. As described above, the percentages of minority and low-income individuals in Shasta County populations are well below threshold levels for minority and low-income populations, and employment effects would not be disproportionately distributed among these groups. Selected minority and low-income individuals may be potentially affected. Such economic and job-related impacts would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP1): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP1 would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because the Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

Two tribes, the Winnemem Wintu and the Pit River Madesi Band, live within the vicinity of Shasta Lake, where they continue to actively practice many aspects of their traditional culture. Both groups have related that a complex

cultural landscape of village sites, ceremonial areas, sacred sites, burial sites, and resource areas would be affected directly by CP1.

Two particularly important Winnemem Wintu locations that would be affected by CP1 are Puberty Rock and the doctoring pools near Nawtawaket Creek. CP1 could submerge Puberty Rock for longer periods, restricting the Winnemen Wintu from holding the puberty ceremony at this important location. Relocating the rock to higher ground is not possible; in the Winnemem Wintu's worldview, its location is preordained and connected with the nearby "two sisters" mountain (Bolliboka Mountain). Puberty Rock also marks the location of an extensive village with housepits and burials, situated at Kabyai Creek, west of the McCloud River near the McCloud Campground. CP1 would inundate additional burials at this location, which would require removal and relocation. The Winnemem Wintu have estimated that 120 ancestral villages are still accessible above the current high-water line of Shasta Lake and would be adversely affected by CP1.

Pit River Madesi Band members state that 22 ethnographic villages, associated burial grounds, and several TCPs are located within the existing reservoir and proposed inundation or fluctuation areas.

Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to several locations in the vicinity of Shasta Lake; therefore, the disturbance and loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP1, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact EJ-3 (CP1): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area

Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term, operational changes resulting from CP1 could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These operational effects would not constitute a disproportionately high and adverse impact on minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

In Tehama County, nonwhite individuals accounted for 18.0 percent of the total population in 2010. This is roughly half of the 50 percent threshold for a

minority population. This level also is substantially less than the statewide nonwhite population of 42.4 percent. The poverty level in Tehama County was 19.5 percent in 2010, also well below the 50 percent threshold and slightly higher than the 15.5 percent statewide poverty rate. From 2000 to 2010, poverty levels in Tehama County increase at a rate of 2.2 percent, outpacing the statewide poverty rate (1.3 percent) by 0.9 percent over approximately the same time. Based on this trend, and the comparatively consistent poverty rates between Tehama County and the statewide population, poverty levels in Tehama County are not meaningfully greater than poverty levels statewide. Therefore, the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Thus, disproportionately high and adverse effects on minority or low-income populations would not occur.

Communities along the upper Sacramento River portion of the primary study area would not be exposed to direct construction-related impacts associated with CP1.

Raising Shasta Dam would add 256,000 acre-feet of cold-water storage to the overall capacity of the reservoir. This operational change would be beneficial for two reasons. CP1 would reduce the risk of flooding downstream from Shasta Dam and consequently reduce potentially adverse social, economic, and environmental effects because of flooding for property owners, businesses, and workers. In addition, CP1 would improve environmental and recreational conditions by enhancing habitat for fish and wildlife, benefiting anglers, hunters, and wildlife viewers.

These beneficial impacts would not be disproportionately distributed among minority and low-income populations, because representation of these groups in the population of Tehama County is well below threshold levels. Selected minority and low-income individuals may be potentially affected; however, these environmental and recreational effects would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP1): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Operational effects of CP1 would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-2 (CP1). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high or adverse effects on minority or low-income populations would occur.

Operational effects of CP1 on minority and low-income populations in the lower Sacramento River and Delta portion of the extended study area would be similar to those described for the upper Sacramento River portion of the primary

study area under Impact EJ-2 (CP1). However, benefits in the lower Sacramento River and Delta area resulting from the reduced risk of flooding and improved environmental and recreational conditions would be less than described for the upper Sacramento River area because the lower Sacramento River and Delta is located at a greater distance from the project site. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP1): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of operational changes that improve the reliability of the water supply and power for businesses and others. Minority and low-income populations would not be disproportionately affected. No disproportionately high and adverse effects on minority or low-income populations would occur.

Utility customers in communities within the CVP and SWP service areas may experience indirect, adverse effects through rate increases as a result of CP1. Project-related water storage and hydroelectric facility improvements may be funded partly through increased rates for water and power services. However, such adverse effects would not disproportionately affect minority or low-income populations.

Operational changes resulting from CP1 may increase employment opportunities and water and power reliability in the CVP and SWP communities, which would be beneficial for individual utility customers and businesses. Selected minority and low-income individuals may be beneficially affected by increased employment opportunities. Such beneficial employment-related impacts would not disproportionately affect minority and low-income populations. Thus, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

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

Shasta Lake and Vicinity

Impact EJ-1 (CP2): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake Communities adjacent to the project construction site may experience temporary and/or short-term adverse environmental effects because of construction activities and changes in project conditions and operations.

However, neither construction-related nor operational effects would disproportionately affect minority or low-income populations in the vicinity of Shasta Lake. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur.

Effects on minority and low-income populations would be similar to those described above for Impact EJ-1 (CP1), except that the dam would be raised by 12.5 feet and the construction period likely would extend for up to 6 additional months. The beneficial effects and less-than-significant adverse impacts would be similar to those described under Impact EJ-1 (CP1) because the types of work and the predicted workforce would be similar under each alternative. As described under Impact EJ-1 (CP1), the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Therefore, disproportionately high and adverse effects on minority or low-income populations would not occur. Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP2): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP2 would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because the Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

This impact would be similar to but slightly greater than Impact EJ-2 (CP1) because the inundation area under CP2 would be slightly greater than under CP1. A disproportionately high and adverse effect on Native American populations would occur. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP2, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact EJ-3 (CP2): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term,

operational changes resulting from CP2 could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These operational effects would not constitute a disproportionately high and adverse impact on minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-3 (CP1). CP2 would provide 187,000 acre-feet more cold-water storage capacity than CP1. Greater storage capacity would reduce the risk of flooding and, along with increased cold water, would benefit downstream fisheries and recreation resources and users. Also, as described under Impact EJ-3 (CP1), the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Thus, disproportionately high and adverse effects on minority or low-income populations would not occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP2): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Operational effects of CP2 would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-4 (CP2). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high or adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-4 (CP1). Under CP2, reduced flooding and beneficial effects on fisheries and recreation resources also would occur in the lower Sacramento River and Delta portion of the extended study area. However, the beneficial effects would be less than along the upper Sacramento River because benefits would diminish with increasing distance from the project site. As in the upper Sacramento River portion of the primary study area, the additional 187,000 acre-feet of reservoir storage would provide somewhat greater benefits under CP2 than under CP1. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP2): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of

operational changes that improve the reliability of the water supply and power for businesses and others. Minority and low-income populations would not be disproportionately affected. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-5 (CP1). Construction costs under CP2 would be greater than under CP1, because of the increased need for construction materials and an additional 6 months of construction. These increased costs would result in slightly greater increases in water and power rates than under CP1. However, such adverse effects would not disproportionately affect minority and low-income populations. Operational benefits would be similar to those of CP1, and minority or low-income populations would not be disproportionately affected. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

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

Shasta Lake and Vicinity

Impact EJ-1 (CP3): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake

Communities adjacent to the project construction site may experience temporary and/or short-term adverse environmental effects because of construction activities and changes in project conditions and operations. However, neither construction-related nor operational effects would disproportionately affect minority or low-income populations in the vicinity of Shasta Lake. No disproportionately high or adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-1 (CP1). Under CP3, the effects on minority and low-income populations would be similar to those described above for Impact EJ-1 (CP1), except that the dam would be raised by 18.5 feet and the construction period would extend for at least 6 additional months and require an additional 50 construction workers. The beneficial impacts and less-than-significant adverse impacts would be similar to those described under CP1 because the types of work and the predicted workforce would be similar under each alternative. As described under Impact EJ-1 (CP1), the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Therefore, disproportionately high effects on minority or low-income populations would not occur (nor would disproportionately high and beneficial effects). Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP3): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in

the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP3 would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because the Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

This impact would be similar to but slightly greater than Impact EJ-2 (CP2) because the inundation area under CP3 would be slightly greater than under CP2. A disproportionately high and adverse effect on Native American populations would occur. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP3, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact EJ-3 (CP3): Potential Disproportionate High and Adverse Effect on Minority and Low- Income Populations in the Upper Sacramento River Area

Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term, operational changes resulting from CP3 could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These beneficial operational effects would not be disproportionately distributed among minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-3 (CP1). CP3 would provide 378,000 acre-feet more cold-water storage capacity than CP1. Greater storage capacity would reduce the risk of flooding and, along with increased cold water, would benefit downstream fisheries and recreation resources and users. Also, as described under Impact EJ-3 (CP1), the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Thus, disproportionately high and adverse effects on minority or low-income populations would not occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP3): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and

Delta Area Operational effects of CP3 would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-3 (CP3). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high or adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-4 (CP1). Under CP3, reduced flooding and beneficial effects on fisheries and recreation resources also would occur in the lower Sacramento River and Delta portion of the extended study area. However, the beneficial effects would be less than along the upper Sacramento River because benefits would diminish with increasing distance from the project site. As in the upper Sacramento River portion of the primary study area, the additional 378,000 acre-feet of reservoir storage would provide somewhat greater benefits under CP3 than under CP1. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP3): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of operational changes that improve the reliability of the water supply reliability and power for businesses and others. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-5 (CP1). Construction costs under CP3 would be greater than under CP1 because of the increased need for construction materials and an additional 6 months of construction. These increased costs would result in slightly greater increases in water and power rates than under CP1. However, such adverse effects would not disproportionately affect minority and low-income populations. Operational benefits would be similar to those of CP1, and minority and low-income populations would not be disproportionately affected. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

Shasta Lake and Vicinity

Impact EJ-1 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake
Communities adjacent to the project construction site may experience temporary and/or short-term adverse environmental effects because of construction activities and changes in project conditions and operations. However, neither construction-related nor operational effects would be disproportionately distributed among minority or low-income populations in the vicinity of Shasta Lake. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-1 (CP1). Under CP4 or CP4A, the effects on minority and low-income populations would be similar to those described above for Impact EJ-1 (CP1), except that the dam would be raised by 18.5 feet and the construction period would extend for at least 6 additional months and require an additional 50 construction workers. The beneficial effects and less-than-significant adverse impacts would be similar to those described under CP1 because the types of work and the predicted workforce would be similar under each alternative. As described under Impact EJ-1 (CP1), the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Adverse and beneficial effects would not be disproportionately distributed among minority or low-income populations.

Because adverse and beneficial effects would not be disproportionately distributed among minority or low-income populations, this impact is less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Because adverse and beneficial effects would not be disproportionately distributed among minority or low-income populations, this impact is less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP4 and CP4A would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because the Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance

to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

This impact would be similar to Impact EJ-2 (CP3), but the frequency and timing of inundation may vary between CP4 or CP4A and CP3. Additionally, the timing of inundation is different between CP4 and CP4A in that they each dedicate a portion of the new storage in Shasta Lake for fisheries purposes; however, the portion of this dedicated storage varies. The operations proposed for CP4A may result in the sacred sites being inundated less frequently inundated than for CP4 or CP3.

Although the sacred sites may be inundated less frequently under CP4A, both CP4 and CP4A are expected to have a disproportionately high and adverse effects on Native American populations. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP4 or CP4A, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, “Cultural Resources.”

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact EJ-3 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term, operational changes resulting from CP4 or CP4A could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These beneficial operational effects would not constitute a disproportionately high and adverse impact on minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

The impact would be similar to Impact EJ-3 (CP1) for CP4 or CP4A. CP4 or CP4A would provide 634,000 acre-feet of additional water storage capacity. Like CP1, CP4 would provide 256,000 acre-feet of active storage in the reservoir. Similar to CP2, CP4A would create 443,000 acre-feet of new active storage capacity. Greater storage capacity would reduce the risk of flooding and, along with increased cold water, would benefit downstream fisheries and recreation resources and users. Also, as described under Impact EJ-3 (CP1), the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Minority and low-income populations would not be disproportionately affected.

No disproportionately high and adverse effects on minority or low-income populations would occur. Therefore, this impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

No disproportionately high and adverse effects on minority or low-income populations would occur. Therefore, this impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Operational effects of CP4 or CP4A would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-3 (CP4 and CP4A). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high and adverse effects on minority or low-income populations would occur for CP4 or CP4A.

This impact would be similar to Impact EJ-4 (CP1). Under CP4 or CP4A, reduced flooding and beneficial effects on fisheries and recreation resources also would occur in the lower Sacramento River and Delta portion of the extended study area. However, the beneficial effects would be less than along the upper Sacramento River because benefits would diminish with increasing distance from the project site. As in the upper Sacramento River portion of the primary study area, the additional 378,000 acre-feet of dedicated storage for cold water pool for CP4, or the additional 191,000 acre-feet of dedicated storage for cold water pool for CP4A would provide somewhat greater benefits under CP4 or CP4A than under CP1. Minority and low-income populations would not be disproportionately affected.

No disproportionately high or adverse effects on minority or low-income populations would occur. Therefore, this impact is less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

No disproportionately high or adverse effects on minority or low-income populations would occur. Therefore, this impact is less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of operational changes that improve the reliability of the water supply and power

to businesses and others. Minority and low-income populations would not be disproportionately affected. No disproportionately high and adverse effects on minority or low-income populations would occur for CP4 or CP4A.

The impact for CP4 or CP4A would be similar to Impact EJ-5 (CP1) . Construction costs under CP4 or CP4A would be greater than under CP1 because of the increased need for construction materials and an additional 6 months of construction and require an additional 50 construction workers. These increased costs would result in slightly greater increases in water and power rates than under CP1. However, such adverse effects would not disproportionately affect minority and low-income populations. Operational benefits would be similar to those under CP1 for CP4, and to those under CP2 for CP4A, and minority and low-income populations would not be disproportionately affected.

No disproportionately high and adverse effects on minority or low-income populations would occur. Therefore, this impact for CP4 is less than significant. Mitigation for this impact is not needed, and thus not proposed.

No disproportionately high and adverse effects on minority or low-income populations would occur. Therefore, this impact for CP4A is less than significant. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Shasta Lake and Vicinity

Impact EJ-1 (CP5): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake

Communities adjacent to the project construction site may experience temporary adverse environmental effects because of construction activities and changes in project conditions and operations. However, the construction activity in any specific area would be short-term, and neither construction-related nor operational effects would constitute a high and adverse impact on minority or low-income populations in the vicinity of Shasta Lake. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-1 (CP1). Under CP5, the effects on minority and low-income populations would be similar to those described above for Impact EJ-1 (CP1), except that the dam would be raised by 18.5 feet and the construction period would extend for at least 6 additional months and require an additional 60 construction workers. The beneficial effects and less-than-significant adverse impacts would be similar to those described under CP1 because the types of work and the predicted workforce would be similar under each alternative. As described under Impact EJ-1 (CP1), the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Therefore, minority and low-income populations would not be disproportionately affected.

No disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP5): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP5 would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

This impact would be the same as Impact EJ-2 (CP3). Disproportionately high and adverse effects on Native American populations would occur. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP5, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact EJ-3 (CP5): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term, operational changes resulting from CP5 could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These operational effects would not constitute a disproportionately high and adverse impact on minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-3 (CP1). CP5 would provide 378,000 acre-feet more cold-water storage capacity than CP1. Greater storage capacity would reduce the risk of flooding and, along with increased cold water, would benefit downstream fisheries and recreation resources and users. Also, as described under Impact EJ-3 (CP1), the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Therefore, minority and low-income populations would not be disproportionately affected. No

disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP5): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Operational effects of CP5 would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-3 (CP5). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-4 (CP1). Under CP5, reduced flooding and beneficial effects on fisheries and recreation resources also would occur in the lower Sacramento River and Delta portion of the extended study area. However, the beneficial effects would be less than along the upper Sacramento River because benefits would diminish with increasing distance from the project site. As in the upper Sacramento River portion of the primary study area, the additional 378,000 acre-feet of reservoir storage would provide somewhat greater benefits under CP5 than under CP1. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP5): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of operational changes that improve the reliability of the water supply and power for businesses and others. Minority and low-income populations would not be disproportionately affected. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-5 (CP1). Construction costs under CP5 would be greater than under CP1 because of increased materials, an additional 6 months of construction, and 60 additional construction workers. These increased costs would result in slightly greater increases in water and power rates than under CP1. However, such adverse effects would not disproportionately affect minority and low-income populations. Operational benefits would be similar to those under CP1, and minority and low-income

populations would not be disproportionately affected. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

24.3.5 Mitigation Measures

Table 24-2 presents a summary of effects and mitigation measures for environmental justice.

No-Action Alternative

No mitigation measures are needed for this alternative.

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

No mitigation measures are needed for Impacts EJ-1 (CP1), EJ-3 (CP1), EJ-4 (CP1), or EJ-5 (CP1). No feasible mitigation is available for Impact EJ-2 (CP1). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

Table 24-2. Summary of Mitigation Measures for Environmental Justice

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact EJ-1: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake	Effect before Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	Effect after Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
Impact EJ- Impact EJ-2: Potential Disproportionate High and Adverse Effect on Native American Populations in the Vicinity of Shasta Lake	Effect before Mitigation	NDHA	DHA	DHA	DHA	DHA	DHA
	Mitigation Measure	None required.	No feasible mitigation is available to reduce impact.				
	Effect after Mitigation	NDHA	DHA	DHA	DHA	DHA	DHA
Impact EJ- Impact EJ-3: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area	Effect before Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	Effect after Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
Impact EJ- Impact EJ-4: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area	Effect before Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	Effect after Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
Impact EJ- Impact EJ-5: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas	Effect before Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	Effect after Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA

Key:
CP = Comprehensive Plan
CVP = Central Valley Project
DHA = Disproportionately high and adverse
NDHA = Not disproportionately high and adverse
SWP = State Water Project

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

No mitigation measures are needed for Impacts EJ-1 (CP2), EJ-3 (CP2), EJ-4 (CP2), or EJ-5 (CP2). No feasible mitigation is available for Impact EJ-2 (CP2). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

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

No mitigation measures are needed for Impacts EJ-1 (CP3), EJ-3 (CP3), EJ-4 (CP3), or EJ-5 (CP3). No feasible mitigation is available for Impact EJ-2 (CP3). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation measures are needed for Impacts EJ-1 (CP4 and CP4A), EJ-3 (CP4 and CP4A), EJ-4 (CP4 and CP4A), or EJ-5 (CP4 and CP4A). No feasible mitigation is available for Impact EJ-2 (CP4 and CP4A). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation measures are needed for Impacts EJ-1 (CP5), EJ-3 (CP5), EJ-4 (CP5), or EJ-5 (CP5). No feasible mitigation is available for Impact EJ-2 (CP5). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

24.3.6 Cumulative Effects

Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences,” gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, “Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area,” in Chapter 3, lists the projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table

3-1 under Quantitative Analysis would have disproportional effects on minority or low income populations in the primary study area and the SLWRI would not have adverse impacts in the extended study area, therefore, the following analysis is based on programs and projects listed in Table 3-1 under Qualitative Analysis that would have potential effects in the primary study area as explained below.

In the primary study area (i.e., Shasta Lake and vicinity and the upper Sacramento River from Shasta Dam to Red Bluff), minority and low-income populations are not disproportionately represented. Identified construction effects would be less than significant, and minority and low-income populations would not be disproportionately affected.

Some communities within the extended study area (i.e., the lower Sacramento River and Delta and the CVP and SWP service areas) exceed minority and low-income thresholds. These communities, along with the general population, would benefit from project effects that would reduce future water shortages by improving water supply reliability for both average and drought years. The greatest benefit would be provided by CP3, CP4, CP4A, and CP5, which would provide an additional 634,000 acre-feet of storage capacity. CP1 and CP2 would provide only 256,000 and 443,000 acre-feet of increased storage capacity, respectively, with correspondingly reduced benefits.

Alternatives that would incorporate the greatest increase to dam height would result in the greatest project cost because of higher costs for construction materials and longer construction periods. These increased costs may be reflected in increased utility rates that could be combined with other utility rate increases. Such rate increases would be incremental and would be experienced by the general population, along with minority and low-income communities.

Therefore, the project would not contribute to disproportionate placement of environmental impacts on low-income and minority populations or communities, and no cumulatively considerable impacts would result.

The disturbance or loss of resources associated with locations considered by Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake. Past and present effects to sites of religious and cultural significance are from construction projects, such as Shasta Dam, recreation development and use, and forest management practices. Reasonably foreseeable future projects on Table 3-1 that may affect these resources include but are not limited to Antlers Bridge Replacement Project, which proposes to avoid construction impacts to cultural resources. However due to past and present impacts on these sites, when considered with the effects of the SLWRI, the project would contribute to disproportionate placement of environmental impacts on Native American

populations and would result in a cumulatively considerable incremental contribution to a significant and unavoidable cumulative impact.

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Chapter 25
Wild and Scenic River Considerations for McCloud River

This chapter describes the effects of the dam and reservoir modifications proposed under SLWRI action alternatives on the wild and scenic river values of the lower McCloud River, one of the major tributaries to Shasta Lake.

This chapter differs from the other chapters in this EIS in that it concerns only the McCloud River and does not discuss other portions of the primary study area nor the extended study area. The study area for this chapter consists of the lower McCloud River from the McCloud River Bridge to the confluence with Little Bollibokka Creek (Figure 25-1).

The primary focus of this chapter is the wild and scenic river values of the lower McCloud River, particularly the reach that would periodically be newly inundated if Shasta Dam and Shasta Lake were enlarged. The discussion and analysis concentrate on the values for which the McCloud River has been determined eligible for listing under the Federal Wild and Scenic Rivers Act ((Federal WSRA); Public Law 90-542, as amended; 16 U.S. Code 1271-1287) and for which a portion of the river is protected under the California Public Resources Code (PRC) Section 5093.542. Section 5093.542 was established through enactment of the California Wild and Scenic Rivers Act, as amended (Sections 5093.50 – 5093.70).

This chapter also differs from the other chapters in this EIS; it first provides background information and then discusses the regulatory framework to provide context for the affected environment section.

25.1 Background

Segments of the McCloud River have been determined eligible for listing under the Federal WSRA and are protected under the PRC. The river has not been formally listed as wild and scenic under either the Federal WSRA or PRC and is not part of either the national or State river system.

