Draft

Wildlife Resources Technical Report

Shasta Lake Water Resources Investigation, California

Prepared by:

United States Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

U.S. Department of the Interior
Bureau of Reclamation

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Abbreviations and Acronyms

Bay-Delta	San Francisco Bay/Sacramento–San Joaquin River Delta
BLM	U.S. Department of the Interior, Bureau of Land Management
CALFED	CALFED Bay-Delta Program
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CVP	Central Valley Project
Delta	Sacramento–San Joaquin River Delta
DWR	California Department of Water Resources
ESA	(Federal) Endangered Species Act
FR	Federal Register
HEP	Habitat Evaluation Procedure
I-5	Interstate 5
LRMP	Land and Resource Management Plan
MBTA	Migratory Bird Treaty Act
MOU	memorandum of understanding
MSCS	Multi-Species Conservation Strategy
msl	mean sea level
NMFS	National Marine Fisheries Service
NRA	National Recreation Area
NSR	North State Resources
RBPP	Red Bluff Pumping Plant
RCD	resource conservation district
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RHJV	Riparian Habitat Joint Venture
RM	River Mile
ROD	record of decision
RWQCB	regional water quality control board
SB	Senate Bill
SLWRI	Shasta Lake Water Resources Investigation
SRCA	Sacramento River Conservation Area

SRNWR	Sacramento River National Wildlife Refuge
STNF	Shasta-Trinity National Forest
SWAG	Sacramento Watersheds Action Group
SWP	State Water Project
TNC	The Nature Conservancy
USC	U.S. Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Chapter 1
Affected Environment

This chapter describes the affected environment related to wildlife resources, including special-status species, for the dam and reservoir modifications under the Shasta Lake Water Resources Investigation (SLWRI).

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

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 and 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 1-1). 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. In the initial phase of the SLWRI, 11 streams and rivers were selected to represent the diverse characteristics of the rivers and streams that flow into Shasta Lake.

The U.S. Department of the Interior, Bureau of Reclamation (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 1-1).

To examine the physical and biological resources along riverine reaches 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 the U.S. Forest Service (USFS) as an initial sampling of streams representative of riverine and riparian habitats.

Areas subject to physical disturbance as an indirect result of the project (i.e., relocation sites for roadways, bridges, utilities, and campgrounds that would be inundated subsequent to the enlargement of Shasta Dam as well as dike locations) were incorporated into the Shasta Lake and vicinity portion of the primary study area. These locations are referred to as relocation areas (Figure 1-1).