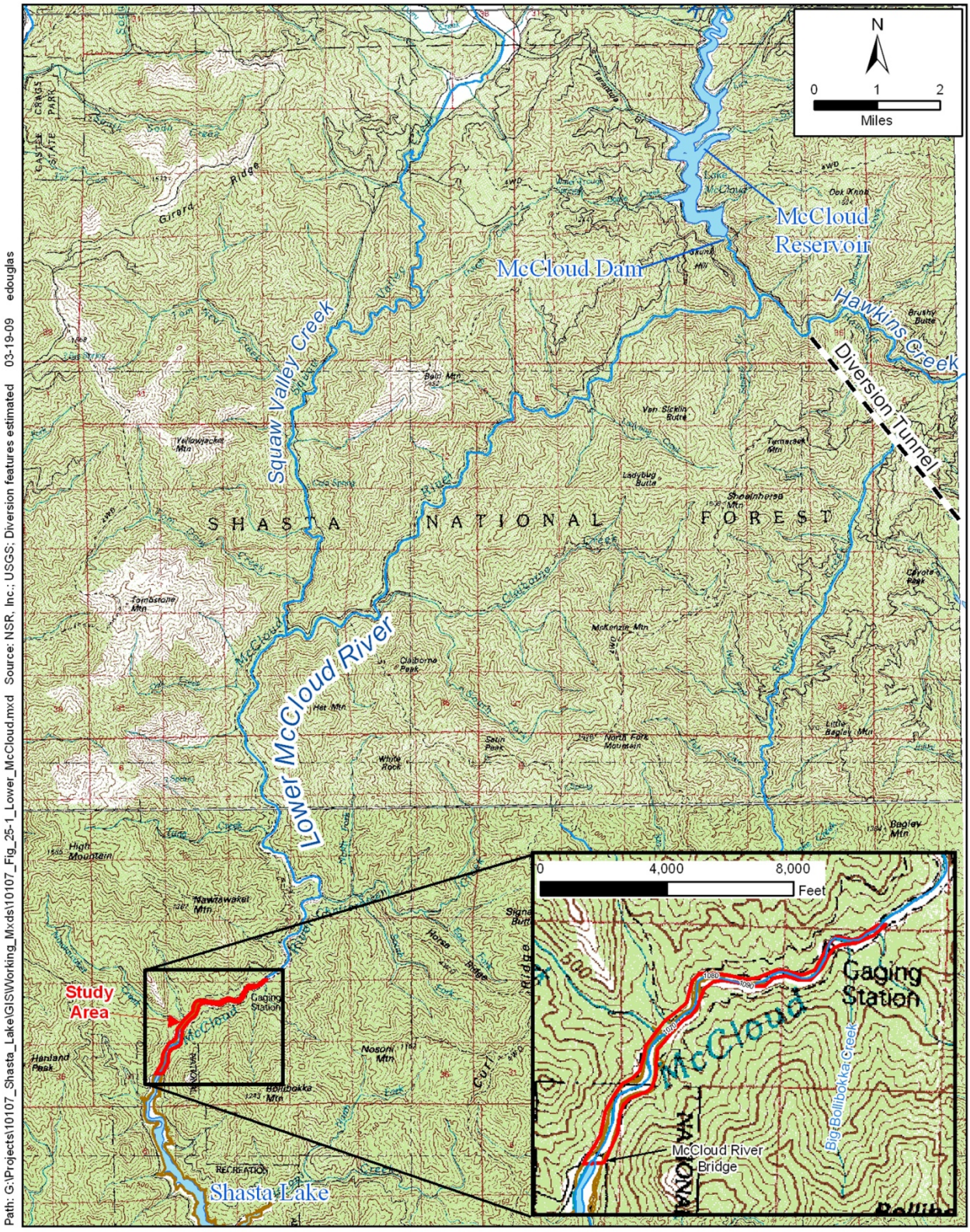

Figure 25-1. Lower McCloud River Study Area

The USFS evaluated the eligibility of the McCloud River for listing as wild and scenic under the Federal WSRA during preparation of the Shasta-Trinity National Forest (STNF) Land and Resource Management Plan (LRMP) in 1994 (USFS 1994). Although the LRMP found the McCloud River eligible for listing, the LRMP direction was to not formally designate any reach of the river as wild and scenic. Instead, the direction was to manage the lower McCloud River under a Coordinated Resource Management Plan (CRMP; USFS 1995a). The CRMP is a coordinated effort between landowners and stakeholders with a vested interest in the river. The CRMP requires its signatories to protect the outstandingly remarkable values (ORV) on lands they own or manage to ensure that the river remains eligible for Federal designation as wild and scenic. The CRMP contains a provision stating that the USFS reserves the right to pursue designation if the CRMP is terminated or fails to protect these values.

The California Natural Resources Agency (Resources Agency) evaluated the McCloud River in the late 1980s (Jones & Stokes Associates 1988) to determine whether it was eligible for listing under the PRC. The Resources Agency study found it eligible, but the California legislature declined to add the river to the California wild and scenic river system. The legislature instead passed an amendment to the California Wild and Scenic Rivers Act to protect the river's free-flowing condition and the river's fishery below McCloud Dam through the PRC.

As described in more detail under "Regulatory Framework," the PRC and Federal WSRA share several similar components: the establishment of a wild and scenic rivers system; the purpose of protecting certain rivers in their "free-flowing" condition; the identification of extraordinary or outstandingly remarkable values that make such rivers eligible for protection; a study process and procedure for including rivers in the system; and classifications of "wild," "scenic," and "recreational." Both the Federal WSRA and PRC prohibit new water impoundments on designated rivers, and both contain directives to government agencies to use their powers to further the policies of the legislation.

The Federal WSRA establishes a larger wild and scenic river corridor—typically at least 0.25 mile on each side of the river—than the PRC and requires Federal agencies to manage the public lands in the corridor to protect the river's free-flowing character and ORVs. In addition, the Federal agency managing rivers that are Federally designated as wild and scenic is required to develop and implement a management plan that will ensure the river's protection. In contrast, the PRC provides protection only to the first line of permanent riparian vegetation and does not require a management plan.

The length of the lower McCloud River that was determined to be eligible for wild and scenic river status differs between the Federal and State evaluations. The USFS defined the lower McCloud River more narrowly than the Resources Agency, considering the portion of the river that is currently periodically

inundated by Shasta Lake – referred to in this chapter as the *transition reach* – as part of the lake rather than part of the river. The USFS defined the lower river as extending from McCloud Dam downstream to an elevation of 1,070 feet mean sea level (msl) (approximately 22 total river miles), which corresponds to the current full-pool elevation of Shasta Lake. The Resources Agency's study report included approximately 5,400 feet of the existing transition reach (down to the McCloud River Bridge) as part of the lower river's segments (approximately 23 total river miles). Both the USFS and Resource Agency documents disclosed that this portion of the reach, protected under the State PRC, does not meet the definition of natural or free flowing because it is downstream of McCloud Dam and some portions of the river offer public access. It is important to note that CDFW designated the Wild Trout Management Area downstream to the boundary of The Nature Conservancy property; the management area did not extend downstream in the reaches primarily controlled by private fishing clubs. The public benefit component of the wild trout fishery is concentrated in the upper 7 miles of the lower McCloud River.

In its evaluation, the USFS divided the McCloud River into 10 segments encompassing 46 total river miles: three segments along the upper McCloud River (24 river miles above McCloud Reservoir) and seven segments along the lower McCloud River (22 river miles below McCloud Dam). Numbering of the upper McCloud River segments began at the headwaters and counted downstream, but numbering of the lower McCloud River segments began at the downstream extent and counted upstream. The USFS concluded that all 10 segments of the McCloud River were eligible for listing as a Federal wild and scenic river because they are free flowing, possess good water quality, and exhibit ORVs in the areas of cultural and historical resources, fisheries, geology, and scenic resources. Part of the lowermost segment – Segment 4 – would be periodically inundated if Shasta Lake is expanded. Segment 4 extends from about 5,400 feet upstream from the McCloud River Bridge, beginning at an elevation of 1,070 feet msl, to about Little Bollibokka Creek. The lower extent of this segment corresponds with the current full-pool elevation of Shasta Lake based on Reclamation geographic information system data. Figure 25-2 shows the downstream extent of Segment 4.

The Resources Agency's report also identified 10 segments, but its evaluation encompassed only 43 total river miles and the numbering of segments began at the headwaters and counted downstream along the entire river. The segments included six along the upper river (20 river miles above McCloud Reservoir) and four along the lower river (23 river miles below McCloud Dam). Eight of the 10 segments were determined eligible for State wild and scenic river status. Segment 10 extends from the McCloud River Bridge to the northern border of Section 9, Township 36 North, Range 3 West, which is just upstream from the river's confluence with Tuna Creek. Approximately 5,400 feet of the transition reach is included in Segment 10; the portion of the transition reach downstream

from the bridge was determined ineligible. The downstream extent of Segment 10 is shown on Figure 25-2.

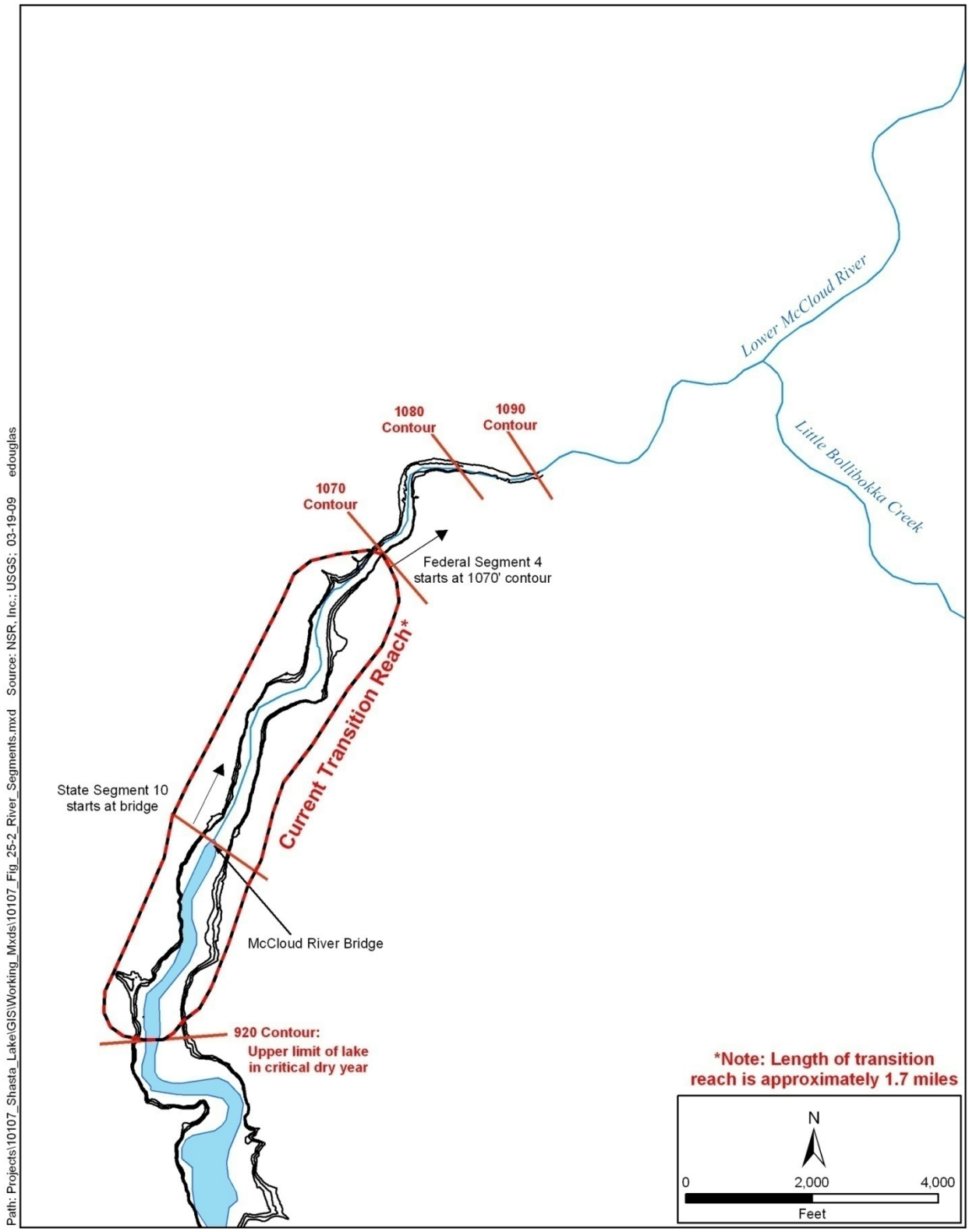

Figure 25-2. Differences in State and Federal Segments and Transition Reach

25.2 Regulatory Framework

25.2.1 Federal

Federal Wild and Scenic Rivers Act

The Federal WSRA, enacted in 1968, established the National Wild and Scenic Rivers System "to preserve rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations." To be eligible for inclusion in the system, a river must be free-flowing and exhibit ORVs. Free-flowing means "existing or flowing in a natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway" (16 United States Code (USC) Section 1286). ORVs are scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (16 USC Section 1271). Depending on the specific conditions of a river, it may be designated as "wild," "scenic," or "recreation." Different segments of a single river can receive different designations; in other words, some segments can be designated wild, some scenic, and some recreation or combinations of these designations.

The Federal WSRA does not prohibit water developments that may affect portions of rivers that are eligible for inclusion in the National Wild and Scenic Rivers System. Section 5(d)(1) of the act does, however, require that in all planning for the use and development of water and related land resources, consideration be given to potential national wild, scenic, and recreational river areas by all Federal agencies involved.

Through the development and approval of the STNF LRMP, the USFS determined that segments of the McCloud River are eligible for inclusion in the national system; however, the river has not been formally designated and thus is not afforded protections under the Federal WSRA. Instead, the McCloud River CRMP was developed "to protect the [river's] unique and outstandingly remarkable features," thereby maintaining its eligibility.

The USFS evaluation concluded that the lower McCloud River, from McCloud Dam downstream about 22 miles to the river's transition to Shasta Lake at about 1,070 feet msl, provides outstanding cultural, fisheries, and geologic values, and its corridor has been classified as a highly sensitive visual area by the USFS (USFS 1994 and 1995b). The entire river corridor contains prehistoric and historic sites from past use by Indian tribes, late 1800 and early 1900 resorts, and evidence of historic logging. The lower river provides habitat for several salmonid species: bull trout/Dolly Varden (*Salvelinus confluentus*), which is believed to be extinct; rainbow trout (*O. mykiss*), which has been transplanted all over the world; and brown trout (*Salmo trutta*), a non-native species. Collectively, the rainbow and brown trout in the lower McCloud River are considered to be a "blue ribbon trout fishery" (USFS 1994). Outstanding geologic values include rock outcrops, cascades, and pools. Based on the ORVs,

the STNF determined that the lower McCloud River meets the eligibility requirements for designation under the Federal WSRA.

Shasta-Trinity National Forest Land and Resources Management Plan

The STNF LRMP is a forest-wide land use plan developed to guide resource management within the forest (USFS 1995b). For planning purposes, the STNF is divided into six land allocations for which specific management prescriptions are identified. The land allocations include Congressionally Reserved Areas, Late-Successional Reserves, Administratively Withdrawn Areas, Riparian Reserves and Key Watersheds, Matrix Lands, and Adaptive Management Areas. Management areas were identified within the STNF to establish management direction in response to the issues and resources of each distinct area. The Management Area defined for the McCloud River provides resource direction for recreational use, specifically fishing (i.e., fishery) and viewing waterfalls, and management of old-growth habitat. Management of the wild and scenic river ORVs of the McCloud River is deferred to the CRMP.

Coordinated Resource Management Plan

In 1990, certain public agencies and private parties with interests in the management of lands adjacent to the McCloud River executed a memorandum of understanding to pursue preparation of a CRMP. The memorandum was signed by representatives of the USFS, CDFW, The Nature Conservancy, Pacific Gas and Electric Company (PG&E), the Bollibokka Land Company, Crane Mills, McCloud River Co-Tenants, Sierra Pacific Industries, and the Hearst Corporation. In 1991, the same signatories, along with California Trout Inc., signed another memorandum of understanding to establish the framework for and approve the CRMP. The CRMP was adopted in July 1991. In 2007, the property owned by the Bollibokka Land Company was sold to Westlands Water District, which is not a party to the CRMP. Although Reclamation and representatives of Westlands Water District have attended periodic meetings with the CRMP members to provide updates on the SLWRI planning process, neither agency is a party to the CRMP.

The purpose of the CRMP is to protect the ORVs through coordinating the actions of signatory members on their individual properties. The CRMP has no authority, responsibility, or jurisdiction for protection of the ORVs beyond the actions of the signatory members on their properties. The CRMP provides a framework for coordinating management activities among the participants to ensure that the characteristics of the river that make it eligible for Federal wild and scenic river designation are protected.

Under the terms of the CRMP, the USFS “reserves the right to pursue [Federal wild and scenic river] designation” if the CRMP is terminated or significantly impaired or if it fails to protect the values that make the river suitable for such designation. This would occur if, for any reason, the actions of a signatory member of the CRMP on the signatory member’s land failed to protect the ORVs, as described in the CRMP Memorandum of Understanding.

25.2.2 State

California Public Resource Code, Sections 5093.50-5093.70

Sections 5093.50–5093.70 were added to the PRC in 1972, through enactment of the California Wild and Scenic Rivers Act, to preserve certain rivers that possess extraordinary scenic, recreational, fishery, or wildlife values in their free-flowing state. The PRC identifies, classifies, and provides protection for specific rivers or river segments, as approved by the legislature. Rivers or river segments that are specifically identified and classified in the PRC comprise the State Wild and Scenic Rivers System. As described in Section 5093.50, rivers or river segments included in the State system must possess "extraordinary scenic, recreational, fishery, or wildlife values"; the PRC does not define what constitutes "extraordinary."

Various amendments to the California Wild and Scenic Rivers Act have been passed, adding related legislation to the PRC. In 1986, Assembly Bill (AB) 3101 (Statutes 1986, Chapter 894) established a study process to help determine eligibility for potential additions to the State system (PRC Section 5093.547 and Section 5093.548). Additionally, protection for river segments can be provided without formally identifying them as part of the State system.

In 1989, an amendment to the California Wild and Scenic Rivers Act was passed, adding Section 5093.542 to the PRC to protect the McCloud River fishery, which it describes as "one of the finest wild trout fisheries in the state." It further declares that "The continued management of river resources in their existing natural condition represents the best way to protect the unique fishery of the McCloud River" and that "maintaining the McCloud River in its free-flowing condition to protect its fishery is the highest and most beneficial use of the waters of the McCloud River." The amendment provides protection to the McCloud River fishery and its "natural" and "free-flowing" condition from Algoma to the confluence with Huckleberry Creek (upper McCloud River), and 0.25 mile downstream from the McCloud Dam to the McCloud River Bridge (lower McCloud River). Although the Legislature declared that the McCloud River possessed "extraordinary resources" in the context of the PRC, the Legislature's action stopped short of formally designating the river as wild and scenic.

In addition, the State PRC is also relevant to the recently passed Proposition 1, "Water Bond. Funding for Water Quality, Supply, Treatment, and Storage Projects," for $7.5 billion, which includes $2.7 billion for storage projects. Proposition 1, section 79751 specifies:

> *Projects for which the public benefits are eligible for funding under this chapter consist of only the following:*
>
> *(a) Surface storage projects identified in the CALFED Bay-Delta Program Record of Decision, dated August 28, 2000,*

> *except for projects prohibited by Chapter 1.4 (commencing with Section 5093.50) of Division 5 of the Public Resources Code.*

Section 79751 does not amend or modify the State PRC. Whether the State of California can use Proposition 1 funds in support of any alternative potentially authorized related to enlargement of Shasta Dam and Reservoir is outside of Reclamation's authority and to be determined by the State of California.

Several key terms in the State PRC are used, but not fully defined with respect to protection of the McCloud River. This chapter adopts the definition of free-flowing as defined in the Federal Wild and Scenic Rivers Act. While the State PRC does not specifically define "Wild Trout Fishery", CDFW does identify several key elements that are relevant to and useful in developing a working definition of a wild trout fishery as it relates to this discussion. Fishery is a generally accepted term referring to an activity leading to the harvesting or use of a fishery resource (e.g., fishing, aquaculture) (CDFG 2003). It also includes a more inclusive definition that relates to the ecological conditions that provide fish habitat and self-sustaining populations (e.g., wild trout) (CDFG 2003).

25.3 Affected Environment

This section defines "affected environment" as the wild and scenic characteristics of the lower McCloud River that could be affected by the proposed modifications to Shasta Dam and Shasta Lake. It briefly describes the McCloud River from its headwaters to the McCloud Arm of Shasta Lake. It then describes the wild and scenic values of Segment 4 identified in the USFS evaluation and the values provided protection in the PRC.

Descriptions of the river and its characteristics were derived primarily from the following sources:

- Wild and Scenic Rivers Evaluation, Appendix E to the EIS for the Shasta-Trinity National Forest Land and Resources Management Plan (USFS 1994)
- Lower McCloud River and McCloud Arm Watershed Analyses (USFS 1998a and 1998b)
- McCloud River Wild and Scenic River Report (Jones & Stokes Associates 1988)
- Lower McCloud River Wild Trout Area Fishery Management Plan, 2004 through 2009 (Rode and Dean 2004)
- Lower McCloud River Habitat Typing Report (USFS 2001)

25.3.1 The McCloud River

McCloud River Basin

The McCloud River basin drains an area of approximately 800 square miles (USFS 1998a) in northern Shasta County and southern Siskiyou County, southeast of Mount Shasta. The river originates in an area of the STNF near Colby Meadows at approximately 4,250 feet above msl (Rode and Dean 2004). From its headwaters to Shasta Lake, the river is approximately 59 miles long. McCloud Reservoir, part of PG&E's McCloud-Pit Hydroelectric Project, separates the upper river from the lower river. The lower McCloud River transitions into the McCloud Arm of Shasta Lake upstream from the McCloud River Bridge (Figure 25-3).

Upper McCloud River

The upper McCloud River is an approximately 36-mile reach from the river's origins at Colby Meadows downstream to the transition with McCloud Reservoir. The river basin above the reservoir drains an area of approximately 403 square miles. Mean monthly flows in the upper McCloud River range from 766 cubic feet per second (cfs) in October to over 1,000 cfs in March, April, and May (PG&E 2006).

McCloud Reservoir

The McCloud Reservoir is a major component of PG&E's McCloud-Pit Hydroelectric Project, which was constructed in 1965 and operates under license from the Federal Energy Regulatory Commission (FERC). The McCloud Reservoir is approximately 5 miles long and has a storage capacity of approximately 35,200 acre-feet of water. The McCloud-Pit Hydroelectric Project diverts approximately 75 percent of the upper McCloud River's flow through a pipeline to Iron Canyon Reservoir, then conveys it downslope and discharges it into the Pit River at the Pit 6 powerhouse, upstream from the Pit River Arm of Shasta Lake (PG&E 2006). The remaining 25 percent of flows provide base flow for the lower McCloud River, a considerable reduction from historic flow volumes (Jones & Stokes Associates 1988).

Lower McCloud River

The lower McCloud River flows southwesterly through a deep canyon with steep slopes approximately 22 miles from McCloud Dam downstream to the transition with Shasta Lake. Vegetation along the lower river is predominately mixed-conifer and Douglas-fir forest. This stretch of river receives runoff from a 404-square-mile area of the lower McCloud River basin and the 95-square-mile Squaw Valley Creek basin. It provides exceptional fishing opportunities and includes two long-established fishing clubs, the Bollibokka Club and the McCloud River Club. The Nature Conservancy's McCloud River Preserve also encompasses a portion of the lower McCloud River.