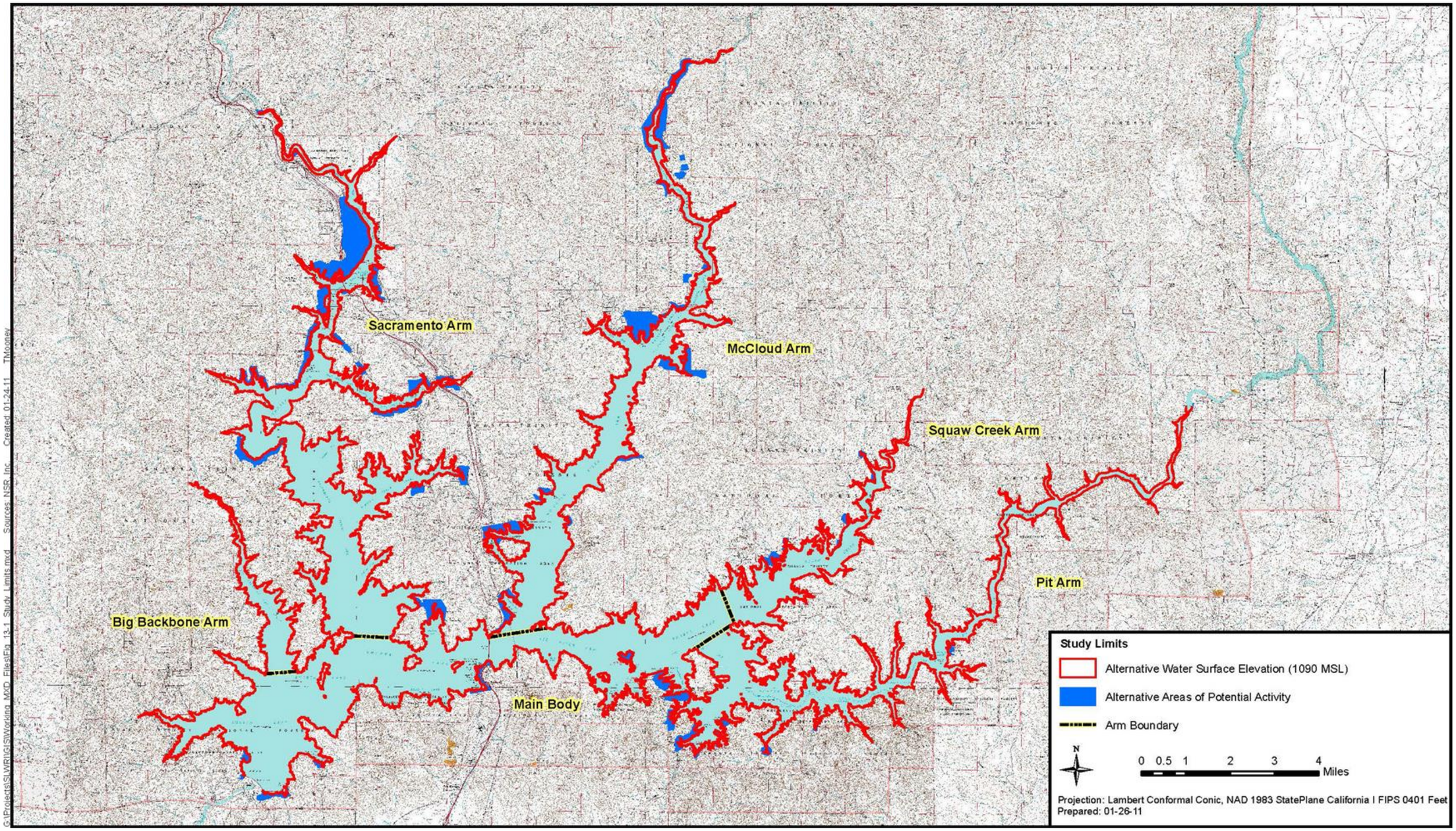

Figure 1-1. Study Limits

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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:

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

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

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

Environmental Setting

Wildlife

The primary and extended study areas support a variety of habitats including riparian forest, oak woodland, riparian scrub, chaparral, annual grassland, vernal pools, seasonal and permanent wetlands, estuaries, tidal sloughs and marshes, and agricultural lands. Each of these habitats supports its own unique assemblage of wildlife species.

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

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

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

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

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

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

Source: CALFED 2000a

Note:

Goals for habitats were developed within the Ecosystem Restoration Program (ERP) and the Strategic Plan for Ecosystem Restoration (CALFED 2000b).

Key:

ERP = Ecosystem Restoration Program

MSCS = Multi-Species Conservation Strategy

Primary Study Area

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 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.

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

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

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 1-2 and 1-3, and depicted in Figures 1-2a through 1-2f. General habitat descriptions including typically occurring wildlife species are described below. Plant taxonomy follows Baldwin et al. (2012).

Table 1-2. Summary of Wildlife Habitats in the Impoundment Area

Habitat	Area (acres*)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Annual grassland	0.44	0.00	3.10	0.70	0.00	0.00
Barren	1.05	0.00	0.55	0.00	0.00	0.00
Blue oak–foothill pine	10.36	0.00	0.00	0.00	4.29	1.94
Blue oak woodland	0.00	0.00	0.00	0.00	0.00	6.81
Closed-cone pine–cypress	32.68	0.00	12.95	20.79	44.72	373.48
Douglas-fir	0.00	0.00	0.00	0.36	0.00	0.00
Lacustrine**	10196.88	1014.12	7225.14	5032.68	2081.60	4372.80
Mixed chaparral	29.19	13.64	161.04	15.06	10.35	59.50
Montane hardwood	73.49	38.76	171.01	66.06	19.43	2.49
Montane hardwood–conifer	70.68	0.99	150.42	140.93	111.63	10.55
Montane riparian	4.16	6.67	26.16	13.91	1.53	1.57
Ponderosa pine	215.11	30.72	188.19	161.74	49.56	57.50
Riverine	0.00	0.88	5.24	15.43	1.41	0.00
Urban	21.95	00.00	1.95	7.96	0.00	1.92
Total	10655.99	1105.79	7945.75	5475.62	2324.52	4888.56

Notes:
*Acreage values are approximate.
**Lacustrine values are included for the entire surface area of Shasta Lake. The extent of activity occurring within Shasta Lake has yet to be determined.