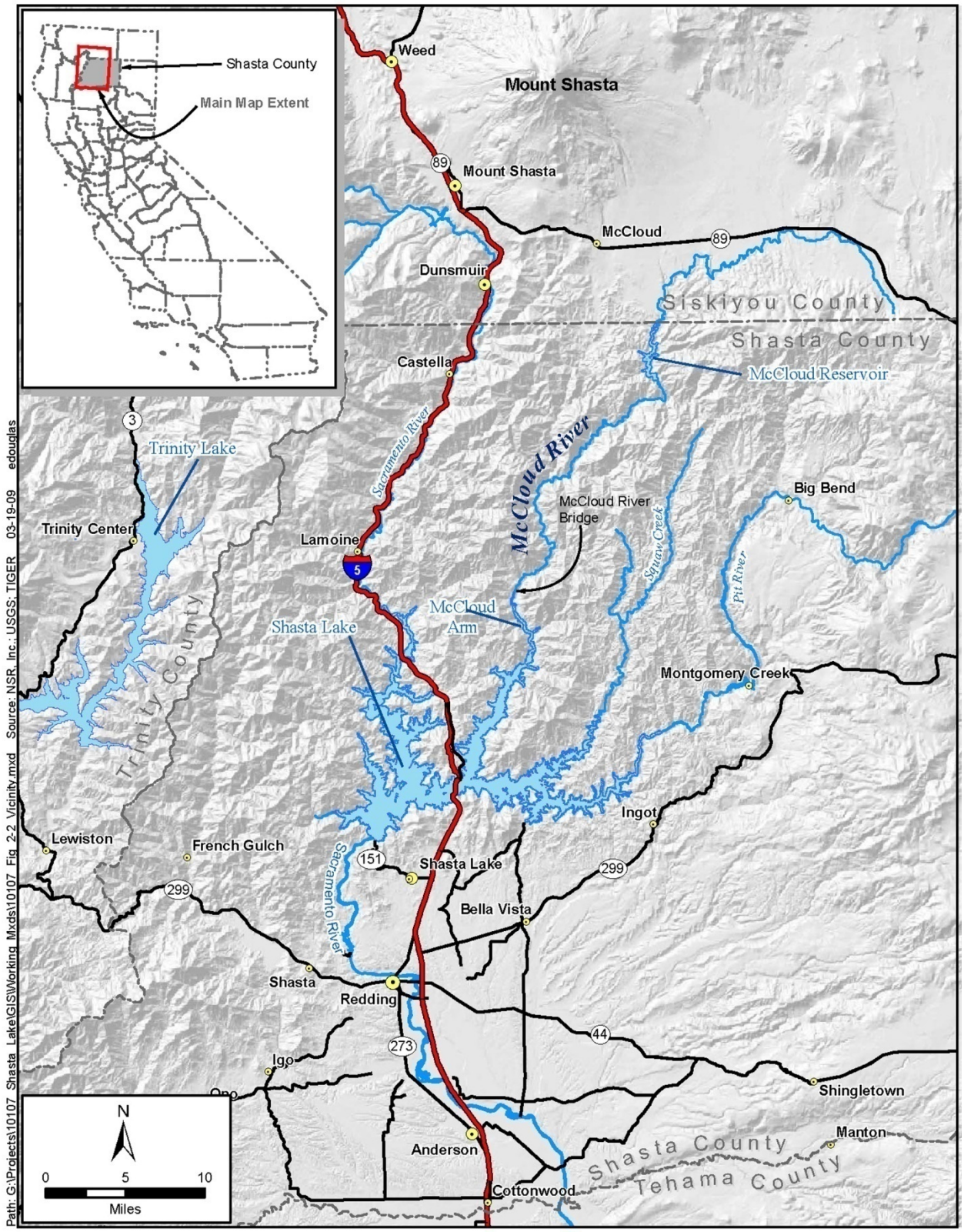

Figure 25-3. Regional Location

Flows in the lower McCloud River have been controlled by releases from McCloud Dam since 1965 (PG&E 2006). Under its current FERC license, PG&E's McCloud-Pit Hydroelectric Project maintains a minimum instream flow of 50 cfs from May through November and 40 cfs from December through April through controlled releases. Accordingly, flows in the lower McCloud River are highly regulated, and annual flows in the river below McCloud Dam do not follow a pattern typical of an unimpaired mountain river in northern California. Before dam construction, flows in the lower river were considerably higher, estimated to be in the range of 924 to 1,245 cfs (mean monthly flows) from June to October (Jones & Stokes Associates 1988, citing U.S. Geological Survey (USGS) for the period of 1967 to 1985).

McCloud Arm of Shasta Lake

The construction of Shasta Dam between 1938 and 1945 converted part of the lower McCloud River into the McCloud Arm of Shasta Lake. The McCloud Arm is more than 16 miles long, with approximately 70 miles of shoreline. It drains an area of approximately 41,000 acres (USFS 1998b). Water levels in the arm fluctuate with the lake's water levels, and during periods of lower water levels, a water line, known as the "bathtub ring," is evident along the banks; this bathtub ring extends about 1 mile upstream from the McCloud River Bridge. During extended periods of lower water levels, vegetation may become established on the exposed banks.

The upper extent of the lake encompasses the transition reach, which varies between about 920 and 1,070 feet msl. Because of the effects of Shasta Lake on the McCloud Arm, the STNF determined that the transition reach did not meet the eligibility requirements of a wild and scenic river (USFS 1994). The USFS defined the upper limit of the McCloud Arm as an elevation of 1,070 feet, or approximately 5,400 feet above the McCloud River Bridge. This elevation corresponds to the lower limit of Segment 4 as defined in the STNF LRMP. A portion of the transition reach – from the McCloud River Bridge to the 1,070-foot elevation – is included in the segments of the river provided protection under the PRC.

The transition reach provides a corridor for fish migrating between Shasta Lake and the lower McCloud River and contributes to the unique fishery of the river. Common fish in the McCloud Arm include native species such as rainbow trout, riffle sculpin, and speckled dace, as well as non-native species (e.g., brown trout, spotted bass) (North State Resources, Inc. 2008).

Water temperatures in the McCloud Arm become warmer as the river transitions to Shasta Lake. The warmer temperatures associated with Shasta Lake support warmwater fish, but the cooler temperatures of the transition reach may prevent some fish from migrating upstream into the lower river. Water temperatures in the transition reach may be suitable for warmwater species.

25.3.2 The McCloud River's Wild and Scenic Values

This section focuses on the wild and scenic river characteristics and ORVs of the lower McCloud River identified by the USFS in the wild and scenic river evaluation performed for the STNF LRMP (USFS 1994) and the wild and scenic river characteristics and extraordinary value protected under the PRC.

The McCloud River's fishery and its free-flowing condition are identified in both the USFS evaluation and the PRC. These characteristics are discussed first, followed by a discussion of the wild and scenic characteristics and values – water quality, geology, cultural/historical resources, and visual quality/scenery – that are identified only in the USFS evaluation.

Throughout the SLWRI planning process, Reclamation has worked closely with private landowners to collect information, perform technical investigations, and incorporate the best available science to support this EIS. Since the DEIS was prepared, information included in Chapters 11, 12, 13, and 25 of this EIS has been updated to include data from recent surveys and investigations performed on both Federal and private lands in the general vicinity of Shasta Lake. Reclamation worked closely with private land owners, including the signatories to the CRMP, to incorporate available information on the McCloud River into this EIS. The following section includes a brief description of the current transition reach (see Figure 25-1) because the reach of the river that would be newly inundated would likely take on the characteristics of the existing transition reach.

Fishery

The fishery of the lower McCloud River is unique; the river is considered a premier trout fishery and is managed according to CDFW's wild trout policy for the reach from Algoma Campground downstream to the lower end of the Nature Conservancy property, despite the ongoing effects of McCloud Dam and Shasta Lake on the river's flows and water quality, and the more recent impacts of the 2012 Bagley Fire on the lower McCloud River watershed. To characterize the fishery, this section includes descriptions of the aquatic habitat in USFS Segment 4, the Resources Agency's Segment 10, and the transition reach as well as the fish species that inhabit the study area.

Aquatic Habitat The lower McCloud River is characterized as a series of alternating riffles, pools, and cascading pocket water occurring along a broad, boulder-studded river channel within a confined, heavily timbered valley. A narrow band of montane riparian vegetation (typically less than 25 feet wide) dominated by willows, white alders, and Oregon ash occurs along the river banks adjacent to steep hill slopes with mixed conifer-Douglas-fir forest (USFS 2001).

In 2001, the USFS prepared a Habitat Typing Report to characterize aquatic habitats in the lower McCloud River from the McCloud River Bridge to McCloud Dam. The report divided the lower river into four reaches: McCloud

Dam to Ladybug Creek, Ladybug Creek to Clairborne Creek, Clairborne Creek to Tuna Creek, and Tuna Creek to McCloud River Bridge. The reach from Tuna Creek to McCloud River Bridge includes all of Segment 4 and nearly all of Segment 10, including the portion of the transition reach that is part of Segment 10. Data are not available for the transition reach below the McCloud River Bridge downstream to Shasta Lake.

The dominant aquatic habitat in the reach of the lower river from Tuna Creek to McCloud River Bridge includes runs (20 percent), mid-channel pools (18 percent), low-gradient riffles (18 percent), lateral scour pools from bedrock (11 percent), and pocket water (10 percent) (USFS 2001). This reach provides most of the corner pool (100 percent), glide (89 percent), and cascade (50 percent) habitats in the lower McCloud River.

The portion of the transition reach upstream from McCloud River Bridge is dominated by low-gradient riffles and mid-channel pools, with some pocket water, glides, runs, and lateral scour pools. Glide habitat is the dominant aquatic habitat between the 1,070-foot and 1,080-foot elevations, and pocket water is the dominant aquatic habitat between the 1,080-foot and 1,090-foot elevations. The habitat within the current transition reach represents a fraction of the total available aquatic habitat within the lower McCloud River and provides a small portion of the habitats within the reach from the McCloud River Bridge to Tuna Creek.

The diversity of riffles, flatwater habitat, and pools is influenced by the presence of boulders and cobble substrate and variations in flow conditions. The lower river is dominated by boulders with pockets of gravel present at pool tailouts and in velocity breaks behind large boulders. The riffles are generally higher gradient channel sections with turbulent surface flow and uniform cobble and boulder substrates. While swift pocket water in the lower McCloud River often appears more like a riffle than a run, the habitable eddies, or pockets, created behind the boulders that characterize this habitat type make it functionally more similar to the other flatwater habitats (USFS 2001). Typically, flatwater and pools are the principal habitats used by the trout in the McCloud River for rearing and feeding (Wales 1939, Rode and Dean 2004, USFS 2001).

The USFS (2001) reported that the aquatic habitat within the transition reach has undergone type conversions caused by aggradation and scour of sediments for about 3,700 feet upstream from the McCloud River Bridge. When Shasta Lake is drawn down, large, wide, low-gradient riffles with channel braiding dominate in this reach. When the lake is at full pool and at intermediate levels of drawdown, the transition reach becomes inundated, but a unidirectional current created by the lower McCloud River's inflow is detectable throughout the inundation zone, slowing as it approaches the flat water of Shasta Lake. To varying degrees, this fluctuating backwater effect converts this reach to a deep,

wide, slow-moving riverine habitat transitioning to lacustrine habitat near the bottom of the transition reach.

Fish Species The current composition and distribution of fish species inhabiting the lower McCloud River and Shasta Lake reflect the historic fishery, the operational effects of Shasta Dam and McCloud Dam, and the introduction of nonnative fish species into the river and Shasta Lake. The completion of Shasta Dam in 1945 eliminated all runs of anadromous fish in the river (Rode and Dean 2004). The historic fishery included Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss irideus*), rainbow trout, and the only known California occurrence of the bull trout. The bull trout is believed to have been extirpated from the lower McCloud River and is possibly extinct in California. Today, the fishery is dominated by rainbow trout and brown trout, an introduced species that migrates between Shasta Lake and the lower McCloud River. Other nonnative species also migrate up the lower McCloud River, including spotted bass (*Micropterus punctulatus*), but bass have not been confirmed upstream from Tuna Falls, a high-gradient rapid at the confluence with Tuna Creek. Despite the change in fish species in this 22-mile reach, the lower McCloud River is still considered one of California's premier trout streams.

Fish observed in the river downstream from the Tuna Creek confluence during a survey conducted in summer 2007 included rainbow trout, spotted bass, speckled dace (*Rhinichthys osculus*), sculpin spp. (*Cottus* spp.), Sacramento sucker (*Catostomus occidentalis*), and Sacramento pikeminnow (*Ptychocheilus grandis*) (North State Resources, Inc. 2008). Other fish that occur in this reach include brown trout, brook trout (*Salvelinus fontinalis*), hardhead (*Mylopharodon conocephalus*), and smallmouth bass (*Micropterus dolomieui*). The status of the riverine fish species of the lower McCloud River is identified in Table 25-1.

Rainbow Trout Fluvial and adfluvial populations of rainbow trout use the habitat available throughout the lower McCloud River. The McCloud River rainbow trout became known as "the rainbow of the fish culturist" because eggs from that population accounted for transplants of rainbow trout in the 1880s to the eastern states and several other countries.

The rainbow trout that inhabit the McCloud River are a vigorous, active fish that primarily inhabit swifter portions of pool and pocket water habitats. Adults migrate into the lower McCloud River from Shasta Lake in the spring and fall months, presumably to spawn. Suitable spawning habitat in the study area is limited, and the trout likely migrate further upstream to spawn (North State Resources, Inc. 2008).

Although the genetic origin of these fish has not been evaluated, the numerous strains of rainbow trout planted in Shasta Lake over the years have likely resulted in some introgression among migratory rainbow trout in the lower McCloud River. The degree to which this migratory population of rainbow trout

contributes to the native trout fishery of the river is not specifically known; however, available data do not indicate that it is substantial.

Table 25-1. Riverine Fish Species of the Lower McCloud River

Species	Current Status	Comments
Sacramento sucker (*Catostomus occidentalis*)	Common	Native, non-game species, observed during 2007 surveys
Riffle sculpin (*Cottus gulosus*)	Common	Native, non-game species, observed during 2007 surveys
Smallmouth bass (*Micropterus dolomieui*)	Uncommon	Introduced sport species in Shasta Lake, moves into lower river from lake, warmwater species
Spotted bass (*Micropterus punctulatus*)	Uncommon	Introduced sport species in Shasta Lake, moves into lower river from lake, observed during 2007 surveys, warmwater species
Hardhead (*Mylopharodon conocephalus*)	Uncommon	Native, non-game species
Rainbow trout (*Oncorhynchus mykiss*)	Abundant	Native trout species, subject to special angling regulations, coldwater species, observed during 2007 surveys
Sacramento squawfish (=pikeminnow) (*Ptychocheilus grandis*)	Common	Native, non-game species, observed during 2007 surveys
Speckled dace (*Rhinichthys osculus*)	Common	Observed during 2007 surveys
Brown trout (*Salmo trutta*)	Common	Introduced sport species found throughout the river, migrates from Shasta Lake to spawn in lower river, subject to special angling regulations, coldwater species
Bull trout (*Salvelinus confluentus*)	CE; Extinct	Native, believed extirpated from entire river by mid-1970s, a few restoration experiments performed in upper river tributaries, coldwater species
Brook trout (*Salvelinus fontinalis*)	Rare	Introduced sport species, stocking in upper river and tributaries discontinued, very rarely observed in lower river, coldwater species

Sources: Wales 1939, Tippets and Moyle 1978, Rode and Dean 2004, Moyle 2002, CDFW, unpublished data, North State Resources, Inc. 2008
Key:
CE = California Endangered
CDFW = California Department of Fish and Wildlife

Rainbow trout typically mature in their second to third year and move upstream to spawn in the lower McCloud River and its tributaries from February to June. The eggs typically hatch in 3 to 4 weeks, depending on water temperature, and fry emerge 2 to 3 weeks later. The fry remain in quiet waters close to shore, among cobbles, or under overhanging vegetation for several weeks. As the fish grow, they move into swifter water habitats.

In the river, this species forms feeding station hierarchies, which they aggressively defend, and prey on aquatic and terrestrial insects drifting in the current. They also eat active bottom invertebrates. It has been reported that

McCloud River rainbow trout tend to be more bottom-oriented when feeding than rainbow trout elsewhere.

In reservoirs, rainbow trout form loose schools and feed on both invertebrates and other fish, although fish dominate their diet as they grow larger. Preferred prey in Shasta Lake is the threadfin shad. Trout growth in Shasta Lake is more rapid than for fluvial trout. The optimum temperature range for growth and for completion of most life stages of rainbow trout is between 50 and 70 degrees Fahrenheit (°F), though they seem to prefer and thrive at temperatures in the lower two-thirds of this range. Rainbow trout in lakes and streams seldom live for more than 6 years.

Brown Trout Like the rainbow trout, fluvial and adfluvial populations of non-native brown trout use habitat throughout the lower McCloud River, but this species migrates more between the lake and river. It is not as abundant as the rainbow trout. CDFW biologists suggest that this species occupies an ecological niche previously occupied by bull trout in the lower McCloud River (Rode and Dean 2004).

Only some of the brown trout migrating from Shasta Lake that passed a lower river counting weir were observed upstream in the CDFW Wild Trout Management Area (Segments 7, 8, 9, and 10), so the actual extent of the spawning grounds of migratory brown trout is not fully known.

Brown trout mature in their second or third year. Some fish may mature in the river while others may migrate to Shasta Lake to feed, returning to spawn on a recurring basis. The stimulus for upstream migration is often a rise in stream flow or changing lake temperatures. Spawning takes place from November through December when water temperatures fall below 50°F. Eggs typically hatch within 7 to 8 weeks, depending on water temperature. Fry emerge from the gravel 3 to 6 weeks later. The habitats used by juvenile brown trout are similar to those used by rainbow trout; however, as brown trout grow, they tend to select habitats with slower water and more cover. In the riverine environment, brown trout prefer slow, deep pools with abundant boulder and bedrock ledge cover. The timing of emigration of juvenile brown trout to Shasta Lake is not known.

Fluvial brown trout have diets similar to those of rainbow trout, but appear to feed more on the stream bottom for benthic prey than rainbows. As brown trout grow, their diet expands to include larger invertebrate prey and fish. Larger brown trout are voracious predators, especially on fish, including young salmonids. In Shasta Lake, adult brown trout prefer threadfin shad as a staple prey.

Brown trout growth in the lower McCloud River appears to increase after age 3, which has been attributed to their migration to Shasta Lake to exploit the forage fish populations. Brown trout growth is best at temperatures ranging from 45 to

69°F, though they seem to prefer and dominate other trout species near the upper half of this range.

Spotted Bass and Smallmouth Bass Black basses and other sunfishes dominate in the littoral zones of Shasta Lake. Spotted bass and smallmouth bass are now the most common species of black bass in Shasta Lake, with spotted bass having become most frequent over the past 20 years. Both spotted and smallmouth bass occupy shallow, low-gradient habitat offered by Shasta Lake and its tributaries. They can be found throughout Shasta Lake and in the lower ends of the main tributary streams, including the lower McCloud River. However, the extent to which black bass have colonized the lower McCloud River is not currently known.

Smallmouth bass and spotted bass share similar life histories, and these similarities may account for their persistence in Shasta Lake compared to that of largemouth bass, which have declined in numbers. Both smallmouth and spotted bass mature in their second or third year and spawn in the late spring. Smallmouth will spawn at cooler temperatures (55 to 61°F) than spotted bass (greater than or equal to 65°F). Both species seek quiet shallow areas over mud, sand, gravel, and rocky, debris-littered bottoms to spawn in both lakes and streams. This type of spawning habitat is available in the transition reach of the lower McCloud River, especially when lake levels are high.

Juvenile bass feed on small invertebrates until they are large enough to prey on small fish and large invertebrates. Temperature preferences and optimal growth for both species of black basses is attained in the range from 68 to 81°F. Because of the year-round cool temperatures (less than or equal to 68°F) of the lower McCloud River, temperatures preferred by bass only occur during the late summer and early fall months upstream from the transition reach. Therefore, the temperature regime of the lower McCloud River may limit intrusions of bass from the lake. However, spotted bass were observed in the lower river below the confluence of Tuna Creek during summer fish surveys (North State Resources, Inc. 2008).

Free-Flowing Condition

The Federal WSRA defines *free flowing* as “existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway” (16 USC Section 1286). The PRC defines free-flowing as “existing or flowing without artificial impoundment, diversion, or other modification of the river.” It states, however, that the “presence of low dams, diversion works, and other minor structures does not automatically bar a river’s inclusion in the system.”

Base flows in the lower McCloud River are partially controlled by releases from McCloud Reservoir in accordance with PG&E’s FERC license and include precipitation and inflow from tributaries. The lower McCloud River experiences seasonal fluctuations and large variations in base flows (USFS 1998a). Releases

from McCloud Reservoir into the lower river are heavily regulated, with a minimum release requirement of 50 cfs from May through November and 40 cfs from December through April; the releases are typically well above these minimum requirements and tend to stay above 100 cfs (USFS 1998a). Tributary contributions are the most noticeable flows during storm events, but are substantially reduced during low-flow conditions. Because of the minimum release requirements from McCloud Reservoir, spring and summer flows are considerably more stable than they would be under unregulated conditions.

PG&E monitors lower McCloud River flows in accordance with its FERC license at a gaging station in Segment 4 upstream from Shasta Lake (0.2 mile downstream from Big Bollibokka Creek); the most recent available water data record covers the water year October 2012–September 2013 (USGS 2013). For this period, measured mean monthly flows ranged from 271 cfs in August to a high of 26,179 cfs in February, with maximum flows as high as 30,100 cfs on December 2, 2012.

Over the course of the year, the transition from lake to river expands and contracts over a distance of about 1.7 miles due to changing water levels in Shasta Lake (Figure 25-2). During April and May of wet years, the transition reach extends about 1 mile (5,400 feet) upstream from the McCloud River Bridge to the full pool elevation of 1,070 feet msl, the downstream boundary of Segment 4. As described in Chapter 6, “Hydrology, Hydraulics, and Water Management” Shasta Lake reaches full-pool elevation about one year in three.

Despite upstream and downstream dams and diversions, the lower McCloud River meets the definition of a free-flowing river under both the Federal WSRA and PRC.

Water Quality

The water quality of the lower McCloud River is influenced by natural processes and land use activities, including PG&E’s McCloud-Pit Hydroelectric Project, timber management activities, and roads. Overall, the water quality of the river is rated as good (USFS 1998). Glacial silt gives the river “a beautiful turquoise color typical of rivers draining glacial valleys in British Columbia and Alaska” (Jones & Stokes Associates 1998).

Turbidity and water temperature are two important factors that influence the water quality of the river and affect aquatic habitat. Turbidity is caused by suspended sediment transported from upstream waters and in surface runoff, particularly from disturbed landscapes, such as areas burned by fire, timber harvest areas or roads. Water temperature is affected by a variety of conditions, such as river flows, solar radiation, and density of vegetation along the river, but is closely tied to the temperature of the flows released from the McCloud Reservoir.

The turbidity of the lower McCloud River is influenced by the water quality and water levels of the McCloud Reservoir and runoff from upland areas throughout the basin. Turbidity levels are generally low during most of the year, ranging from 5–10 nephelometric turbidity units, but can spike to more than 900 units during periods of intense rainfall and flood flows (PG&E 2006).

Sediment becomes trapped at McCloud Dam and is released into the lower river during large storm events, temporarily increasing turbidity levels, especially in the upper segments of the lower river. Testing of the McCloud Dam bypass valve can cause high turbidity for a short period when sediment is discharged from the reservoir into the lower McCloud River. Surface runoff, especially after the first storms of the wet season, can contribute large amounts of turbid runoff from upland areas.

The length of the transition reach depends on the water year type. As the transition reach moves upstream, sediment within the reach is remobilized and turbidity levels respond accordingly. Periodic fluctuations in water levels can result in erosion along the banks and localized increases in turbidity levels in the transition reach and the McCloud Arm.

The year-round cool water temperature regime of the lower McCloud River inhibits the productivity of its fishery, but provides high-quality holding habitat for salmonids, contributing to the river's unique value as a tributary to Shasta Lake. The controlled releases from McCloud Dam appear to have a direct bearing on the water temperatures downstream. Water temperatures tend to be higher in Segment 4 than immediately below McCloud Dam. Data recorded at PG&E's monitoring station on the river just upstream from Shasta Lake (0.2 mile downstream from Big Bollibokka Creek) indicate that water temperature ranges from the high 30s to the upper 60s (°F), with lower temperatures in the winter and higher temperatures in the summer (PG&E 2006).

The infusion of cooler water from the lower McCloud River influences water temperatures in the transition reach throughout the year. The degree of influence depends on the amount of discharge from the river and Shasta Lake levels. The temperatures throughout the lower McCloud River also control to some degree the distribution of the warmwater fishery known to occupy the river below Tuna Falls.

Outstandingly Remarkable Values Identified in USFS Evaluation

Cultural/Historical Resources Cultural resources include archaeological sites, historical structures and sites, and areas of religious or cultural significance to Native Americans. Significant resources that provide important information on the prehistory and history of an area or that are considered sacred to Native Americans can contribute to wild and scenic river values.

The McCloud River basin was part of a major center of occupation by the Wintu people, who occupied the McCloud River area at the time of Euro-

American contact in the 1800s. Although much of the Wintu territory was overrun with miners and other opportunistic Euro-Americans, the lower McCloud River was left largely untouched due in part to a lack of easily mined materials and the ruggedness of the terrain (Yoshiyama and Fisher 2001), but also because of the resistance of the Wintu to incursions into their territory. Because of its generally undisturbed nature, the significance of the lower McCloud River to prehistoric and ethnographic records of this area of California's history is considered to be great (Jones & Stokes Associates 1988).

Within the 0.25-mile corridor deemed eligible by the USFS, three formally recorded sites and other known sites contribute to the lower river's ORVs because they provide important information on the use of the area from before the Late Archaic Period (1300 to 150 before present, calibrated using radiocarbon dating) to the Historic Era (1840 to present). Three Wintu villages, called Tsekerenwaitsogi, Klolwakut, and Boloibaki, are thought to have been located in the general area of the present-day Bollibokka Club headquarters (Guilford-Kardell 1980), which is part of the former Wintu territory. These villages likely represent the typical lifestyle of the Wintu at the time of Euro-American contact, when they lived in permanent villages near rivers and streams and were semi-sedentary, foraging people (DuBois 1935). As part of the Wintu occupation of this area, prehistoric, historic, and modern Traditional Cultural Properties, sacred locations, and important use areas are located throughout the lower McCloud River basin (outside of the 0.25 mile corridor), including features such as mountains, unique landforms, caves, distinctive rock outcrops, waterfalls, pools, springs, and resource gathering areas.

Point McCloud Bridge (known as McCloud River Bridge in this chapter) is a historical resource that was constructed in 1940 and altered in 1986; the bridge would be subject to relocation in conjunction with SLWRI activities. The Bollibokka Club is a historical resource located on the north bank of the river between the confluence of Big Bollibokka Creek on the east and Wittawaket Creek on the west. Buildings associated with the club were built between the 1860s and 1920s by Austin and Rueben Hills, the founders of Hill's Brothers Coffee, and previous owners (Lucas and Stienstra 2007). A log cabin dates from the 1860s, and other structures date from the ownership of the Hills Family, including the clubhouse built in 1924 and a structure built of river cobble in 1915 (Whitney 2004). Although these resources could be eligible for listing on the National Register of Historic Places, they have not been formally evaluated.

The fishery of the lower McCloud River was also very important to prehistoric and historic uses of the area. The Native Americans in the lower McCloud River basin conducted communal fish drives of salmon or steelhead at night, which brought together many communities and provided opportunities for trade and social networking, including the parsing out of the catch among the people and villages involved (DuBois 1935). Fish, including salmon, steelhead, Sacramento sucker, freshwater shellfish, and lamprey, were an important part of the Native American diet in this area. When the northern mines opened in the 1800s,

settlers moved into the area, and the McCloud River and other rivers' fisheries provided important sources of food. In the early years of settlement, fish and game in the area were used for subsistence; however, this changed with the formation of the State of California and increased fishery management and recreational fishing.

Geology The lower McCloud River flows through a number of geologic formations, including the McCloud Limestone formation. This formation contains fossilized remains of invertebrate and vertebrate fauna that provide important scientific information on the history of California, and it has a high potential for research. According to the USFS (1998b), the limestone features exposed at a number of locations around Shasta Lake are unique and contribute to worldwide paleontological knowledge. The McCloud Limestone contains 36 species of corals, some of which may form the basis of a new taxonomic group.

Because of its very diverse fossil faunas, the mountainous terrain between the McCloud and Pit arms of Shasta Lake is perhaps California's single most important area for paleontological research (Munthe and Hirschfield 1978, cited in USFS 1998b). The limestone outcrops on the ridge immediately northwest of McCloud River Bridge (several hundred vertical feet above Shasta Lake) have produced several large Mississippian and Pennsylvanian invertebrate faunas. Because this period is poorly represented on the West Coast, this fossiliferous limestone is important to understanding the late Paleozoic evolution in this part of the country (USFS 1998b). Limestone outcrops adjacent to the McCloud Arm also provide habitat for several special-status species, such as Shasta salamander, Shasta eupatorium, Howell's cliff-maids, and Shasta snow-wreath (Reclamation 2003).

Exposed outcrops of the limestone formation are visible from the lower McCloud River in and upslope of the transition reach and contribute to its scenic values.

Visual Quality/Scenery The visual setting of the lower McCloud River upstream from Shasta Lake includes views of the river, limestone rock outcrops, adjacent coniferous and oak forests, and infrastructure associated with the Bollibokka and McCloud River clubs. A USGS stream gage has also been in place for a number of years. The pristine nature of the lower river provides for high-quality scenic views. However, the scenic views of the lower McCloud River are enjoyed by only a limited number of viewers, consisting primarily of private landowners, club members, and their guests.

Views of the river include "picturesque cascading whitewater, and deep, long, green- or turquoise-colored pools," with Douglas-fir and black and canyon oaks dominating the steep slopes and hillsides along the river (Jones & Stokes Associates 1988). Several buildings are present at the Bollibokka Club headquarters, but these structures blend in with the visual setting. The transition reach exhibits some evidence of fluctuating surface water elevations associated

with changes in water levels of Shasta Lake. Areas that are noticeably affected by the reservoir levels exhibit "a bathtub ring of steep, treeless slopes with occasional deposits of alluvium."

The scenic views make most of the lower McCloud River, including Segment 4, eligible as a scenic river under the Federal WSRA (USFS 1994). To be classified as a scenic river, the river must be free of impoundments, be accessible in places by roads, and have a river basin/shoreline that is largely undeveloped. Segment 4 does not contain any human-made or other impoundments that affect its free-flowing conditions. Roads to the Bollibokka Club provide access to portions of Segment 4 for members of the club and their guests. Currently, public access is limited to pedestrians on USFS lands along the shoreline of Shasta Lake. For these reasons, the USFS has determined that this segment meets the eligibility requirements of a scenic river under the Federal WSRA.

25.4 Environmental Consequences and Mitigation Measures

This section identifies how the characteristics of the lower McCloud River that make it eligible for listing under the PRC and Federal WSRA could be affected by each alternative and whether the alternatives would conflict with the provisions of the STNF LRMP and the CRMP.

25.4.1 Methods and Assumptions

This analysis of environmental consequences focuses on the effects of proposed modifications to Shasta Dam and Shasta Lake on the McCloud River's free-flowing conditions, its water quality, and the ORVs (cultural resources, fisheries, geology, and scenery) that make it eligible for listing as a wild and scenic river under the Federal WSRA. In large part, the environmental effects are based on computer modeling of water levels, known elevations of the existing bathtub ring that is observable in the transition reach, and the anticipated changes in the environment due to fluctuations in water levels and expansion of the transition reach. Physical effects to the free-flowing conditions, water quality, and ORVs are analyzed in terms of their effects on the eligibility of the river for wild and scenic river designation. While aquatic habitat data are used to quantify the relative impact to the fishery values, a qualitative analysis is provided for most resources because of a lack of quantitative data and the subjective nature of the values. Information to support the analysis was generated from available literature and planning documents and technical studies prepared as part of the SLWRI as well as other chapters in this EIS.

CalSim Modeling

The CalSim-II computer model was used to assist in the evaluation of the potential impacts of the project alternatives on water-related resources. The model used historical data on California hydrology to represent the variety of

weather and hydrologic patterns, including wet periods and droughts, under which water storage and conveyance facilities would be operated. Two scenarios (base cases) of demands for, and storage and conveyance of, water were used in model runs: 2005 facilities and demands ("existing conditions") and forecasted 2030 demands and reasonably foreseeable projects and facilities ("future conditions"). A model run was conducted for each of these base cases combined with each alternative so that the effects of the No-Action Alternative and the action alternatives could be evaluated for both existing and future conditions.

The analysis focuses on the environmental effects in the portion of Segment 4 that would periodically be inundated. These effects are discussed in the following section.

Gage Data

PG&E, in coordination with USGS, monitors lower McCloud River flows in accordance with its FERC license for the McCloud-Pit Hydroelectric Project at a gaging station just upstream from the McCloud River Bridge, approximately 0.2 mile downstream from Big Bollibokka Creek (USGS 11368000 McCloud River above Shasta Lake, California). The station measures mean, minimum, and maximum monthly flows in the lower McCloud River. The most recent available water data record covers the water year of October 2012 to September 2013 (USGS 2013). This data was used to describe flow conditions in the lower McCloud River.

Water Quality Monitoring

Current and historical water quality monitoring data for the McCloud River have been collected by Federal and state agencies as well as PG&E and The Nature Conservancy. The California Department of Water Resources maintains water quality information on the McCloud River in the California Data Exchange Center database. The Nature Conservancy monitors water quality at the McCloud River Preserve. Water quality monitoring of the lower McCloud River includes measures of water temperature, dissolved oxygen, pH, specific conductance, and turbidity, as well as correlated data on weather, air temperature, and debris movement. PG&E monitors water quality in compliance with its FERC license. Available information on water quality was used to describe the setting of the lower river and assess changes in water quality that would occur as a result of the Shasta Dam modification alternatives.

Habitat Typing

The USFS stream habitat typing performed in 1999 and 2000 (STNF, December 2001 unpublished data report, as found in USFS 2001) was used to describe aquatic habitat in the lower McCloud River and to assess the changes in aquatic habitat from implementation of the Shasta Dam modification alternatives. The habitat typing data were used in conjunction with the CalSim-II modeling results, digitized orthophotographs, and high-resolution topographic data to provide habitat maps and graphic depictions of the distribution of aquatic

habitat in the lower river below Little Bollibokka Creek. A longitudinal profile, using water surface elevations, was generated to illustrate habitats; it does not provide an accurate representation of channel geometry.

A quantitative evaluation of the aquatic habitats was performed using digital images and the USFS habitat typing data in an integrated geographic information systems environment. Longitudinal habitat delineation was determined from the habitat typing data, with minor adjustments to match photo-interpreted habitat, and incorporated into the geographic information systems in conjunction with water surface elevations generated through the CalSim-II modeling results. Estimates of aquatic habitat areas were generated from digitized wetted stream perimeters. These measurements were based on orthophotographs taken April 25, 2001. While the absolute amount of riverine habitat can vary with flow, the relative proportions of different types of habitat remain relatively constant. Therefore, we used the relative proportions of aquatic habitat types to compare impacts to the transition reach with the entire lower river.

25.4.2 Criteria for Determining Significance of Effects

The following significance criteria were developed based on guidance provided by the State CEQA Guidelines, other Federal and State guidance, and consider the context and intensity of the environmental effects as required under NEPA. (Please see Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences) for an explanation of the distinction between significance under NEPA and significance under CEQA.) Impacts of an alternative on the wild and scenic river values of the lower McCloud River would be significant if project implementation would:

- Affect the eligibility for Federal listing as a wild and scenic river of any portion of the lower McCloud River above the 1,070-foot elevation
- Conflict with the STNF LRMP or with management of the McCloud River under the CRMP
- Impact the wild trout fishery and free-flowing conditions as described in the State PRC

25.4.3 Direct and Indirect Effects

No-Action Alternative

Under the No-Action Alternative, Reclamation would not pursue an action to enlarge Shasta Dam to help increase anadromous fish survival in the upper Sacramento River and address the growing water supply reliability issues in California. Water levels in Shasta Lake and the transition reach would continue to fluctuate similar to current conditions. USFS Segment 4 and the Resources Agency’s Segment 10 would not be affected by this alternative.

Impact WASR-1 (No-Action): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Under the No-Action Alternative, the current maximum elevation of water levels in the transition reach would not be increased, and Segment 4 would not be affected. Fluctuations in water levels would continue to be similar to current conditions, with water levels reaching the maximum elevation of 1,070 feet msl – the downstream boundary of Segment 4 – in the transition reach for a brief period (typically a few days in May) during wet years.

The average monthly water surface of Shasta Lake would continue to fluctuate based on the water year, with a maximum elevation of 1,053 feet msl in April of an average water year and 1,070 feet msl in April and May of a wet year. These fluctuations would not affect the free-flowing conditions and water quality of Segment 4. The ORVs that make the river eligible for designation as a Federal wild and scenic river would continue to be affected only by ongoing natural processes and land use activities, and all of Segment 4 would remain eligible for listing under the Federal WSRA. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-2 (No-Action): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan Under the No-Action Alternative, the STNF LRMP would continue to be implemented as it has in the past, with no changes in the management of the McCloud River's free-flowing condition, water quality, and ORVs. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-3 (No-Action): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 Under the No-Action Alternative, the protections afforded the McCloud River by the PRC would not be affected. River conditions would not be modified, and the provisions of the PRC would continue to protect the river. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-4 (No-Action): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 Under the No-Action Alternative, the protections afforded the McCloud River by the PRC would not be affected. River conditions would not be modified, and the provisions of the PRC would continue to protect the river. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

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

CP1 would involve a 6.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 8.5 feet and enlarge the total storage space in the lake by 256,000 acre-feet. This increase would equate to an increase of about 1,100

acres of surface area occupied by Shasta Lake when the lake is full. CP1 includes measures to increase water supply reliability while contributing to increased survival of anadromous fish. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 70,000 acre-feet and 35,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing municipal and industrial (M&I) deliveries.

Impact WASR-1 (CP1): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Under CP1, the increased gross pool of Shasta Lake would expand the current transition reach up to the 1,078-foot elevation, resulting in adverse effects on the characteristics of approximately 1,470 feet of Segment 4. The rest of the McCloud River would remain eligible for designation as a Federal wild and scenic river. This impact would be significant.

Under CP1, approximately 1,470 feet, or 11 percent, of Segment 4 would be periodically inundated. This increase in the transition reach to a maximum elevation of 1,078 feet msl would equate to a 16 percent increase over the current transition reach. The length of time during the year when the transition reach is inundated and the maximum elevation of the inundation area would vary by the type of water year (wet, above normal, below normal, average, dry, or critical).

Within the expanded transition reach, flow conditions and fisheries would periodically be affected, with the timing and duration of the effects similar to those that occur in the current transition reach. Over time, the expansion of the bathtub ring would affect water quality, geology, and visual quality/scenery in the affected portion of Segment 4. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans. These effects could reduce the total length of the lower McCloud River that is eligible for wild and scenic river designation by about 1,470 feet (approximately 1.2 percent of the total length of the lower river).

Free-Flowing Conditions Under CP1, the currently free-flowing section of the lower McCloud River would be reduced by about 1,470 feet or about 1.2 percent. The flow characteristics of the affected portion of Segment 4 would periodically be modified, resulting in slower moving waters and a wider river channel. When inundated, the affected portion would retain some current, but flow velocities would decrease with distance downstream. This modification would not meet the definition of a free-flowing river under the Federal WSRA.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 1,470-foot reach of Segment 4 that would be affected by CP1 would become ineligible for listing under the Federal WSRA.

Water Quality As Shasta Lake's water levels rise, vegetation and soils along the banks of the affected portion of Segment 4 would become inundated. Most or all of the vegetation that is inundated would eventually die and be washed or fall into the river, bringing with it sediment and other materials that could affect water quality. Soils in the affected portion of Segment 4 would erode as water levels rise and fall, causing an increase in turbidity. These effects would likely be most noticeable during the initial inundation periods, since the river corridor is likely to eventually stabilize as the soil is eroded to bedrock.

Within the approximately 1,470-foot reach of Segment 4 that would be affected under CP1, water temperatures would fluctuate relative to temperatures immediately upstream. Similar to flow, these changes would vary by water year type. Increased turbidity and warmer water temperatures would be most noticeable along the affected portion of Segment 4 because this area has not been previously exposed to periodic inundations.

Adverse effects on water quality would be associated with the periodic fluctuations in the water levels of Shasta Lake. Because water quality is a fundamental requirement for wild and scenic river eligibility, the 1,470-foot reach of Segment 4 that would be affected by CP1 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Under CP1, erosion of rock outcrops and expansion of the bathtub ring in an approximately 1,470-foot reach of Segment 4 could expose buried or previously undiscovered prehistoric cultural resources associated with Wintu occupation of the area and historic recreational uses of the area. As this reach becomes inundated, any exposed resources would be susceptible to the effects of water, which could damage or otherwise alter their values, affecting their eligibility for listing on the National Register of Historic Places and reducing their importance for providing information on past use within the corridor. As the water recedes, exposed resources would be susceptible to wind and rain and could be visible, potentially exposing them to theft or vandalism. These adverse effects would be localized along the corridor of the affected portion of Segment 4 and would likely only affect a small portion of the cultural resources that may be associated with the lower McCloud River basin.

The historic structures associated with the Bollibokka Club occur outside of the area that would be affected by the expanded transition reach and would not be affected. However, unrecorded resources associated with the Wintu village locations may occur within the corridor along the river and could be subjected to periodic inundation, deposition, and scour within the upper portions of the

expanded transition reach. Portions of three other recorded sites could also be subject to similar impacts within the expanded transition reach, which could result in damage to resources within the sites. Although these sites may provide information on the area's history or prehistory, none of these sites has been evaluated for listing on the National Register of Historic Places.

Sacred sites important to Native Americans have not been specifically identified, and access to lands adjacent to the reach that would be periodically inundated under CP1 is limited because all of these lands are privately owned.

The cultural resources located along the 1,470-foot reach of Segment 4 that would be affected under CP1 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the 1,470-foot extension of the transition reach would be affected during periodic inundations, resulting in potential adverse effects on the fish that occur in the river. Potential adverse effects on fish could include a reduction in spawning habitat for trout in the expanded transition reach and an increase in the range of warmwater fish in the lower McCloud River. Fishing opportunities would not be affected more than they are now with the periodic fluctuations in river levels.

Under CP1, the transition reach would be extended by about 1,470 feet to the 1,078-foot elevation, resulting in a larger inundation area when Shasta Lake water levels are the highest. Aquatic habitat in the affected portion of Segment 4 consists primarily of flatwater habitat (52 percent glide, 19 percent mid-channel pool, and 13 percent run), with pocket water (11 percent) and a small, low-gradient riffle (5 percent) in the lower portion of the segment. With the periodic inundations, sediment deposition could cause flatwater habitat to convert to riffle habitat, resulting in a reduction in flatwater habitat of less than 3 percent of the total lower McCloud River's flatwater habitat. During the inundation period, riffle and pool habitat (approximately 1.2 percent of the total lower McCloud River) would be converted to flatwater habitat. Also, riparian vegetation along the newly inundated banks of the affected portion of Segment 4 would be expected to die, which could affect water temperatures and reduce cover for fish in this reach. The extent of these effects would depend on the frequency, duration, and surface elevation of the inundation, which would vary depending on the type of water year and water levels of Shasta Lake.

The migration of fish, especially trout, between the lower McCloud River and Shasta Lake is an important attribute of the unique trout fishery. Many of the rainbow and brown trout that occupy the lower McCloud River spend part of their lives rearing in Shasta Lake, feeding on the abundant prey in the lake and attaining large sizes that would not be possible if they reared only in the river. Upon returning to the river to spawn, these lake-reared fish provide the trophy-sized trout, particularly brown trout, for which the lower McCloud River is renowned (Rode and Dean 2004). Based on a survey that extended up to Tuna

Falls (North State Resources, Inc. 2008), the reach of Segment 4 that would periodically be inundated does not contain any barriers or impediments to fish movement or migration, and CP1 would not create any. Consequently, trout migration through the transition reach to upstream spawning areas would not be impaired.

Conversely, warmwater fish movement between the lake and river is not likely to be facilitated by the expanded transition reach. Warmwater fish from Shasta Lake, such as spotted bass, have been observed throughout the lower McCloud River, at least up to the confluence with Tuna Creek (North State Resources, Inc. 2008). Nonnative warmwater species inhabiting Shasta Lake (e.g., smallmouth bass and spotted bass) are known to exploit riverine and transitional habitats and are effective predators of juvenile trout. No barriers have been observed in the transition reach that could prevent warmwater fish from moving upstream, and no barriers would be created by the expansion of the transition reach. Warmwater fish would continue to be able to move between the lake, the transition reach, and lower McCloud River (Segment 4).

Aquatic habitat changes could affect how fluvial resident trout use habitat within the affected portion of Segment 4. General effects may range from temporary displacement of trout to upstream habitats at high water levels to degraded riverine habitat suitability within the transition reach.

Suitable spawning habitat for rainbow and brown trout in the expanded transition reach is limited because of the few pools and riffles available during the spring and fall when these species spawn. Based on the USFS habitat data and more recent reconnaissance surveys, the amount of spawning gravels in the expanded transition reach represents only a small percentage of the suitable spawning habitat in the lower McCloud River. However, any effect on spawning habitat would be considered adverse.

Geology During periods of maximum inundation in the 1,470-foot portion of Segment 4 that would be affected under CP1, some rock outcrops may become inundated and could erode, but the overall geologic value of the McCloud Limestone features would not be adversely affected.

Visual Quality/Scenery The visual quality of the affected portion of Segment 4 would decrease as the vegetation along the banks becomes inundated and eventually dies, the bathtub ring expands, and evidence of flow is reduced. These conditions would be similar to those in the current transition reach. The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP1 would result in making approximately 1,470 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation

measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP1): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 1,470 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. Although raising Shasta Dam would result in inundation of part of Segment 4, the McCloud River and the adjoining lands in this part of the segment are not National Forest System lands and therefore not subject to the LRMP. Management of the river's ORVs under the STNF LRMP and the CRMP would not be affected. No land use changes would occur along the river, and the USFS and signatories to the CRMP would be able to continue implementing provisions of their plans that apply to the river. Because the LRMP does not apply to the private lands in Segment 4, there would be no impact and no mitigation is required.

Impact WASR-3 (CP1): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The State PRC includes provisions that protect the wild trout fishery of the lower McCloud River. Under CP1, this equates to about 1,470 feet of the river that would be modified and function as an additional portion of the existing transition reach. This reach of the river provides limiting spawning habitat for wild trout (NSR 2009) and during runoff conditions is subject to sedimentation and erosion of the bed and banks similar to upstream reaches. Public access to utilize the fishery offered in this reach is limited to the area below the high-water mark (State Lands) and lands managed by the STNF similar to the other portions of Segment 10 upstream of the McCloud River Bridge. Implementation of proposed modifications to Shasta Dam and Shasta Lake could affect the wild trout fishery (access and ecology) of the lower McCloud River identified in the State PRC. This impact would be potentially significant.

The proposed modifications to Shasta Dam and Shasta Lake would result in periodic fluctuations in water levels within the expanded transition reach, permanently affecting about 1.2 percent of the lower McCloud River and its associated fishery habitat. Under CP1, the transition reach would be extended by about 1,470 feet, a 16 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to that described under Impact WASR-1 and Impact WASR-2 and comparable to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the fishery (populations and habitat) are small in the context of the entire lower McCloud River. This impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP1): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The State PRC includes provisions that protect the free-flowing conditions of the McCloud River, including the conditions in the transition reach upstream of the McCloud River Bridge. Implementation of proposed modifications to Shasta Dam and Shasta Lake could affect the free-flowing conditions of the McCloud River, as identified in the State PRC. This impact would be significant.

The proposed modifications to Shasta Dam and Shasta Lake would result in periodic fluctuations in water levels within the expanded transition reach, permanently affecting about 1.2 percent of the lower McCloud River. Under CP1, the transition reach would be extended by about 1,470 feet, a 16 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the river would not be adversely affected beyond the upstream extension of the transition reach. The primary impact of the expansion of the transition reach would be modifications to the free-flowing character in a manner similar to that described under Impact WASR-1 and Impact WASR-2. While the overall impacts to the free-flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (1.2 percent), this impact would be significant and unavoidable. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

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

CP2 would involve a 12.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 14.5 feet and enlarge the total storage space in the lake by 443,000 acre-feet. This increase would equate to an increase of about 1,850 acres of surface area when the lake is full. CP2 also includes measures to increase water supply reliability while contributing to increased survival of anadromous fish. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 120,000 acre-feet and 60,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP2 would help reduce future water shortages through increasing drought year and average year water supply reliability for agricultural and M&I deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River.

Impact WASR-1 (CP2): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Impact WASR-1 (CP2) would be similar to Impact WASR-1 but would affect 1,270 feet more of Segment 4 than CP1.

Implementation of CP2 would reduce the total length of the McCloud River that is eligible for wild and scenic river designation by about 2,740 feet (approximately 2.3 percent of the total length of the lower river). The rest of the lower McCloud River would remain eligible for listing.

Under CP2, approximately 2,740 feet, or 21 percent, of Segment 4 would be periodically inundated. The transition reach would increase to a maximum elevation of 1,084 feet msl, which would extend it by about 2,740 feet (a 30 percent increase over the current transition reach), inundating a larger portion of the lower McCloud River within the study area and Segment 4. The inundated area would increase to approximately 51 total acres (an increase of 18 acres over existing conditions and 9 acres more than CP1 conditions), with a maximum width of approximately 530 feet (an increase of 60 feet over existing conditions) and a total length of approximately 11,740 linear feet (2.22 miles). The extension of the transition reach by approximately 2,740 feet would affect approximately 21 percent of Segment 4. Additional impacts under CP2 compared with CP1 would be minimal and would be limited to the additional 440-foot extension of the transition reach and about 15 additional feet on both sides of the river.

During a wet year, the maximum average water surface elevation of Shasta Lake would be 1,080 feet msl, with a peak elevation of 1,084 feet msl during May. This is an increase of 15 feet above the existing maximum average. During an average water year, the maximum average water surface elevation would increase to 1,051 feet msl, an increase of 11 feet above existing conditions. During dry and critical water years, the change would be on the order of 5 to 9 feet in elevation.

The increased gross pool of Shasta Lake would expand the current transition reach up to the 1,084-foot elevation, a 30 percent increase. Flow conditions and fisheries in the 2,740-foot reach of Segment 4 would periodically be affected, with the timing and duration of the effects similar to those in the current transition reach. Over time, the expansion of the bathtub ring would adversely affect water quality, geology, and visual quality/scenery. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans.

Free-Flowing Conditions As discussed under Impact WASR-1 (CP1), the flow characteristics of the extended transition reach under CP2 would be periodically modified, resulting in slower moving waters and a wider river channel. This modification would not meet the definition of a free-flowing river under the Federal WSRA. The width of the transition reach would be increased by approximately 30 feet on both sides of the river. Flow conditions and the river's free-flowing nature upstream from the expanded transition reach would remain similar to current conditions.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 2,740-foot reach of Segment 4 that would be affected by CP2 would become ineligible for listing under the Federal WSRA.

Water Quality Under CP2, increased turbidity and warmer water temperatures would be most noticeable along the expanded 2,740 feet of the transition reach and in the 30-foot corridor on either side of the transition reach because these areas have not been previously exposed to periodic inundations. As discussed under Impact WASR-1 (CP1), effects on water quality would be associated with the periodic increases in water levels of Shasta Lake.

Because water quality is a fundamental requirement for wild and scenic river eligibility, the 2,740-foot reach of Segment 4 that would be affected by CP2 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Impacts would be the same as discussed under Impact WASR-1 (CP1); however, a slightly larger portion of the three recorded sites and possible resources associated with the known Wintu villages would be inundated.

The cultural resources located along the 2,740-foot reach of Segment 4 that would be affected under CP2 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the affected 2,740-foot segment consists of pocket water and a lateral scour pool. The potential conversion of flatwater habitat to riffle habitat in the 2,740-foot segment would be similar to but greater than under WASR-1 (CP1), and overall impacts to aquatic habitat and fish would be similar to those discussed under Impact WASR-1 (CP1).

Geology Impacts would be the same as discussed under Impact WASR-1 (CP1); the geologic values of the lower McCloud River would not be adversely affected.

Visual Quality/Scenery Impacts would be the same as discussed under Impact WASR-1 (CP1). The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP2 would result in making approximately 2,740 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP2): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 2,740 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. There would be no impact, and no mitigation is required.

Impact WASR-3 (CP2): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-3 (CP1) but the magnitude of the impact would be greater under CP2 because of the longer transition reach. Under CP2, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 2.3 percent of the lower McCloud River. Under CP2, the reach affected by Shasta Lake water levels would be extended by about 2,740 feet, a 30 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. An impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the wild trout fishery, including public access and management opportunities in conjunction with fish habitat and populations, are small in the context of the entire lower McCloud River, this impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP2): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-4 (CP1) but the magnitude of the impact would be greater under CP2 because of the longer transition reach. Under CP2, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 2.3 percent of the lower McCloud River. Under CP2, the reach affected by Shasta Lake water levels would be extended by about 2,740 feet, a 30 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the lower McCloud River would not be adversely affected beyond the upstream extension of the transition reach. While the overall impacts to the free-flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (2.3 percent), the impacts would be significant. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted

by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

CP3, CP4, CP4A, and CP5 – 18.5-Foot Dam Raise, with Variations

CP3, CP4, CP4A, and CP5 would involve an 18.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 20.5 feet and enlarge the total storage space in the lake by 634,000 acre-feet. This increase would equate to an increase of about 2,500 acres of surface area when the lake is full. CP3 focuses on increasing agricultural water supply reliability and increasing anadromous fish survival CP4, CP4A, and CP5 increase water supply reliability and include enhancements in the upper Sacramento River for anadromous fish survival including gravel augmentation and the restoration of riparian, floodplain, and side channel habitat.

CP3 would increase the ability of Shasta Dam to make cold-water releases and regulate water temperatures for fish in the upper Sacramento River, primarily in dry and critical water years. CP3 would help reduce estimated future water shortages by increasing the reliability of dry and critical year water supplies for agricultural deliveries by at least 63,000 acre-feet per year and average annual deliveries by about 62,000 acre-feet per year. Under CP3, operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, with the additional storage retained for water supply reliability and to expand the cold-water pool for downstream anadromous fisheries.

CP4 would be used to improve the ability to meet temperature objectives and habitat requirements for anadromous fish during drought years and increase water supply reliability. Of the increased reservoir storage space under CP4, about 378,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4, operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as in CP1, with 70,000 acre-feet and 35,000 acre-feet reserved to specifically focus on increasing M&I deliveries during dry and critical years, respectively. CP4 includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River.

CP4A reserves a portion of the increased storage in Shasta Lake for maintaining cold-water volume or augmenting flows in the Sacramento River as part of an adaptive management plan for anadromous fish survival. Of the increased reservoir storage space under CP4A, about 191,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4A, operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as in CP2, with 120,000 acre-feet reserved in dry years and 60,000 acre-feet reserved in critical years for M&I deliveries. CP4A includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River. CP5 would help reduce future water shortages through increasing drought year

and average year water supply reliability for agricultural and M&I deliveries. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 150,000 acre-feet and 75,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP5 also includes constructing additional fish habitat in and along the shoreline of Shasta Lake and along the lower reaches of its tributaries; augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River; and increasing recreation opportunities at Shasta Lake.

Impacts associated with CP3, CP4, CP4A, and CP5 would be very similar to those described for CP1 and CP2, but the increased water levels of Shasta Lake would affect a longer reach of the lower McCloud River. Because of their similarities, and in an effort to reduce redundancy, only the differences between the plans are described below.

Impact WASR-1 (CP3, CP4, CP4A, and CP5): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Implementation of CP3, CP4, CP4A, and CP5 would reduce the total length of the McCloud River that is eligible for wild and scenic river designation by about 3,550 feet (less than 3 percent of the total length of the lower river). The rest of the lower McCloud River would remain eligible for listing.

Under CP3, CP4, CP4A, and CP5, the extent of the transition reach would increase to a maximum elevation of 1,090 feet msl, which would extend the current transition reach by about 3,550 feet (a 39 percent increase over the current transition reach), inundating a larger portion of the lower McCloud River within the study area and Segment 4. The inundated area would increase to approximately 60 total acres (an increase of 27 acres over existing conditions, and 9 acres more than CP2 conditions), with a maximum width of approximately 610 feet (an increase of 140 feet over existing conditions) and a total length of approximately 12,550 linear feet (2.38 miles). The extension of the transition reach by approximately 3,550 feet would affect approximately 26 percent of Segment 4. Additional impacts under CP3, CP4, CP4A, and CP5 compared with CP1 and CP2 would be minimal and would be limited to the additional 810-foot extension of the transition reach and about 20 additional feet on either side of the river.

During a wet year, the maximum average water surface elevation of Shasta Lake would be 1,086 feet msl, with a peak elevation of 1,090 feet msl during May. This is an increase of 21 feet above the existing maximum average. During an average water year, the maximum average water surface elevation would increase to 1,054 feet msl, an increase of 14 feet above existing conditions. During dry and critical water years, the change would be on the order of 6 to 13 feet in elevation.

The increased gross pool of Shasta Lake would expand the current transition reach by approximately 3,550 feet (810 feet beyond CP2's effects) up to the 1,090-foot elevation, resulting in a 39 percent increase in the transition reach. Within the expanded transition reach, flow conditions and fisheries would periodically be affected, with the timing and duration of the effects similar to those in the current transition reach. Over time, the expansion of the bathtub ring would affect water quality, geology, and visual quality/scenery. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans.

Free-Flowing Conditions As discussed under Impact WASR-1 (CP1), the flow characteristics of the extended transition reach under CP3, CP4, CP4A, and CP5 would be temporarily modified, resulting in slower moving waters and a wider river channel. This modification would not meet the definition of a free-flowing river under the Federal WSRA. The width of the transition reach would be increased by approximately 70 feet on either side of the river. Flow conditions and the river's free-flowing nature upstream from the expanded transition reach would remain similar to current conditions.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 3,550-foot reach of Segment 4 that would be affected by CP3, CP4, CP4A, and CP5 would become ineligible for listing under the Federal WSRA.

Water Quality Under CP3, CP4, CP4A, and CP5, increased turbidity and warmer water temperatures would be most noticeable along the expanded 3,550-foot reach of the transition reach and in the 70-foot corridor on either side of the transition reach because these areas have not been previously exposed to periodic inundations. Under these plans, the wider affected river corridor could result in greater temporary effects on water quality because more vegetation would be temporarily inundated and more soils would be exposed. As discussed under Impact WASR-1 (CP1), effects on water quality would be associated with the periodic increases in water levels of Shasta Lake.

Because water quality is a fundamental requirement for wild and scenic river eligibility, the 3,550-foot reach of Segment 4 that would be affected by CP3, CP4, CP4A, and CP5 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Impacts would be similar to those discussed under Impact WASR-1 (CP1). Under CP3, CP4, CP4A, and CP5, the

wider affected river corridor could result in greater effects on cultural resources because of the wider inundated area and increased erosion. Larger portions of the three recorded sites and known Wintu villages would become inundated.

The cultural resources located along the 3,550-foot reach of Segment 4 that would be affected under CP3, CP4, CP4A, and CP5 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the additional 810-foot segment under CP3, CP4, CP4A, and CP5 consists of a mid-channel pool and a lateral scour pool. The potential conversion of flatwater habitat to riffle habitat in the 3,550-foot reach of Segment 4 that would be affected under these plans would be similar to but greater than under WASR-1 (CP1), and overall impacts to aquatic habitat and fish would be similar to those discussed under Impact WASR-1 (CP1).

Geology Impacts would be the same as discussed under Impact WASR-1 (CP1), except additional rock outcrops could become inundated because of the wider affected corridor.

Visual Quality/Scenery Impacts would be similar to those discussed under Impact WASR-1 (CP1). Under these plans, the wider affected river corridor could result in greater effects on the visual setting because of the wider inundated area and increased impacts on vegetation. The water line would also be visible at a higher elevation and could be more noticeable. The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP3, CP4, CP4A, and CP5 would result in making approximately 3,550 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP3, CP4, CP4A, and CP5): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 3,550 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. There would be no impact, and no mitigation is required.

Impact WASR-3 (CP3, CP4, CP4A, and CP5): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-3 (CP1), but the magnitude of the impact would be greater under CP3, CP4, CP4A, and CP5 because of the longer transition reach. Under CP3, CP4, CP4A, and CP5, the proposed modifications to Shasta Dam and Shasta Lake would result in

temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 3 percent of the lower McCloud River. Under CP3, CP4, CP4A, and CP5, the reach affected by Shasta Lake water levels would be extended by about 3,550 feet, a 39 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the wild trout fishery including public access and management opportunities in conjunction with fish habitat and populations are small in the context of the entire lower McCloud River, this impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP3, CP4, CP4A, and CP5): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-4 (CP1), but the magnitude of the impact would be greater under CP3, CP4, CP4A, and CP5 because of the longer transition reach. Under CP3, CP4, CP4A, and CP5, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 3 percent of the lower McCloud River. Under CP3, CP4, CP4A, and CP5, the reach affected by Shasta Lake water levels would be extended by about 3,550 feet, a 39 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the river would not be adversely affected beyond the upstream extension of the transition reach. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the free flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (3 percent), the impacts would conflict with the State PRC. This impact would be significant. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

25.4.4 Mitigation Measures

Table 25-2 presents a summary of mitigation measures for wild and scenic rivers.

The mitigation measures described in the following section were developed partly in response to comments on the DEIS. While these measures are considered to be potentially feasible and effective in their ability to reduce impacts, this EIS acknowledges that there is uncertainty with respect to reducing impacts to less-than-significant levels.

Table 25-2. Summary of Mitigation Measures for Wild and Scenic Rivers

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact WASR-1: McCloud River's Eligibility for Listing as a Federal Wild and Scenic River	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	No feasible mitigation available to reduce impact at this point in the planning process.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact WASR-2: Conflict with Shasta-Trinity National Forest, Land and Resource Management Plan	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None required.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact WASR-3: Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Fishery Protection, Restoration and Improvement Program for the Lower McCloud River Watershed.				
	LOS after Mitigation	NI	PS	PS	PS	PS	PS
Impact WASR-4: Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure WASR-4 (CP1-CP5): Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU

Key:
CP = Comprehensive Plan
LOS = level of significance
NI = no impact
PS = potentially significant
S = significant
SU = significant and unavoidable

No-Action Alternative

Under the No-Action Alternative, no action would be taken, including implementation of mitigation measures; rather, existing conditions would continue to change in response to natural processes and human activities. No mitigation measures are required for the No-Action Alternative.

Mitigation Measure WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Wild Trout Fishery Protection, Restoration and Improvement Program Within the Lower McCloud River Watershed

The inundation of a portion of the lower McCloud River will affect the habitat available to wild trout and other aquatic organisms. The impacts are similar to, but more specific to the lower McCloud River watershed than those described under Impact Geo-2 in Chapter 4, "Geology, Geomorphology, Minerals and Soils"; Impact WQ-1 in Chapter 7, "Water Quality"; and Impacts Aqua-4 and Aqua-7 in Chapter 11, "Fisheries and Aquatic Ecosystems." This mitigation measure incorporates Mitigation Measures Geo-2, WQ-1, and Aqua-4.

This mitigation measure also includes the commitment to identify suitable sections of the lower McCloud River protected under the State PRC that may be available for acquisition from willing sellers for purposes of protecting, restoring and improving the wild trout fishery. This element of the mitigation measures is intended to be consistent with CDFW's wild trout policy as defined in the Strategic Plan for Trout Management, Appendix E, Section C (CDFG 2003), emphasizing designation and management of the wild trout fishery available to the public.

Watershed analysis and assessments prepared for the lower McCloud River watershed document that roads and modified fire regimes have increased sediment contributions to receiving waters, particularly in those watersheds that have been subjected to mining, forest management, and other types of large-scale developments and disturbances (CVWRCB 2011). Reclamation will apply this element of this mitigation measure to protect, restore, and improve the wild trout fishery in the lower McCloud River watershed.

The STNF, through the efforts of the interagency mitigation working group described in Chapter 2, "Action Alternatives," identified that acquisition of lands along the lower McCloud River is a priority and is consistent with the LRMP to meet a number of resource goals and objectives (e.g., cultural resources, recreation, biological resources). Under Impacts WASR-3 and WASR-4, the wild trout fishery and free-flowing conditions in the main stem lower McCloud River that would be affected in the protected reach would be at most 3,550 feet. This element of Mitigation Measure WASR-3 would include acquisition of private lands along the river corridor commensurate with the selected action alternative, if authorized, and available from a willing seller.

This mitigation measure requires that Reclamation work with the watershed stakeholders (e.g., CRMP members) to develop a basin plan that identifies deficient areas where riparian and watershed improvements can be made and work with landowners to improve those areas. Reclamation will commit to funding the planning effort, which will be completed within 10 years after construction has been initiated. This plan is intended to reduce the impacts of inundation on the wild trout fishery in the McCloud River and its tributaries. This program would be performed in conjunction with the efforts of the interagency work group described in Mitigation Measure Geo-2.

Although implementation of this mitigation measure will reduce the impacts associated with WASR-3, Reclamation acknowledges that the impact would remain potentially significant.

Mitigation Measure WASR-4 (CP1-CP5): Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed The inundation of a portion of the lower McCloud River will impede the free-flowing nature of as much as 3,550 feet of the river, thereby affecting the hydrologic and hydraulic

characteristics of the affected reach. These impacts are similar to other inundated tributaries, but more specific to the lower McCloud River. These impacts are described in Chapter 4, "Geology, Geomorphology, Minerals and Soils" (Impact Geo-2); Chapter 7, "Water Quality" (Impact WQ-1); and Chapter 11, "Fisheries and Aquatic Ecosystems" (Impacts Aqua-4 and Aqua-7). This mitigation measure incorporates Mitigation Measures Geo-2, WQ-1, and Aqua-4, specifically in the context of increasing the overall hydrologic function of the lower McCloud River watershed in a variety of ways. Examples of the measures that may be implemented include the following:

- Silviculture treatments that improve fuel conditions, reduce runoff from high intensity fires and enhance the functions and values of wetlands and riparian areas

- Road decommissioning and drainage improvement projects that reduce concentrated road-related runoff and reestablish flows to tributaries to the lower McCloud River

- Restoration/improvement of in-channel habitat to enhance potential for sustained flows from tributaries

This measure also includes the mitigation measures described in Chapter 12, "Botanical Resources and Wetlands," intended to support land acquisition and wetland mitigation. Five mitigation measures would be applicable to WASR-4: Bot-2, Bot-3, Bot-4, Bot-5 and Bot-7. Land acquisition and wetland mitigation measures are intended to offer a certain level of protection from future development (e.g., diversions) as well as opportunities to improve the hydrologic function at multiple scales that could provide an overall benefit to the free-flowing conditions of the lower McCloud River.

Although implementation of this mitigation measure will reduce the impacts associated with WASR-4, Reclamation acknowledges that the impact would remain significant and unavoidable.

25.4.5 Topics Eliminated from Further Consideration

No topics related to the eligibility of the McCloud River for listing under the Federal WSRA, the compatibility of the alternatives with the STNF LRMP or the CRMP, or their compatibility with the PRC providing protection to the McCloud River were eliminated from further consideration.

25.4.6 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the

projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 under Quantitative Analysis would have impacts on the McCloud River in the primary study area and the SLWRI would not have adverse impacts in the extended study area; therefore, the following analysis is based on programs and projects listed in Table 3-1 under Qualitative Analysis that would have potential effects in the primary study area as explained below.

Significant effects were identified related to the compatibility of the project with the PRC, Section 5093.542. The potential effects would be of greater magnitude and duration with the larger dam raises (i.e., CP3 through CP5 would have greater potential effects than CP1 and CP2). These impacts may also be associated with two reasonably foreseeable future actions that could affect the McCloud River: the relicensing of PG&E's McCloud-Pit Project and the pilot project to reintroduce anadromous salmonid populations upstream from Shasta Dam. FERC has issued the Final EIS for the relicensing of the McCloud-Pit Project. However, the relicensing process for the McCloud-Pit Project is ongoing, and the conditions that may be required under a new FERC license are uncertain. The potential effects of the relicensing on the lower McCloud River are therefore unknown.

In 2012, the Bagley Fire and subsequent winter flood events resulted in significant changes to vegetation conditions, erosional processes, and water quality in the lower McCloud River watershed. The impacts of this combination of natural disturbances are ongoing and there is considerable uncertainty on how they are affecting the physical processes and biological resources of the lower McCloud River watershed. Subsequent management activities (e.g., road reconstruction, silviculture) are ongoing throughout the Bagley Fire area.

The 2009 NMFS Biological Opinion described in Chapter 3 requires Reclamation to implement a pilot project that would provide passage for anadromous salmonids upstream from Shasta Dam. This project is listed in Table 3-1 as the Fish Passage Program at Shasta. This project could reintroduce anadromous salmonids to the lower McCloud River. At this point in the planning process, the details of this project are ill-defined and the potential for success is uncertain. Therefore, the potential effects of this future action on the lower McCloud River are unknown. Given the information available on these future actions, the potential for project-related impacts to be cumulatively considerable would be less than significant and could, in fact, result in benefits to some of the values and resources of the lower McCloud River.

Chapter 26
Other Required Disclosures

26.1 Significant Adverse Effects that Cannot be Avoided If a Project is Implemented

Section 21100(b)(2)(A) of CEQA requires an EIR to include a detailed statement setting forth "any significant effect on the environment that cannot be avoided if the project is implemented." Chapters 4 through 25 of this EIS analyze in detail all of the project's potentially significant environmental impacts, including cumulative impacts; list feasible mitigation measures that could avoid, minimize, rectify, reduce or eliminate, or compensate for the project's significant impacts; and specify whether these mitigation measures would reduce the impacts to a less-than-significant level. If no feasible mitigation measure is available to reduce a significant impact to a less-than-significant level, then the impact would be a significant and unavoidable impact.

After consideration of actions, operations, and features to avoid, mitigate, and/or compensate for adverse effects, the action alternatives would likely result in the following significant and unavoidable direct and indirect impacts:

- **Geology, Geomorphology, Minerals, and Soils** – Loss or diminished availability of known mineral resources that would be of future value to the region; lost or diminished soil biomass productivity; and substantial soil erosion or loss of topsoil due to shoreline processes (all action alternatives).

- **Air Quality and Climate** – Short-term emissions of criteria air pollutants and precursors at Shasta Lake and vicinity during project construction (all action alternatives).

- **Agriculture and Important Farmland** – Direct and indirect conversion of forest land to nonforest uses in the vicinity of Shasta Lake (all action alternatives).

- **Botanical Resources and Wetlands** – Loss of Multi-Species Conservation Strategy (MSCS) covered species; loss of USFS sensitive, U.S. Department of the Interior, Bureau of Land Management (BLM) sensitive, or California Rare Plant Rank (CRPR) species; loss of jurisdictional waters; and loss of general vegetation habitats (all action alternatives).

- **Wildlife Resources** – Take and loss of habitats for the Shasta salamander, bald eagle, northern spotted owl, and Pacific fisher; impact on the foothill yellow-legged frog, tailed frog, northwestern pond turtle, purple martin, special-status bats, American marten, ringtail, terrestrial mollusks, and their habitat; impact on willow flycatcher, Vaux's swift, yellow warbler, yellow-breasted chat, long-eared owl, northern goshawk, Cooper's hawk, great blue heron, and osprey, and their foraging and nesting habitat; permanent loss of general wildlife habitat; take and loss of foraging and nesting habitat for other birds of prey and migratory bird species; and loss of critical deer winter and fawning range (all action alternatives).

- **Cultural Resources** – Inundation of Traditional Cultural Properties (all action alternatives).

- **Land Use and Planning** – Conflict with existing land use goals and policies of affected jurisdictions (Shasta Lake and vicinity and upper Sacramento River), and disruption of existing land uses (Shasta Lake and vicinity and upper Sacramento River) (all action alternatives).

- **Aesthetics and Visual Resources** – Inconsistency with guidelines for visual resources in the STNF LRMP, degradation and/or obstruction of a scenic view from key observation points, and generation of increased daytime glare and/or nighttime lighting (all action alternatives).

- **Wild and Scenic River Considerations for McCloud River** – Effect on McCloud River's eligibility for listing as a Federal Wild and Scenic River and effects to McCloud River resources identified in the California Public Resources Code, Section 5093.542 (all action alternatives).

The action alternatives could also result in the following significant and unavoidable cumulative impacts (i.e., an impact would make a considerable contribution to a significant cumulative effect):

- **Geology, Geomorphology, Minerals, and Soils** – Cumulative effects from use of soil and mineral resources, leading to diminished regional availability of cement, concrete sand, and aggregate and loss of soil productivity (all action alternatives).

- **Air Quality and Climate** – Cumulative effects from emissions of nitrogen oxide during project construction (all action alternatives).

- **Hydrology, Hydraulics, and Water Management** – Cumulative effects on south Delta water levels, X2 position, and Delta outflow (all action alternatives).

- **Botanical Resources and Wetlands** – Cumulative effects from inundation at Shasta Lake, leading to take and loss of habitat for special-status species at Shasta Lake and vicinity; cumulative effects from increased water delivery in the service areas and growth-related loss of sensitive plant communities and special-status plant species (all action alternatives).

- **Wildlife Resources** – Cumulative effects from inundation at Shasta Lake, leading to take and loss of habitat for numerous special-status species at Shasta Lake and vicinity (all action alternatives).

- **Cultural Resources** – Inundation of Traditional Cultural Properties (all action alternatives).

- **Aesthetics and Visual Resources** – Changes to aesthetic values and resources at Shasta Lake (all action alternatives).

- **Power and Energy Resources** – Changes to SWP and CVP power production and consumption (CP1).

- **Environmental Justice** – Cumulative effects from disproportionate placement of environmental impacts on Native American populations, leading to disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance in the vicinity of Shasta Lake (all action alternatives).

Feasible mitigation will be implemented to reduce these impacts but would not be sufficient to reduce these impacts to a less-than-significant level.

26.2 Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 Code of Federal Regulations (CFR) Section 1502.16 [40 CFR Section 1502.16]). This involves using all practicable means and measures, including financial and technical assistance, in a manner calculated to: foster and promote the general welfare; to create and maintain conditions under which man and nature can exist in productive harmony; and fulfill the social, economic, and other requirements of present and future generations of Americans.

All action alternatives analyzed in this EIS would involve new construction, such as raising Shasta Dam, replacing bridges, and relocating/reconstructing recreational facilities and access roads adversely affected by higher reservoir

levels. Specific activities would modify the Pit River Bridge, modify/replace six other bridges, relocate various recreation facilities, utilities and related infrastructure, and inundate numerous small segments of existing paved and unpaved roads. All of the action alternatives would result in indirect and induced employment, which may support hiring in businesses that would provide materials to the construction effort; in service-related industries that would provide food, beverages, and other goods to construction workers; or in more technical industries, such as consulting firms and other businesses (see Chapter 16, "Socioeconomics, Population, and Housing"). Sales and profits for businesses that support the construction industry in the primary study area would increase over the 4.5- to 5-year construction period.

Potential habitat- and recreation-related losses caused by enlarging the dam and reservoir would irreversibly affect habitats and developments near the dam inundation area. Impacts on habitat areas within the dam inundation area would be mitigated by preservation of similar habitats elsewhere. Construction activities would include short-term uses of capital, labor, fuels, and construction materials; habitats; and recreation areas. General commitments of construction materials are largely irreversible because most construction materials are unsalvageable.

Potential benefits of the action alternatives include an increase in water supply reliability and a reduction in the probability of experiencing a potential flood-related loss of resources, property, and human life. Environmental uses and habitat for a variety of aquatic and terrestrial species along the Sacramento River and waterways within the primary and extended study areas would be maintained and potentially enhanced with the proposed mitigation. No adverse effects would pose a long-term risk to health and safety.

26.3 Irreversible and Irretrievable Commitments of Resources

The State CEQA Guidelines require a discussion of the significant irreversible environmental changes that would be caused by implementation of the proposed project. In addition, an EIS prepared under NEPA must analyze irreversible and irretrievable commitments of resources, such as soils, wetlands, waterfowl habitat, and cultural resources (40 CFR1502.16).

The irreversible and irretrievable commitment of resources is the permanent loss of resources for future or alternative purposes. Irreversible and irretrievable resources are those that cannot be recovered or recycled, or those that are consumed or reduced to unrecoverable forms. The action alternatives would result in the irreversible and irretrievable commitment of the following energy and material resources during project construction and maintenance:

- Construction materials, including resources such as soil and rocks

- Land area committed to new/expanded project facilities and water inundation areas

- Energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for project construction, operations, and maintenance

Nonrenewable resources are expected to account for a minimal portion of the region's resources; the project's use of nonrenewable resources would not affect the availability of these resources for other needs within the region. Construction activities would not result in inefficient use of energy or natural resources. The selected construction contractors would use best available engineering techniques, construction and design practices, and equipment-operating procedures. Furthermore, mitigation would be provided to offset any loss of habitat areas and other land uses within the proposed dam inundation areas. Long-term project operation would not result in substantial long-term consumption of energy and natural resources, and increased energy production would result from the additional storage capacity at Shasta Lake.

26.4 Growth-Inducing Impacts

CEQA requires that an EIR discuss how a project may induce growth. NEPA requires that an EIS consider indirect effects of a project, which are often the result of growth inducement. A project is considered potentially growth inducing if it is reasonably foreseeable that the project may foster economic or population growth or may result in the construction of additional housing (California Code of Regulations Section 15126.2(d)[CCR 15126.2(d)]). The increase in water supply reliability that would result from the construction of any of the proposed action alternatives would be potentially growth inducing because it would foster economic growth and potentially remove an obstacle to development.

The purpose of this section is to disclose how the action alternatives that are analyzed in this EIS could be growth inducing and to describe how the potential resulting environmental effects would be addressed. In *Napa Citizens for Honest Government v. Napa County Board of Supervisors* (2001) 91 Cal.App.4th 342, 367–371 [110 Cal.Rptr.2d 579], the California Court of Appeal, Fourth District, provided clear direction on the standards for disclosure of growth-inducing effects in an EIR that also is relevant to an EIS. The lead agency also may consider mitigation measures for the anticipated effects. Growth-inducing impacts are evaluated for the project alternatives in accordance with the California Court of Appeal finding in *Napa Citizens for Honest Government v. Napa County Board of Supervisors* (2001):

> *Neither CEQA itself, nor the cases that have interpreted it, require an EIR to anticipate and mitigate the effects of a*

> *particular project on growth on other areas. In circumstances such as these, it is sufficient that the final EIR (FEIR) warns interested persons and governing bodies of the probability that additional housing will be needed so that they can take steps to prepare for or address that probability. The FEIR need not forecast the impact that the housing will have on as yet unidentified areas and propose measures to mitigate that impact. That process is best reserved until such time as a particular housing project is proposed.*

The increase in water supply reliability resulting from the action alternatives would make additional water resources available for municipal, industrial, and agricultural uses in the CVP and SWP service areas. The additional water resources could be used for actions that sustain and support growth.

Growth-inducing effects resulting from the increase in water supply reliability that were caused by the action alternatives would be indirect. However, Reclamation's ability to forecast the extent and location of these effects throughout its extensive service area is extremely limited. More than likely, the effects would be spread throughout the CVP and SWP service areas, would change annually, and would depend on how the additional water supply stored in Shasta Lake is ultimately used. Because the potential indirect, growth-inducing effects are speculative, amorphous, and not site specific, no feasible mitigation measures are available or proposed. No mitigation measure could be feasibly applied across the entire CVP and SWP service areas. Direct impacts on traffic and air quality and changes to the jobs/housing balance would be evaluated and mitigated by the local land use agency during general plan updates and project-specific application review. The following potential effects of an increase in water supply reliability are discussed:

- Existing fallow agricultural land and rangeland may be converted to irrigated row crops or irrigated orchard. This land use change could increase effects of local economic growth on farmers and could result in more local employment opportunities.

- If water supply is an obstacle to expansion of industrial facilities, this obstacle may be removed. Increased industrial capacity could result in economic growth and provide more local employment opportunities.

- If water supply is an obstacle to residential development, this obstacle may be removed, and local land use authorities may be encouraged to approve residential development projects on currently zoned agricultural land:

  - Residential development would result in the construction of houses.

- Residential development may cause economic growth through the collection of development fees.

The project analysis covers the primary study area and an extended study area. The primary study area encompasses Shasta Dam and Shasta Lake; inflowing rivers and streams including the Sacramento River, McCloud River, Pit River, and Squaw Creek; and the Sacramento River downstream to about the Red Bluff Pumping Plant. Because of the potential influence of Shasta Dam modification on natural resources along the Sacramento River as well as on other programs and projects in the Central Valley, the project also evaluates an extended study area that includes the Sacramento River basin downstream from the Red Bluff Pumping Plant, the American River basin, the Delta, the San Joaquin River basin, and the CVP and SWP service areas.

The extended study area includes CVP and SWP reservoirs and the portions of tributaries that are downstream from these reservoirs and affect the Sacramento River, San Joaquin River, Trinity River, and Delta flows. These reservoirs and tributaries include Lake Oroville, Folsom Lake, Millerton Lake, San Luis Reservoir, New Melones Reservoir, and Trinity Lake, and portions of the Trinity, Feather, American, and Stanislaus rivers. The CVP and SWP service areas include much of the Sacramento and San Joaquin valleys, and substantial portions of the Bay Area and Southern California.

The following sections describe mechanisms that could be growth inducing and analyze potential growth-inducing effects of the action alternatives.

26.4.1 Increased Construction Work

The action alternatives would create new construction jobs in the primary study area, but this temporary effect would not be growth inducing. Concrete workers, workers with large-scale construction experience, general laborers, and others would be drawn from the local construction industry. These jobs would represent a relatively small increase (i.e., less than 0.5 percent) in the total labor force in the two counties of the primary study area (Shasta and Tehama counties), but also would represent a substantial increase in employment for many of the cities surrounding the project, where employment has consistently been below the state average (EDD 2010, 2011). Therefore, jobs created by the action alternatives would be serviced by the local workforce and would not be growth inducing (see Chapter 16, “Socioeconomics, Population, and Housing”).

26.4.2 Increased Flood Risk Reduction

The action alternatives also are anticipated to provide some flood risk reduction benefits, but these benefits would not be growth inducing. The added reservoir capacity at Shasta Lake would give Reclamation greater flexibility in using the reservoir for flood management purposes, thereby increasing the threshold at which seasonal heavy-rain events produce flood conditions downstream from Shasta Dam. The benefits of this increase in reservoir capacity and related flood management options would be most evident along the upper Sacramento River

in the primary study area, and would decrease downstream where other major tributaries, such as the Feather and American Rivers, join the Sacramento River. Structures in and inhabitants of this floodplain experience the most direct effects from storage releases during flood events. The action alternatives would reduce the frequency, magnitude, and duration of some potential future flood events, like those that have affected structures and residents in this part of the primary study area in the past.

As a result of the added reservoir capacity, the overall risk of flooding and its related consequences below Shasta Dam is expected to be reduced. Although heavy-rain events would continue to occur in the region, and potentially increase as a result of global climate change, enlarging the dam is intended to provide greater flexibility in flood management in the lower Sacramento River and Delta area because of the increased capacity of the reservoir. As a result, less damage to existing structures in or near the lower Sacramento River and Delta floodplains would be expected over time although the probability of certain flood events of a substantial size would not be decreased from the increased reservoir capacity at Shasta Lake. Most importantly, the flood risk reduction benefits of the dam enlargement would not change the existing floodplain or Federal Emergency Management Agency flood zone designations, so the action alternatives would not remove an obstacle to development or even reduce any obstacles to development. Flood risk reduction benefits from any of the action alternatives, therefore, are not growth inducing.

26.4.3 Increased Water Supply Reliability

Implementing any of the action alternatives would improve water supply reliability in the primary and extended study areas. This improved water supply reliability would better accommodate existing water contracts by increasing the available water supply in some years. The environmental consequences of these contracts have been (and in the future will be) evaluated in separate environmental review processes. The improvement in water supply reliability would not change long-term contract amounts or deliveries within their existing historical ranges.

A variety of factors indirectly influence business, residential, and population growth in the region. Among these are city and county general plans and policies, and the availability of utility services, public schools, and transportation services. Water is one of the primary public services needed to support urban development, including businesses, industry (including agriculture), and housing; a deficiency in water service capacity could constrain future development.

Implementing any of the action alternatives also would increase water supplies for CVP/SWP deliveries, which would have the potential to be growth inducing. The expected increase in water deliveries relative to the CVP and SWP service areas would be small (i.e., less than 1 percent), and increased deliveries likely would be provided to a number of geographic areas within the CVP and SWP

service areas. Also, a substantial portion of this water would substitute for groundwater pumping, would allow for changes in agricultural irrigation practices, or would return idle cropland to production. For this reason, implementing any of the action alternatives would result in beneficial effects on agricultural resources, which would intrinsically benefit the economies in the affected localities. An increase in the reliability of water provided to agricultural areas would not necessarily lead to a direct increase in population because the water primarily would service existing agricultural lands and would not be expected to foster expansion into undeveloped natural communities. Substantial acreages of existing agricultural lands are idle because of reduced water reliability, and some of these existing acreages would receive water and be put back into agricultural production. However, the cumulative effect of a more reliable water source would be to increase agricultural effectiveness, a key economic sector in the region, which could indirectly result in growth-inducing impacts by bringing more money into the local economies.

The proposed action alternatives would increase water supply reliability for agricultural and/or municipal and industrial (M&I) uses. Agriculture is the most important segment of the economy below Shasta Dam and throughout California's Central Valley. Anticipated increases in agricultural water supply reliability are based on simulated CVP and SWP irrigation deliveries. The average annual increase in CVP and SWP irrigation deliveries under action alternatives would be up to 62,200 acre-feet per year. Anticipated increases in M&I water supply reliability are estimated based on simulated increases in CVP and SWP M&I deliveries. The average annual increase in CVP and SWP M&I deliveries under action alternatives would be up to 25,000 acre-feet per year.

Anticipated increases in total water supply reliability are based on the sum of simulated increases in agricultural and M&I water supply reliability. Average annual increases in total water supply reliability under action alternatives would be up to 75,900 acre-feet per year. Therefore, the action alternatives would result in increases in agricultural and/or M&I water supply reliability, which potentially would be a growth-inducing effect.

If residential development is constrained by water supply, then increased water supply reliability may remove an obstacle to residential development. Therefore, any of the action alternatives potentially would be growth inducing. Local land use authorities are required to demonstrate sufficient water supply reliability, pursuant to Senate Bill 610 (Chapter 643, Statutes of 2001), in addition to completion of a water supply evaluation required by CEQA. Water supply reliability may be demonstrated with surface water, water contracts, groundwater, and combinations thereof. Impacts on the physical environment would be evaluated and mitigated at a project level. The locations of potential residential development on existing agricultural or rangeland cannot be predicted, and because of the speculative and amorphous nature of potential growth-inducing impacts, no feasible mitigation for impacts of the action alternatives is available at this time.

Increased reliability of the water supply could reduce a limitation on growth throughout the primary and extended study areas; however, any project that could affect natural resources or otherwise accommodate growth in the study areas would have to comply with existing planning documents and would be subject to project-specific public environmental analysis and review. The effects of subsequent growth would be analyzed in general plan EIRs and in project-level CEQA compliance documents for the local jurisdictions in which the growth would occur. Mitigation of these potential effects would be the responsibility of these local jurisdictions, not Reclamation.

In summary, the expected increase in water deliveries relative to the entire CVP service area would be extremely small and could be provided to any number of geographic areas within the CVP service area (and in part would substitute for ongoing groundwater pumping). Water provided to agriculture would be used primarily if not exclusively to return idle cropland to production. Furthermore, it would be speculative to identify specific areas where growth could occur or the indirect effects on specific community service facilities in a particular service area. For these and other reasons specified above, the growth-inducing effects from the action alternatives are limited, minimal, and can be effectively mitigated through local jurisdictions as needed.

26.5 Environmentally Preferable Alternative/Environmentally Superior Alternative

CEQ Regulations require identification of an environmentally preferable alternative and the CEQA Guidelines require identification of an environmentally superior alternative. However, the CEQ Guidelines and CEQA Guidelines do not require adoption of the environmentally preferable/superior alternative as the preferred alternative for implementation. This Final EIS identifies a preferred alternative (see Chapter 32, “Final EIS,” Section, 32.4.1 “Preferred Alternative.” The selection of the preferred alternative is independent of the identification of the environmentally preferable/superior alternative, although the identification of both will be based on the information presented in this EIS.

Section 1505.2(b) of the CEQ Regulations requires the NEPA lead agency to identify the environmentally preferable alternative in a Record of Decision. The CEQ Regulations define the environmentally preferable alternative as “…the alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources.” Similar to the environmentally preferable alternative under NEPA, the CEQA Guidelines, Sections 15120 and 15126.6(e)(2), require identification of an environmentally superior alternative. If the environmentally superior alternative is the “no project” alternative, the CEQA Guidelines, Section

15126.6(e)(2), require identification of an environmentally superior alternative among the action alternatives.

Each action alternative generally has similar characteristics as all alternatives vary based on combinations of dam raise height, water management, and environmental restoration, and gravel augmentation. The primary distinguishing factors between action alternatives are related to dam raise height, water supply reliability, anadromous fish survival, and other project objectives. CP1, CP2, and CP3 primarily address water supply reliability and anadromous fish survival; however, each of these plans also would contribute to other project objectives. Furthermore, the likelihood that each of these three plans would meet its intended objectives is very high because the plans generally would not rely on any other actions. However, CP4 or CP4A would emphasize anadromous fish survival through an increase in the Shasta Lake storage dedicated to cold-water supply each year, Sacramento River environmental restoration, and gravel augmentation, and CP5 specifically addresses reservoir area environmental restoration and gravel augmentation. For Sacramento River and reservoir area environmental restoration, success would depend on the continued effectiveness of the environmental restoration facilities/features proposed as part of the SLWRI – enhanced lake area habitat, increased native vegetation, and new riparian rehabilitation areas – well past completion of construction.

Construction-related impacts would be similar for all of the action alternatives, and the significance determinations for each of the action alternatives generally are the same. Varying magnitudes of impacts generally would be related to the height of the dam raise because additional construction resources would be required for the larger raise and more land would be affected within the larger inundation area. All of the action alternatives would provide additional opportunities for flood risk reduction and increased anadromous fish survival; they also would provide greater water supply reliability during extremely dry years, which would benefit all water users. CP1 and CP2 would have less of an impact on land uses within the reservoir area than the other action alternatives because they would raise the dam by 6.5 feet and 12.5 feet, respectively, compared to the 18.5-foot increase proposed under CP3, CP4, CP4A, and CP5. However, water supply reliability and anadromous fish survival would be maximized with the larger raise.

Impacts associated with each alternative are summarized at the end of each resource chapter and in Table S-1 in the Summary.

This EIS provides a substantive portion of the environmental information necessary for Reclamation to determine the Environmentally Preferable Alternative. Accordingly, and consistent with NEPA requirements, the environmentally preferable alternative will be identified in the Record of Decision.

26.6 Least Environmentally Damaging Practicable Alternative

The SLWRI would require discharge of dredged or fill material into waters of the United States. Section 404 of the Federal Clean Water Act (CWA) authorizes USACE to issue permits for the discharge of dredged or fill material into waters of the United States, including wetlands (33 United States Code [USC] 1344). Guidelines promulgated by the U.S. Environmental Protection Agency and commonly known as the Section 404(b)(1) Guidelines (40 CFR 230 et seq.), regulatory guidelines of USACE (33 CFR 320 et seq.), and NEPA guidelines (40 CFR 1500 et seq.) are substantive environmental criteria used to evaluate permit applications submitted to USACE. An analysis of practicable alternatives is the primary screening mechanism used by USACE to determine the appropriateness of permitting a discharge. A key element of this approval is the requirement that USACE approve only the Least Environmentally Damaging Practicable Alternative (LEDPA), in accordance with guidance provided by Section 404(b)(1) of the CWA.

An alternative is considered practicable if it is available and capable of being implemented after considering cost, existing technology, and logistics in light of overall project purposes (40 CFR 230.3[q]). Practicable alternatives may include placing a project in an area not owned by the applicant that could be reasonably obtained by the project applicant to achieve the overall purpose of the project (40 CFR 230.10[a][2]).

The LEDPA would be determined on the basis of the entire environmental review and identified in the Record of Decision, consistent with Section 404(b)(1) of the Federal CWA, which requires that only the LEDPA may be approved and implemented by a Federal agency. This EIS provides a substantive portion of the environmental information necessary for USACE to determine the LEDPA consistent with Section 404(b)(1) guidelines.

26.7 Compliance with Applicable Laws, Policies, and Plans

For more detailed descriptions of the laws, policies, and plans listed below, see Section 3.4, “Regulatory Framework.”

26.7.1 Federal Requirements

National Environmental Policy Act

NEPA requires that an appropriate document be prepared to ensure that Federal agencies accomplish the Act’s purposes. The Council on Environmental Quality has adopted regulations and other guidance that provide detailed procedures for Federal agencies to follow in implementing NEPA. Once finalized, Reclamation would use the Final EIS to comply with Council on Environmental Quality regulations and document NEPA compliance.

Clean Water Act

Section 404 A Section 404(b)(1) alternatives information package will be prepared for the action alternatives and submitted to USACE and the U.S. Environmental Protection Agency. In addition, Reclamation will obtain a Section 404 permit before filling any waters of the United States. USACE will issue a Record of Decision that addresses pertinent consideration and implementation requirements. Section 404 also requires that the LEDPA be identified and implemented by an authorized Federal agency.

Section 401 Water quality certification requires evaluation of potential impacts in light of water quality standards and CWA Section 404 criteria governing discharge of dredged and fill materials into waters of the United States. The Federal government delegates water pollution control authority under Section 401 of the CWA to the states. Refer to the Porter-Cologne Water Quality Control Act discussion below.

Rivers and Harbors Act

In USACE's Sacramento District, navigable waters of the United States in the project area that are subject to the requirements of the Rivers and Harbors Act include the Sacramento River and all waterways in the Sacramento-San Joaquin drainage basin affected by tidal action. Sections of the River and Harbors Act applicable to the action alternatives are described below.

Section 9 All of the action alternatives include construction of dikes. A Section 9 approval would be required before construction of any dikes. Reclamation would obtain approval from the Chief of Engineers and the Secretary of the Army before construction of any dikes in navigable waters of the United States.

Section 10 A Section 10 permit would be required before any activity that would alter waters of the United States. To comply with the Rivers and Harbors Act, Reclamation would apply for a permit from USACE's Sacramento District before construction, and that application would be processed simultaneously with the CWA Section 404 permit application. This EIS evaluates the environmental effects that the action alternatives would have on waters of the United States, including navigable waters.

Section 13 The Central Valley Regional Water Quality Control Board has jurisdiction within the primary study area. The Federal government delegates water pollution control authority to states under Section 402 of the CWA. Refer to the Porter-Cologne Water Quality Control Act discussion below.

Federal Endangered Species Act

Reclamation has coordinated with USFWS and NMFS regarding potential project effects on Federally listed species. The potential effects of the SLWRI on endangered and threatened species are described in Chapter 11, "Fisheries and Aquatic Ecosystems"; Chapter 12, "Botanical Resources and Wetlands";

and Chapter 13, "Wildlife Resources." Reclamation will prepare the appropriate biological assessments to address potential impacts on Federally listed species and will consult with USFWS and NMFS regarding impacts of the proposed action.

Magnuson-Stevens Fishery Conservation and Management Act

Chapter 11, "Fisheries and Aquatic Ecosystems," discusses impacts on fisheries and fisheries habitat. Reclamation will coordinate with NMFS to ensure that recommended measures be put into the Preferred Plan that would minimize adverse modifications to Essential Fish Habitat. The specific implementation plan will analyze the significance of modifications to Essential Fish Habitat and will support the habitat assessments included for restoration-specific actions during Endangered Species Act, Section 7 consultations.

Fish and Wildlife Coordination Act

Compliance with the Fish and Wildlife Coordination Act (FWCA) involves assessing the impacts of the proposed action on preservation, conservation, and enhancement of fish and wildlife habitat and preparation of a FWCA Report. Reclamation will be required to include recommendations for preserving affected habitats, mitigating their loss, and enhancing such habitats, in its documentation of compliance. Documentation of compliance with the FWCA is a separate analysis of habitats of concern to USFWS, NMFS, and CDFW, and does not replace the analysis required by Section 7 of the Federal Endangered Species Act.

Migratory Bird Treaty Act

Chapter 13, "Wildlife Resources," evaluates potential impacts on migratory bird species and identifies mitigation measures to reduce impacts on birds, nests, and eggs. In addition, Reclamation will implement all feasible measures included in the FWCA Report discussed above. Reclamation will comply with the Migratory Bird Treaty Act by implementing mitigation measures described in the EIS and in the FWCA Report, before and during implementation of the proposed action.

Bald and Golden Eagle Protection Act

USFWS has proposed new permit regulations to authorize the take of bald and golden eagles under the Bald and Golden Eagle Protection Act, generally when the take to be authorized is associated with otherwise lawful activities (72 Federal Register 31141–31155, June 5, 2007). With delisting of the bald eagle in 2007, the Bald and Golden Eagle Protection Act is the primary law that protects bald eagles as well as golden eagles. As discussed in Chapter 13, "Wildlife Resources," suitable habitat is not present for golden eagle in the primary study area; however, each of the action alternatives would have a significant and unavoidable impact on the bald eagle. Therefore, Reclamation will consult with USFWS to implement the reasonable and prudent alternative and conservation measures to reduce impacts on the bald eagle.

Safe Drinking Water Act

Water used for domestic purposes must be treated in accordance with Federal and State standards by the local or regional water supply. Reclamation will be in compliance with the Safe Drinking Water Act because the action alternatives would not change existing license requirements or impede enforcement of primary drinking water standards.

Farmland Protection Policy Act

As a Federal agency preparing environmental compliance documents, Reclamation has included in its analysis a farmland assessment designed to minimize adverse impacts on Prime and Unique Farmlands and provide for mitigation as appropriate. Chapter 10, "Agriculture and Important Farmland," evaluates potential effects of the action alternatives on Important Farmland.

National Forest Management Act

As discussed in Chapter 1, "Introduction," USFS is a cooperating agency in this EIS. Under the National Forest Management Act, any decision emanating from a NEPA process must comply with the Land and Resource Management Plan (LRMP) to authorize an action on lands managed by Shasta-Trinity National Forest (STNF). Significant impacts on lands and resources managed by STNF are discussed in Chapter 4, "Geology, Geomorphology, Minerals, and Soils;" Chapter 12, "Botanical Resources and Wetlands;" Chapter 13, "Wildlife Resources;" Chapter 17, "Land Use and Planning;" Chapter 18, "Recreation and Public Access;" and Chapter 19, "Aesthetics and Visual Resources." These impacts may require nonsignificant, project-specific amendments to the LRMP.

The National Forest Management Act also requires that USFS maintain viable populations of existing native and desired nonnative species in the planning area. Reclamation will meet this requirement by preparing a biological evaluation and associated management indicator species assessment. Those documents will be used by USFS to make a finding that the actions disclosed in the record of decision, issued by Reclamation, will be consistent with the LRMP.

Federal Land Policy and Management Act

As described in Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," the Federal Land Policy Management Act directs USFS and BLM to manage public lands under the principles of multiple use and sustained yield. Under the Federal Land Policy and Management Act, the use and occupancy of public lands requires authorization by a land management agency, typically under the auspices of a special-use permit. As the principal land management agency for the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area, USFS and, to a lesser degree, BLM, will need to use the Final EIS to support issuance of authorizations to various parties, pursuant to the Federal Land Policy and Management Act.

Wild and Scenic Rivers Act

Section 7 of the Federal Wild and Scenic Rivers Act requires STNF to manage the outstandingly remarkable values of the McCloud River, consistent with the objectives, standards, and guidelines of its LRMP. The evaluation in the LRMP concluded that the lower McCloud River, from McCloud Dam downstream about 22 miles to the river's transition to Shasta Lake at about 1,070 feet mean sea level, provides outstanding cultural, fisheries, and geologic values, and its corridor has been classified as a highly sensitive visual area by USFS (USFS 1995). Based on the outstandingly remarkable values, STNF determined that the lower McCloud River meets the eligibility requirements for designation under the Federal Wild and Scenic Rivers Act. Chapter 25, "Wild and Scenic River Considerations for McCloud River," evaluates potential effects of the SLWRI on the McCloud River.

Federal Water Project Recreation Act

Compliance with the Federal Water Project Recreation Act is achieved by documenting the consideration of recreation opportunities in USACE reports and NEPA documents. Within this EIS, Reclamation has taken into consideration and addressed outdoor recreation and fish and wildlife enhancement in the primary and extended study areas.

National Historic Preservation Act

Under Section 106 of the National Historic Preservation Act, Federal agencies must consider effects to eligible resources ("historic properties") from the proposed undertaking, in consultation with the California State Historic Preservation Officer (SHPO) and other parties. This includes affording the Advisory Council a reasonable opportunity to comment on such undertakings. For this project, consultation between Reclamation, USFS, any other applicable Federal agencies, SHPO, and other consulting parties would include consideration of possible options for avoiding, minimizing, or mitigating adverse effects. If SHPO, Reclamation, USFS, other applicable Federal agencies, and the Council (if participating) agree to measures to resolve adverse effects to historic properties, these are formalized in a Memorandum of Agreement (MOA). Other consulting parties may be invited to sign the MOA. The Section 106 process (36 CFR Part 800.14) is completed once the terms of the MOA have been met. Alternatively, the Federal agencies may elect to enter into a programmatic agreement that would be developed as an alternative procedure to implement the Section 106 process (36 CFR Part 800.14). In rare cases, if consultation fails to result in agreement on resolving adverse effects, consultation may be terminated pursuant to the process detailed in 36 CFR Part 800.7.

Indian Trust Assets

When adverse impacts on Indian Trust Assets (ITA) cannot be avoided, appropriate mitigation or compensation will be provided. ITAs consist of lands that have been deeded to tribes or on which tribes have a historical legal claim. However, no such lands are within the primary study area. Thus, the SLWRI

would have no impact on ITAs. Because ITAs have been evaluated and the SLWRI would have no impact on these resources, the SLWRI would comply with ITAs.

Executive Order 11988 (Flood Hazard Policy)

As discussed in Chapter 6, "Hydrology, Hydraulics, and Water Management," all of the action alternatives would have an effect on floodplains in the primary study area. However, none of the action alternatives would increase flood flows, and feasible mitigation would be implemented to compensate for the impact of altered flow on riparian and wetland communities.

Executive Order 11990 (Protection of Wetlands)

As discussed in Chapter 12, "Botanical Resources and Wetlands," a wetland delineation will be prepared for the Preferred Plan and a USACE Section 404 permit will be obtained before construction. Reclamation will identify the location of sensitive habitats by conducting a wetland delineation, avoid and minimize impacts to the extent feasible, and compensate for any losses. However, implementation of any of the action alternatives would result in significant and unavoidable impacts on wetlands.

Executive Order 12898 (Environmental Justice Policy)

As discussed in Chapter 24, "Environmental Justice," the disturbance or loss of resources associated with locations considered by Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake. Therefore, the project would contribute to disproportionate placement of environmental impacts on Native American populations and would result in a cumulatively considerable incremental contribution to a significant and unavoidable cumulative impact. No feasible mitigation is available to reduce this high and adverse effect. Compliance with Executive Order 12898 occurs through the identification of this effect and acknowledgement of the lack of feasible mitigation measures available to reduce it.

Americans with Disabilities Act

The Americans with Disabilities Act of 1990 is a comprehensive law prohibiting discrimination against people with disabilities in employment practices, use of public transportation, use of telecommunication facilities, and use of public accommodations. Title II of the ADA applies to government facilities and requires that reasonable modifications must be made to services and programs so that they are readily accessible to and usable by people with disabilities. If any alternative proposed under the SLWRI is approved and authorized, Reclamation would make every reasonable effort to make any new construction or improvement fully compliant with ADA requirements. If it is found to be infeasible to make a new construction or improvement element fully ADA compliant, Reclamation would obtain any required waivers or modifications to the ADA standards.

Executive Order 13007 (Indian Sacred Sites) and Memorandum of April 29, 1994

EO 13007 defines a sacred site as "any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site."

Potential impacts of the action alternatives on Native American sacred sites are addressed in Chapter 14, "Cultural Resources." Reclamation will continue to coordinate with federally recognized tribes to address potential impacts on sacred sites.

Executive Order 13112 (National Invasive Species Management Plan)

A weed management plan is within the scope of the action alternatives and would include methods for managing the spread of invasive plant species. Because the details of the weed management plan have not been finalized at the time of this writing, this EIS identifies preparation and implementation of a weed management plan as a mitigation measure. Developing and implementing the weed management plan as a mitigation measure demonstrates compliance with Executive Order 13112. Reclamation will demonstrate continued compliance with this executive order by implementing the methods described in the weed management plan.

Federal Clean Air Act

As discussed in Chapter 5, "Air Quality and Climate," the SLWRI would not result in long-term effects on air quality. Because the effects of the action alternatives on air quality have been evaluated and mitigated to the extent possible, any of the action alternatives would comply with the Federal Clean Air Act.

Federal Transit Administration

This EIS evaluates potential groundborne-vibration impacts on sensitive receptors, including the maximum sensitivity of 65 vibration decibels for hospitals, high-technology manufacturing, and laboratory facilities. Some construction activities associated with the action alternatives could result in groundborne vibrations exceeding 65 vibration decibels. However, sensitive receptors would need to be within 250 feet of the activities to be affected, and no sensitive receptors would be within this distance. Reclamation has demonstrated consistency with this policy by evaluating the construction activities that would generate the maximum possible groundborne vibration at the highest sensitive uses.

Federal Energy Regulatory Commission

Changes to hydroelectric facilities on the Pit River, including instream flow releases or modifications to downstream structures, may necessitate a license amendment from the Federal Energy Regulatory Commission. Reclamation will support Pacific Gas and Electric Company in any application to the Federal Energy Regulatory Commission for necessary license amendments before implementing any action alternatives that would affect Pit River flows.

U.S. Coast Guard

The SLWRI has the potential to affect several bridges over inflows to Shasta Lake. Reclamation will coordinate with the U.S. Coast Guard in respect to these potential impacts.

26.7.2 State Requirements

The section below describes potential State or local agency requirements under CEQA if the preferred alternative or action alternatives is authorized and approved. It is possible that some state or local agencies will be unable to process and issue permits and approvals identified below.

California Environmental Quality Act

This document has been prepared in consideration of CEQA requirements. This EIS may not be sufficient to serve as a DEIR for CEQA purposes and would require scrutiny by any State or local CEQA Lead Agency before release to the public as a DEIR. Section 15221 of the CEQA Guidelines states that when a NEPA document is ready before the CEQA document, the State Lead agency shall evaluate the NEPA document for CEQA compliance and augment the CEQA document with CEQA specific analysis, as necessary. The State Lead Agency, assuming one is identified in the future, would evaluate the legal sufficiency of all aspects of the document including range of alternatives, impact assessments, mitigation measures, and effects to State protected resources including state-listed endangered and threatened species.

California Endangered Species Act

Evaluations have been conducted for State-listed endangered and threatened species, and have determined that the proposed action would affect several State-listed species. Effects on those species are discussed in Chapter 11, “Fisheries and Aquatic Ecosystems;” Chapter 12, “Botanical Resources and Wetlands;” and Chapter 13, “Wildlife Resources.” Reclamation will prepare appropriate biological assessments to address potential impacts on Federally listed species. The CEQA lead agency will consult with CDFW regarding impacts of the proposed action on State-listed species.

California Fish and Game Code—Fully Protected Species

This EIS identifies potential actions that could result in take of fully protected species, and the CEQA lead agency will work closely with CDFW to evaluate methods to avoid impacts on fully protected species.

California Fish and Game Code Section 1602—Streambed Alteration

A CDFW streambed alteration agreement must be obtained for any project that would result in an impact on a river, stream, or lake. This EIS identifies potential actions within the proposed action that would require the alteration of stream features, subject to Section 1602 of the California Fish and Game Code. The CEQA lead agency will secure an approved streambed alteration agreement before performing any actions subject to Section 1602.

California Fish and Game Code Sections 5900–5904, 5930–5948, 7261, and 7370—Fish Passage

This EIS identifies actions that could affect fish passage, and Reclamation or the CEQA lead agency will work closely with CDFW to evaluate methods to avoid impacts on sturgeon, fish passage, and designated "Heritage Trout Waters." Potential impacts on fisheries are described in Chapter 11, "Fisheries and Aquatic Ecosystems."

California Native Plant Protection Act

All action alternatives are evaluated in this EIS for consistency with this Act. Mitigation measures are provided, as necessary, to minimize potential take of listed and special-status plants under the California Native Plant Protection Act.

California Native Plant Society California Rare Plant Ranking System

This EIS identifies plants of concern in the California Rare Plant Ranking System (formerly known as the California Native Plant Society species lists) that may be affected by the action alternatives, using the California Rare Plant Ranking System as a method of identifying species of concern. Mitigation and minimization measures will be implemented, as necessary, to reduce the significance of potential impacts on these species of concern.

Central Valley Flood Control Act of 2008

The action alternatives have been developed in a manner that is consistent with the Central Valley Flood Control Act, and the action alternatives would not inhibit development and implementation of the *Central Valley Flood Protection Plan*.

Central Valley Flood Protection Board Encroachment Permit

Certain action alternatives would require work along the Sacramento River in areas that may be subject to Title 23; the river is managed for flood control, and thus it contains features subject to Central Valley Flood Protection Board jurisdiction. The CEQA lead agency will secure encroachment permits, as needed, to satisfy Title 23 before performing any work along relevant reaches of the Sacramento River that contain flood control features subject to Central Valley Flood Protection Board jurisdiction.

Water Rights

The action alternatives do not include any actions that would require acquisition, use, or modification of water rights. Therefore, the action

alternatives would comply with all existing water rights in the primary and extended study areas.

California Public Resources Code

The Legislature has declared that the McCloud River, which is within the primary study area, possesses "extraordinary resources" in the context of Section 5093.542 of the California Public Resources Code, established through enactment of the Wild and Scenic Rivers Act, as amended (Sections 5093.50 through 5093.70). However, the Legislature's action stopped short of formally designating the river as wild and scenic. Chapter 25, "Wild and Scenic River Considerations for McCloud River," evaluates potential effects of the action alternatives on the McCloud River. New legislation may be required for State support and/or participation in any of the action alternatives.

The California Public Resources Code also contains several other sections relevant to the project. Compliance with provisions of the California Public Resources Code is achieved in this EIS by analyzing the impact of the action alternatives on recreation opportunities. Chapter 18, "Recreation and Public Access," discusses effects on Shasta Lake and the surrounding recreation areas under the action alternatives.

California Harbors and Navigation Code

Significant modifications to facilities on Shasta Lake may necessitate coordination with the California Department of Boating and Waterways and/or the U.S. Coast Guard. The CEQA lead agency and/or Reclamation will coordinate with them as necessary.

Porter-Cologne Water Quality Control Act

Action alternatives that have the potential to adversely affect water quality are identified in this EIS. Measures necessary for compliance with the Porter-Cologne Water Quality Control Act would need to achieve consistency with implementation programs under the water quality control plan for the Sacramento River basin, and with the Central Valley Regional Water Quality Control Board's waste discharge requirements. Other necessary actions likely would include application for and finalization of National Pollutant Discharge Elimination System permits and Section 401 water quality certifications.

California Land Conservation Act of 1965 (Williamson Act)

Approximately 51 percent of Shasta County's farmland is under Williamson Act contracts (Shasta County 2004). Williamson Act lands affected by the action alternatives are discussed in Chapter 10, "Agriculture and Important Farmland."

California Clean Air Act

This EIS evaluates the contribution of the action alternatives to any violation of air quality standards and identifies mitigation measures to help achieve

consistency with the State implementation plan's attainment goal before implementation of any of the alternative actions.

California Scenic Highway Program

On the south side of Shasta Lake, portions of State Route 151 are an officially designated State Scenic Highway. County Road A18 is an officially designated County Scenic Highway, and it also is located on the southern side of Shasta Lake. Portions of Interstate 5, as it approaches Shasta Lake and crosses the Pit River Bridge, are considered eligible for designation as a State Scenic Highway. Impacts on scenic highways are discussed in Chapter 19, "Aesthetics and Visual Resources."

State Lands Commission Land Use Lease

In the primary study area, the lands under the jurisdiction of the California State Lands Commission include areas along the Sacramento River, north of Red Bluff. Work on the Sacramento River would require a lease from the California State Lands Commission. The CEQA lead agency will coordinate with the California State Lands Commission and obtain a State Lands Commission Land Use Lease before starting work in areas under the Commission's jurisdiction.

California Surface Mining and Reclamation Act

In general, the California Surface Mining and Reclamation Act of 1975 (SMARA) requires that the lead agency approve a permit and a reclamation plan, and that an approved financial assurance be posted for the reclamation of the mined land. If borrow is required from borrow site(s), not previously permitted under SMARA, the CEQA lead agency will either obtain a SMARA permit or an exemption from SMARA for all borrow sites before beginning borrow activities.

State of California General Plan Guidelines

Chapter 8, "Noise and Vibration," evaluates long-term effects on noise levels in the primary and extended study areas. Long-term changes in noise levels associated with any of the alternative actions would be less than significant. All alternative actions would comply with the appropriate noise guidelines based on Reclamation's evaluation of long-term compatibility of the actions with noise levels.

California Department of Transportation

Highway improvements or modifications that may be necessary as part of this project may require an encroachment permit, issued through the California Department of Transportation (Caltrans). The project may involve modifications to roadways that Caltrans considers "complex," and Reclamation or the CEQA lead agency may need extensive communication with the Caltrans Department of Engineering Services and/or structure-specific encroachment permits. The requirements are detailed in the *Caltrans Encroachment Permits Manual*, which is available at the Caltrans Web site.

26.7.3 Local Plans and Policies

Shasta County Air Quality Management District's Authority to Construct and Permit to Operate

The CEQA lead agency would obtain an Authority to Construct permit before building or installing any new emissions unit or modifying any existing emissions unit that requires a permit, if necessary. The CEQA lead agency also would obtain a Permit to Operate after all construction is completed and the emission unit is ready for operation, if needed.

Other Local Permits and Requirements

Several other local permits and requirements may apply to the action alternatives. Shasta and Tehama counties and their public works departments will require compliance with local plans and ordinances, such as the county general plan, zoning ordinances, grading plan, and various use permits. Utility easements and various encroachments also may be required.

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Chapter 27
Public Involvement, Consultation, and Coordination

This chapter summarizes completed, ongoing, and anticipated public outreach and agency involvement efforts related to development of the SLWRI, including activities that satisfy NEPA requirements for public scoping and agency consultation and coordination. Efforts to engage the public, stakeholders, Federally recognized Native American Tribes, Native American groups, and public agencies are an important role in the SLWRI. These efforts are guided by the *Strategic Agency and Public Involvement Plan* (Reclamation 2003a), and include a broad range of activities designed to accomplish official and supplementary outreach goals. Chapter 28, "DEIS Distribution List," lists the entities receiving a copy of the DEIS. Reclamation encourages review of this DEIS and will continue to solicit public and agency input on the proposed action. For updated information on the Final EIS, please see Chapter 32, "Final EIS."

The *Strategic Agency and Public Involvement Plan* features four main objectives:

- **Stakeholder Identification** – Identifying and involving individuals, groups, and other entities that have an expressed or implied interest in the SLWRI.

- **Project Transparency** – Informing stakeholders and the public of study results in a timely, unbiased fashion through a variety of methods, including stakeholder and/or public meetings, Web postings, and mailings.

- **Issues and Concerns Resolution** – Gaining awareness of the issues and concerns of stakeholders and the public early in the process, and responding to these issues in an effective and timely manner.

- **Project Implementation** – Assisting policy-makers in understanding project purposes and benefits, and demonstrating that the project has met all necessary requirements to be implemented.

27.1 Public Involvement Through Project Scoping

Public scoping activities are conducted as part of compliance with both NEPA and CEQA, but are more formalized under NEPA. Scoping allows agencies, stakeholders, organizations, and other interested parties to identify resources to be evaluated, issues that may require environmental review, reasonable alternatives to consider, and potential mitigation if significant adverse effects are identified. The scoping process helps with early identification of problems to be studied, and also helps to eliminate from detailed study issues that are not critical to the decision at hand. Scoping also provides decision makers with insight on the issues and concerns that the public believes should be considered as part of the feasibility study. Public scoping activities performed for the SLWRI environmental documentation process are described below.

27.1.1 Notice of Intent to Propose an Environmental Impact Statement

Reclamation initiated the scoping process by publishing a notice of intent to prepare an EIS and a notice of public scoping meetings pursuant to NEPA on October 7, 2005, in the *Federal Register* (Volume 70, pages 58744–58746). The opportunity for submitting written comments on the notice of intent extended through December 6, 2005.

On the same day that the notice of intent and notice of meetings were published in the *Federal Register*, Reclamation announced the scoping meetings to be held in a news release posted on the project Web site and distributed via e-mail to media in the extended study area. The release was also distributed to agencies, stakeholders, organizations, and other interested parties. A second news release on October 20, 2005, announced an additional scoping meeting to be held in Red Bluff, and was published in display advertisements that Reclamation purchased in newspapers within the immediate study area in Redding, Red Bluff, and Dunsmuir.

27.1.2 Public Scoping Meetings

In 2005, seven public scoping meetings were conducted in an “open house” format throughout California to update the public on the status of the proposed action and to solicit and receive input on alternatives, project related concerns, and issues to be addressed in the environmental review process. Project team members from Reclamation and its consultants staffed informational workstations and interacted with meeting participants to provide information and answer questions. Attendance ranged from very light for meetings held in Concord, Fresno, and Los Angeles at 2, 2 and 4 people, respectively. Attendance was comparatively stronger in Dunsmuir, Redding, Red Bluff and Sacramento at 11, 39, 20 and 10 people, respectively. The proximity to the projects, and advertisements in three local newspapers, likely contributed to a stronger attendance in the northern cities.

The meetings were attended by private citizens, Federal and State agency personnel, local government representatives, political representatives, members

of the media, Native American Tribes, Native American groups, and business owners, and representatives of private industry, utilities, environmental interest groups, and nongovernmental organizations.

Displays of information were presented at each meeting on large-scale panels at a series of four workstations. Information included on these panels is summarized as follows.

Background

This workstation described Shasta Dam and Shasta Lake, authorization of the Federal feasibility study and other pertinent guidance, the CALFED Bay-Delta Program (CALFED) Programmatic Record of Decision (ROD) relating to enlarging Shasta Dam and Shasta Lake, and the primary and extended study areas.

Environmental Overview

This workstation summarized the major resource areas to be evaluated, defined the biological, socioeconomic, physical, and cultural environments, and identified potential impacts on those environments. The workstation also included information on the Federal environmental review process and Federal and State regulatory requirements and processes.

Study Process

This workstation presented information on water resources problems and needs being addressed in the SLWRI environmental documents. The primary and secondary study objectives were identified along with the overall study mission. The workstation also included information about the Federal plan formulation process, including the development of the SLWRI initial alternatives and the formulation of comprehensive alternatives.

Initial Alternatives

This workstation described the initial alternatives formulated, potential major features associated with potential enlargement of Shasta Dam and Shasta Lake that are likely to be considered in future studies, and potential environmental restoration features to be included in the alternatives.

The *Environmental Scoping Report* (Reclamation 2006) describes the scoping process, comments received during scoping, and how these comments would be addressed as part of the SLWRI and in support documentation (e.g., Feasibility Report and EIS).

27.2 PDEIS Outreach

Before releasing the DEIS, Reclamation released the Preliminary Draft Environmental Impact Statement and the Draft Feasibility Report. This February 2012 release was followed by an October 2012 Reclamation news

release requesting additional public comment on the Draft Feasibility Report for input on potential cost, benefits and impacts of enlarging Shasta Dam and Reservoir. In December 2012, Reclamation extended the comment period for review of the document from December 28, to January 28, 2013, to allow time for additional public comments on the Draft Feasibility Report.

27.3 Other Public Outreach

In addition to scoping activities, other public outreach activities have included the following:

- Release of major previous Reclamation studies and reports investigating potential enlargement of Shasta Dam and Reservoir included: *Enlarged Shasta Lake Investigation Preliminary Findings Report* (1983), *Shasta Dam and Reservoir Enlargement, Appraisal Assessment of the Potential for Enlarging Shasta Dam and Reservoir* (1999), *SLWRI Strategic Agency and Public Involvement Plan* (2003b), *SLWRI Mission Statement Milestone Report* (2003a), *SLWRI Initial Alternatives Information Report* (2004a), *SLWRI Environmental Scoping Report* (2006), and *SLWRI Plan Formulation Report* (2007). As described above, Reclamation also completed the Preliminary DEIS (2011a), Draft Feasibility Report (2011b), and supporting technical appendices for the SLWRI in November 2011. These documents were released to the public in February 2012, to share study findings and provide additional opportunities for public and stakeholder input.

- Release of two project information papers associated with milestone reports- the *Mission Statement Milestone Report* (Reclamation 2003b) and the *Initial Alternatives Information Report* (Reclamation 2004a) – in support of public outreach.

- Right-of-entry request letters to more than 450 property owners in support of field surveys and investigations including geological, archeological, biological and topographical surveys.

- Stakeholder workshops during development of the SLWRI (multiple years)

- Project briefings to Federal, state and local elected officials, water and hydropower interest groups, and environmental interest groups have been on-going since 2003.

- Project update meetings with property owners and/or business interests in the Shasta Lake area (multiple years)

- Presentations to the California Water Commission, Bay-Delta Public Advisory Committee, and related agency presentations (multiple years)
- Briefings to resource management groups and stakeholders (multiple years)
- Project Web site for the SLWRI (www.usbr.gov/mp/slwri/index.html)

Future meetings will focus primarily on public outreach related to the release of this DEIS.

27.4 Consultation and Coordination

Reclamation has consulted various public agencies and organizations during the public outreach process and throughout development of the SLWRI DEIS to obtain feedback on the investigation. Consultations have assisted Reclamation in determining the scope of the DEIS, developing project components and objectives, identifying the range of alternatives, and defining potential environmental impacts, impact significance, and mitigation measures.

27.4.1 Consultation and Coordination with Agencies

Reclamation conducts ongoing consultation and coordination efforts with agencies. The SLWRI study management structure includes the active participation of numerous cooperating agencies and other stakeholders on a Project Coordination Team (PCT) and Study Management Team and in Technical Working Groups. Cooperating agencies for the SLWRI, pursuant to NEPA, include USFS, Colusa Indian Community Council of the Cachil Dehe Band of Wintun Indians, USACE, and U.S. Department of the Interior, Bureau of Indian Affairs. Other participants in the PCT include USFWS; NMFS; U.S. Department of the Interior, Bureau of Land Management; and other Federal and State agencies. These groups were active contributors to the ongoing development and/or review of the alternative plans that are addressed herein and in supporting documentation.

The PCT is among the most effective means of communication between agencies, continuing to provide for regular participation by numerous cooperating agencies. Regularly scheduled bimonthly meetings have been held and continue to be held, for the purpose of project coordination and decision making, with invitations extended to all cooperating agencies and other CALFED Bay-Delta Program agencies and the Central Valley Regional Water Quality Control Board.

Key elements of these coordination activities are the *Planning Aid Memorandum* and *Coordination Act Report*, documents issued by USFWS. A draft *Planning Aid Memorandum* outlining areas of potential concern was circulated among the resource agencies in the first quarter of 2007.

Development of the *Coordination Act Report* began in summer 2007, with circulation of a draft in 2008. An updated draft of the *Coordination Act Report* was provided in October 2014.

27.4.2 Coordination with Native American Tribal Governments

Native American tribal governments are American Indian or Alaska Native tribal entities registered with the U.S. Department of the Interior, Bureau of Indian Affairs (BIA) as having a formal government-to-government relationship – inclusive of the responsibilities, powers, limitations, and obligations attached to that designation – with the United States. This Federal registration further recognizes the tribal governments' possession of certain inherent rights of self-government (i.e., tribal sovereignty) and carries with it entitlements to certain Federal benefits, services, and protections because of their special relationship with the United States.

Consistent with a memorandum from the President on April 29, 1994, Reclamation and the cooperating agencies will continue to actively engage Federally recognized tribal governments in planning and developing the investigation, and will consult with each tribe on a government-to-government basis before taking actions that could affect such tribal governments. Under Federal Trust responsibility, Reclamation will provide full disclosure (benefits and negative impacts) of the project, allow time for tribal review/consultation, and receive comments and/or suggestions for alternatives.

The PCT held several coordination meetings with Federally recognized tribes during 2007 and 2008. Tribes were invited to an informal meeting held on April 4, 2007, in Redding, California, to provide general information about the SLWRI and determine tribal participation interests. Additionally, from August 2007 to November 2008, members of the PCT held six separate meetings with four Federally recognized tribes whose traditional territories overlap with the SLWRI project area. The purposes of the meetings were to solicit, clarify, and document major concerns and issues regarding the SLWRI, and to establish a preferred method or approach for maintaining effective communication with each tribe during the remainder of the feasibility study and in future endeavors.

27.4.3 Coordination with Native American Groups

A Native American group is comprised of individuals who self-identify as Native American, but have not been conferred formal tribal sovereignty by the United States. Native American groups are consulted with as interested parties under NHPA Section 106. Under 36 CFR §800.4(3), agencies seek information from these parties, who are identified as likely having knowledge of, or concerns with, historic properties in the area, and may identify issues related to potential effects.

In accordance with Executive Order 12898, Native American groups and Federally-recognized tribes – are considered minority populations, and are encouraged as stakeholder groups to participate in the ongoing investigation.

Several Native American groups, such as the Winnemem Wintu and Shasta Nation, have expressed significant interest in the SLWRI. In response, the PCT conducted – in addition to the six Tribal Government Coordination meetings – four meetings with Native American groups in 2007 and 2008. This engagement began with an informal meeting with Native American groups on April 4, 2007, to distribute general information about the SLWRI and to identify their interests for project participation. As with Federally recognized tribes, meetings were held with Native American groups to solicit, clarify, and document major concerns and issues regarding the SLWRI, and to establish each group's preferred method or approach for receiving communications about the SLWRI during the remainder of the study.

27.5 Major Topics of Interest

The focus of interest varied among the outreach activities, but a common theme centered on potential impacts on the Shasta Lake area that could result from enlargement of the reservoir.

The public, stakeholders, and other Federal agencies, and State and local agencies identified several areas of concern during SLWRI meetings and workshops. Key topics included potential adverse effects on cultural resources in the Shasta Lake area; recreation and recreation providers in the Whiskeytown-Shasta-Trinity National Recreation Area; terrestrial special-status species around Shasta Lake, including State-designated fully protected species, aquatic special-status species in the Sacramento River and Delta (including delta smelt); the lower McCloud River and its special designation under California Public Resources Code 5093.542(c); Delta water quality; south Delta water levels; Central Valley hydrology below CVP and SWP facilities and resulting effects on water supplies for water contractors and other water users; and consistency with the CALFED Programmatic ROD. These topics are described in more detail in Chapter 1, "Introduction," Section 1.6, "Areas of Controversy."

27.6 DEIS Outreach

This DEIS was released on July 1, 2013, for public and agency review and comment for a 90 day period that ended September 30, 2013. The document's Notice of Availability (NOA) was posted by the U.S. Environmental Protection Agency in the July 1, 2013, *Federal Register*. During this public comment period, Reclamation held a public workshops in Los Banos, Redding and Sacramento to solicit, receive and respond to public input on the DEIS. Consistent with NEPA requirements, three public hearings were held before the close of the public comment period and held in the same communities. Before the conduct of each workshop and the public hearings, Reclamation issued a news release to its statewide media list and posted advertisements in

newspapers of record for each community, which were the Los Banos Enterprise, Redding Record-Searchlight and The Sacramento Bee.

The workshops were held July 16, 17, and 18, 2013, in Redding, Sacramento and Los Banos, respectively. The total number of people that signed in for the meetings was 150, 20 and 15 people, respectively. The public hearings were held September 11, 12 and 13, 2013, in Sacramento, Los Banos and Redding, respectively. The total number of people that signed in for the meetings was 9, 5 and 138, respectively. These meetings were formatted similar to public scoping with an open house preceding a formal public session. The open house portion of the July and September meetings included five project information stations staffed by project team members available to respond to attendee's questions. These workstations included Process, Schedule and Next Steps; Alternatives; Implementation Considerations; Biological Resources; and Cultural Resources.

Following each open house for the July public workshops, Reclamation staff led a brief presentation and responded to questions from attendees. Following each open house for the September public hearings, Reclamation staff provided a brief presentation before opening the formal public hearing consistent with NEPA. The public hearing was led by a hearing officer, with comments recorded verbatim by a stenographer.

Comments provided during the public hearing have been incorporated, as identified, to the Final EIS. Written comments from the public, reviewing agencies, and stakeholders received during the public comment period were also incorporated, as identified, to the Final EIS. Next steps in the environmental review process are described in Chapter 32, "Final EIS," Section 32.7, "Next Steps."

Chapter 28
DEIS Distribution List

This chapter provides locations where the DEIS was available for review and provides an overview the governmental entities, organizations, and interested parties that received copies of the DEIS. This list includes agencies and organizations that were involved in the scoping process for the proposed action, requested a copy of the DEIS, or that may use the DEIS for discretionary or informational purposes. For updated information on the Final EIS, please see Chapter 32, "Final EIS."

28.1 Document Availability

The public distribution of the DEIS emphasized the use of electronic media to ensure cost-effective, broad availability to the public and interested parties. This DEIS is available on the Internet at Reclamation's Web site, http://www.usbr.gov/mp/slwri/documents.html. The hard copies of the DEIS were made available for review at the following locations:

U.S. Department of the Interior, Bureau of Reclamation Library
2800 Cottage Way
Sacramento, California 95825

Bureau of Reclamation, Northern California Area Office
16349 Shasta Dam Boulevard
Shasta Lake, California 96019

U.S. Department of the Interior, Natural Resources Library
1849 C Street NW, Main Interior Building
Washington, D.C., 20240

Dunsmuir Branch Library
5714 Dunsmuir Avenue
Dunsmuir, California 96025

Shasta County Public Library,
Redding Library
1100 Parkview Avenue
Redding, California 96001

Kern County Library,
Holloway-Gonzales Branch
506 East Brundage Lane
Bakersfield, California 93307

Concord Library
2900 Salvio Street
Concord, California 94519

Los Banos Public Library
1312 South 7th Street
Los Banos, California 93635

Napa City-County Library
580 Coombs Street
Napa, California 94559

28.2 Agencies and Organizations Receiving Copies of the DEIS

All persons, agencies, and organizations listed in this chapter were informed of the availability of and locations to obtain the DEIS. Parties listed below have received an electronic or hard copy of the main body of the DEIS or the entire DEIS, including appendices.

28.2.1 Federal Agencies

- U.S. Army Corps of Engineers
- U.S. Department of Interior, Fish and Wildlife Service
- U.S. Department of Interior, Bureau of Indian Affairs
- U.S. Department of Interior, Bureau of Land Management
- U.S. Department of Agriculture, Forest Service
- U.S. Department of Commerce, National Marine Fisheries Service
- U.S. Environmental Protection Agency

28.2.2 State Agencies

- California Water Commission
- California Department of Boating and Waterways
- California Department of Conservation
- California Department of Education

- California Department of Fish and Wildlife
- California Department of Public Health
- California Department of Parks and Recreation
- California Department of Toxic Substances Control
- California Department of Transportation
- California Department of Water Resources
- California Department of Food and Agriculture
- California Department of Forestry and Fire Protection
- California Environmental Protection Agency
- California Highway Patrol
- California Air Resources Board
- California Central Valley Flood Protection Board
- Central Valley Regional Water Quality Control Board
- California Governor's Office of Planning and Research
- State Water Resources Control Board
- California Energy Commission
- Delta Protection Commission
- Delta Stewardship Council
- Native American Heritage Commission
- State Lands Commission
- Office of Historic Preservation

28.2.3 Regional and Local Entities

- Shasta County
- Tehama County
- Siskiyou County

- Trinity County
- Shasta County Air Quality Management District
- Tehama County Air Quality Management District
- City of Anderson
- City of Corning
- City of Dunsmuir
- City of Mount Shasta
- City of Redding
- City of Red Bluff
- City of Shasta Lake

28.2.4 Federally Recognized Tribes

- Grindstone Indian Rancheria
- Paskenta Band of Nomlaki Indians
- Pit River Environmental Council
- Pit River Tribe of California
- Redding Rancheria

28.2.5 Other Interested Parties

- More than 250 non-governmental organizations representing environmental, agricultural, business, tribal, and related interests
- More than 50 water districts, irrigation districts, other water purveyors, and related utilities
- More than 50 media outlets
- More than 180 private business interests
- More than 1,000 individuals, including reservoir area property owners

Chapter 29
List of EIS Preparers

Following is a list of persons who contributed to preparation of this EIS.

This list is consistent with the requirements set forth in NEPA and CEQA (40 CFR 1502.17 and Section 15129 of the State CEQA Guidelines).

29.1 Federal

Reclamation (NEPA Lead Agency)	
Katrina Chow	Project Manager
Ron Ganzfried	Senior Reviewer
Michael Tansey	Climate Change
Anastasia Leigh	Cultural Resources
Laureen Perry	Cultural Resources
Craig Stroh	Economics
Janice Pinero	Endangered Species Act
Bob Gee	Engineering
Tom Hepler	Engineering
Adam Toothman	Engineering
Carolyn Bragg	Environmental Resources
Michael Inthavong	Environmental Resources
Elizabeth Vasquez	Environmental Resources
John Hannon	Fisheries Biologist
Greg Mangano	Geology
Jared Vauk	Geology
David Hansen	GIS
Patricia Rivera	Indian Trust Assets
Kristin White	Modeling
Ann Stine	Natural Resources
Louis Moore	Public Affairs
Julie Bowen	Real Estate

Reclamation (NEPA Lead Agency) (contd.)	
Heidi Schuchbauer	Real Estate
Chuck Johnson	Recreation
Tom Fitzhugh	Water Operations
Russ Yaworsky	Water Operations
Scott Springer	Wild and Scenic River and Recreation

29.2 Non-Federal

29.2.1 Consultants

MWH		
Name	**Qualifications**	**Participation**
Mary Paasch, P.E., PMP	B.S., Agricultural Engineering; M.S., Agricultural Engineering; 18 years of experience.	Project Manager
Danelle Bertrand, P.E.	B.S., Civil Engineering; M.S., Civil Engineering; 7 years of experience.	Deputy Project Manager/Project Planning
Jeff Payne, P.E.	B.S., Civil Engineering; M.S., Water Resources Engineering; 15 years of experience.	Climate Change
Don Crone, P.E.	B.S., Civil Engineering; 39 years of experience.	Cost Estimating
James Loucks, P.E.	B.S., Construction Engineering; 33 years of experience.	Cost Estimating
Puja Mohandas	B.A., Architecture; M.A., Architecture; M.S., Civil Engineering; 10 years of experience.	Cost Estimating
Paul Smith	B.S., Civil Engineering; 47 years of experience.	Cost Estimating
Vincent Barbara	B.S., Agriculture Business; M.A., Economics; 6 years of experience.	Economics
Matthew Carpenter, P.E.	B.S., Civil Engineering; 15 years of experience.	Engineering
Robert Filgas, P.E.	B.S., Civil Engineering; 28 years of experience.	Engineering
Andrew Nishihara, P.E.	B.S., Bioengineering; 5 years of experience.	Engineering
Philip Salzman, P.E.	B.S. Civil Engineering; B.A. Biological Sciences; 18 years of experience.	Engineering

MWH (contd.)		
Name	**Qualifications**	**Participation**
Shankar Parvathinathan, P.E.	B.E., Chemical Engineering; M.S., Environmental Engineering; Ph.D., Environmental Engineering; 13 years of experience.	Engineering and Hydraulics
James Herbert, C.E.G, P.G.	B.S. Geological Sciences; 33 year of experience.	Engineering Geology and Geology
Ian Buck, P.E.	B.S., Civil Engineering; 4 years of experience.	Engineering, Recreation, Real Estate and Cost Estimating
Evan Perez, P.E.	B.S., Civil Engineering; M.S., Civil Engineering; 2 years of experience.	Engineering, Recreation, Real Estate and Cost Estimating
Eric Clyde, P.E.	B.S., Civil Engineering; M.S., Civil Engineering; 36 years of experience.	Engineering; Hydrology, Hydraulics, and Water Management.
Jill Chomycia, P.H.	B.S., Geological Sciences; M.S., Soil Sciences; M.S., Hydrology; 10 years of experience.	Environmental Planning
Stephanie Theis	B.S., Fisheries Ecology; Graduate Studies, Applied Ecology and Conservation Biology; 24 years of experience.	Fisheries and Aquatic Ecosystems
Craig Altare, P.G.	B.S., Geology; M.S., Hydrology; 10 years of experience.	Geology and Water Quality
Erica Bishop	B.S., Physical Geography; M.A., Water Resources; 10 years of experience.	Geology, Geomorphology, Minerals and Soils
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MWH (contd.)		
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Meredith Parkin, PMP	B.S, Human Nutrition and Food Science; J.D., Law; 14 years of experience.	NEPA/CEQA Specialist
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Rina Binder-Macleod	B.Eng., Environmental Engineering; M.Eng., Civil Engineering; 2 years of experience.	Planning and Document Coordination
Rajaa Hassan, P.E.	B.S., Civil Engineering; M.S., Civil and Environmental Engineering; 13 years of experience.	Power and Energy
Helen Iosfin, P.Eng.	M.Sc, Electrical Engineering; 32 years of experience.	Power and Energy
Kristin Goree	B.S., Government; 9 years of experience.	Public Involvement
Craig Moyle, PMP	B.A., Journalism; 21 years of experience.	Public Involvement
Dina Hunt, P.E.	B.S., Civil and Environmental Engineering; M.S., Civil and Environmental Engineering; 10 years of experience.	Seismic Hazards
William Smith, P.E.	B.S., Forest Engineering; 37 years of experience.	Water Quality, Water Management and Power and Energy
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North State Resources (NSR)		
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Heather Kelly	B.S., Biology; 17 years of experience.	Botanical Resources and Wetlands, Wildlife Resources
Len Lindstrand III	B.S., Wildlife Management; Minors in Fisheries Management and Forestry; 21 years of experience.	Botanical Resources and Wetlands, Wildlife Resources
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Mike Gorman	B.S., Fisheries; 10 years of experience.	Fisheries and Aquatic Ecosystems
Keith Marine	B.S., Wildlife and Fisheries Biology; M.S., Ecology; 29 years of experience.	Fisheries and Aquatic Ecosystems
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Tim Reilly	B.S., Soil Science; 37 years of experience.	Geology, Geomorphology, Minerals, and Soils
Duncan Drummond	B.S., Geology; 9 years of experience.	Geology, Geomorphology, Minerals, and Soils; Water Quality

North State Resources (NSR) (contd.)		
Name	**Qualifications**	**Participation**
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Name	**Qualifications**	**Participation**
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URS (Under subcontract to MWH)		
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Westwater Research		
(Under subcontract to MWH)		
Name	**Qualifications**	**Participation**
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Chapter 30
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NMFS. *See* National Marine Fisheries Service.

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