Table 1-3. Summary of Wildlife Habitats in the Relocation Areas

Habitat	Area (acres*)					
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm
Annual grassland	5.05	0.00	29.02	10.65	1.29	1.25
Barren	0.00	0.00	0.00	0.82	0.00	0.00
Blue oak–foothill pine	3.61	0.00	0.00	0.00	0.00	13.74
Blue oak woodland	0.00	0.00	0.00	3.89	0.00	2.28
Closed-cone pine–cypress	0.11	0.00	56.90	8.95	1.94	33.72
Douglas-fir	0.00	0.00	0.00	3.18	0.00	0.00
Mixed chaparral	25.68	0.00	120.00	46.36	4.44	134.82
Montane hardwood	48.21	0.00	198.56	214.87	6.34	3.44
Montane hardwood–conifer	121.63	0.00	205.41	316.45	42.22	42.28
Montane riparian	0.34	0.00	4.72	8.02	0.23	1.45
Ponderosa pine	185.06	0.00	466.94	406.43	43.08	45.30
Riverine	0.00	0.00	0.39	3.75	0.00	0.00
Urban	21.05	0.00	230.58	0.48	0.00	2.49
Total	408.74	0.00	1312.51	1023.04	99.53	280.48

Note:
*Acreage values are approximate.

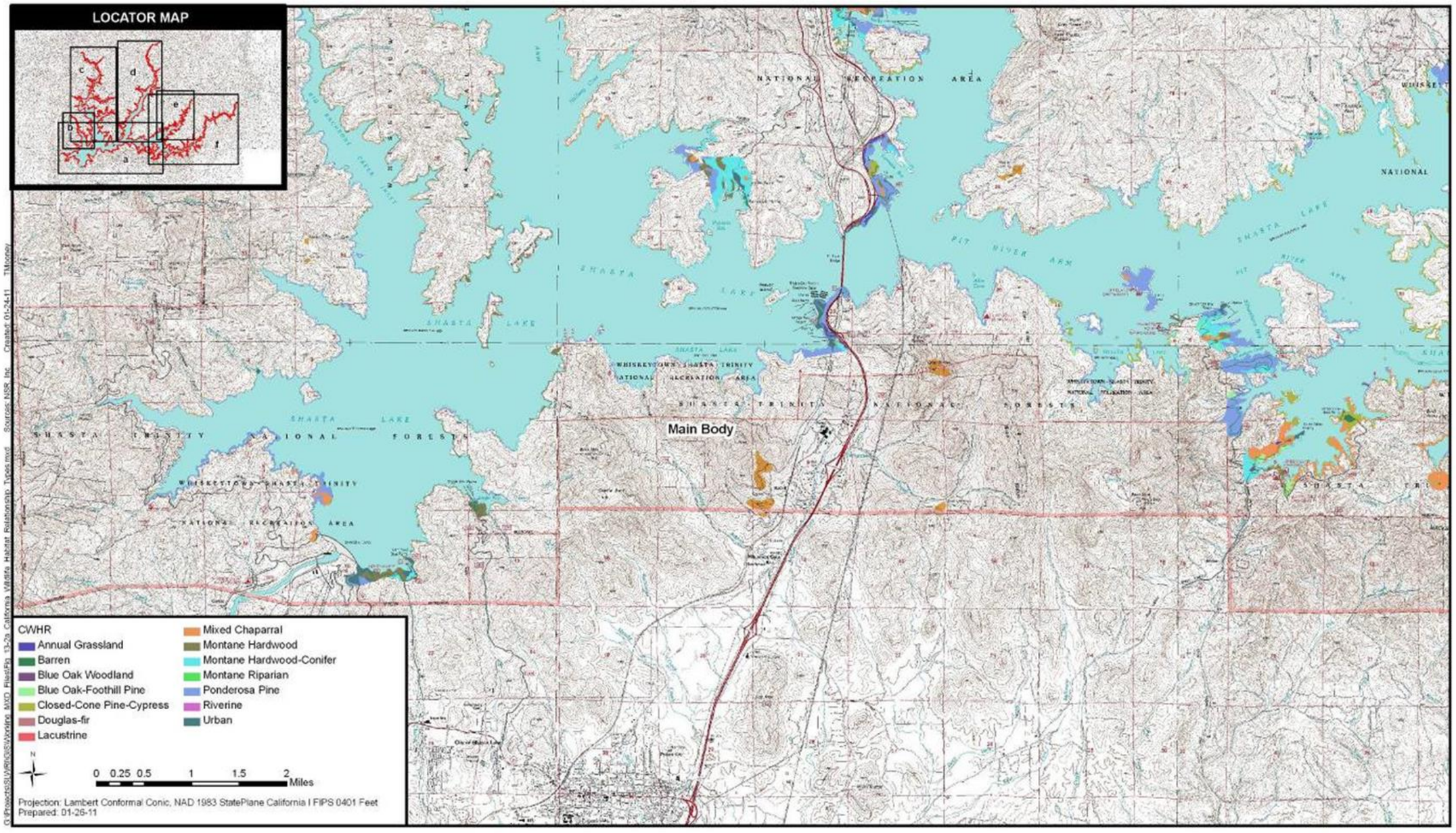

Figure 1-2a. California Wildlife Habitat Relationship Types

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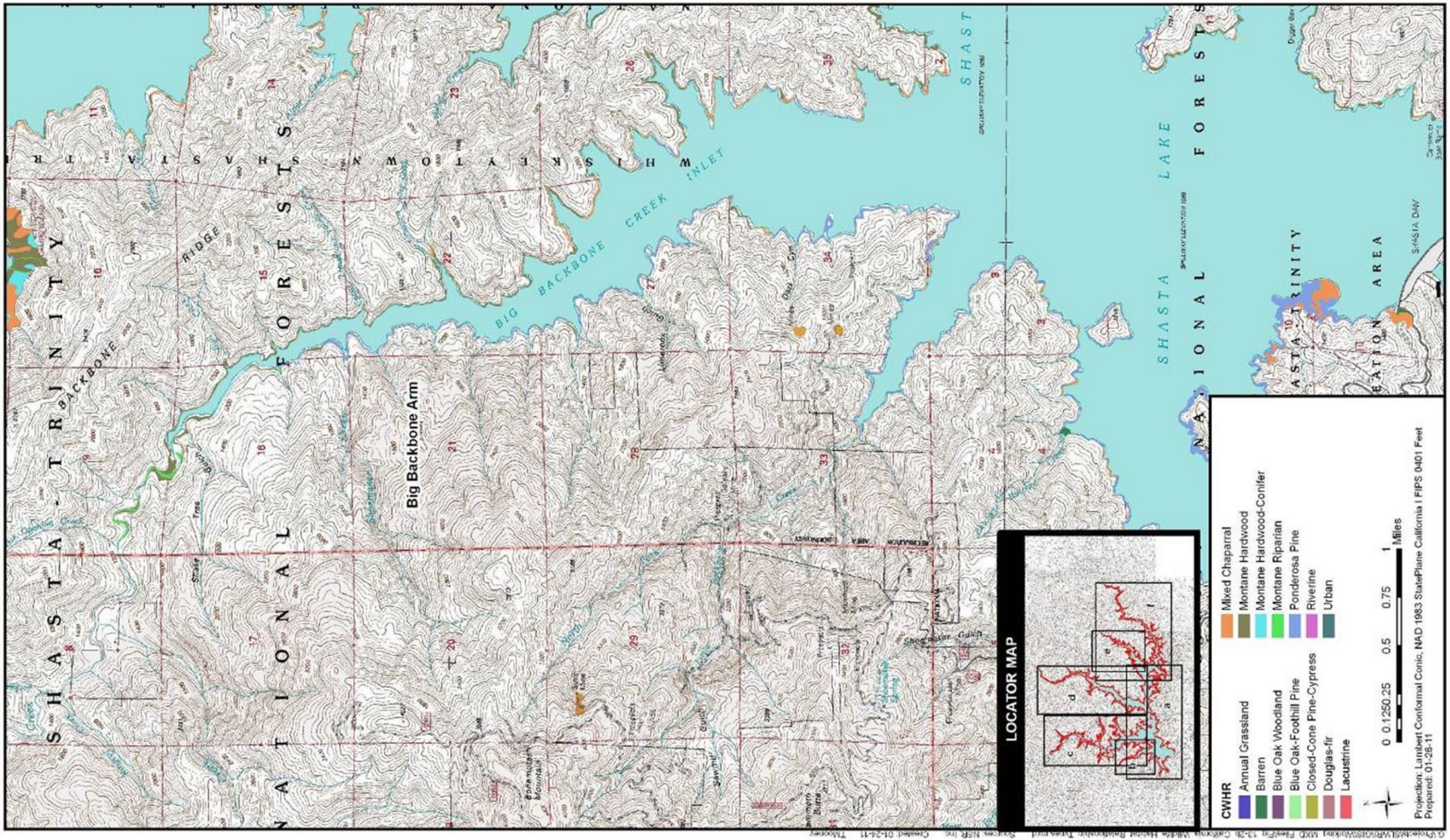

Figure 1-2b. California Wildlife Habitat Relationship Types

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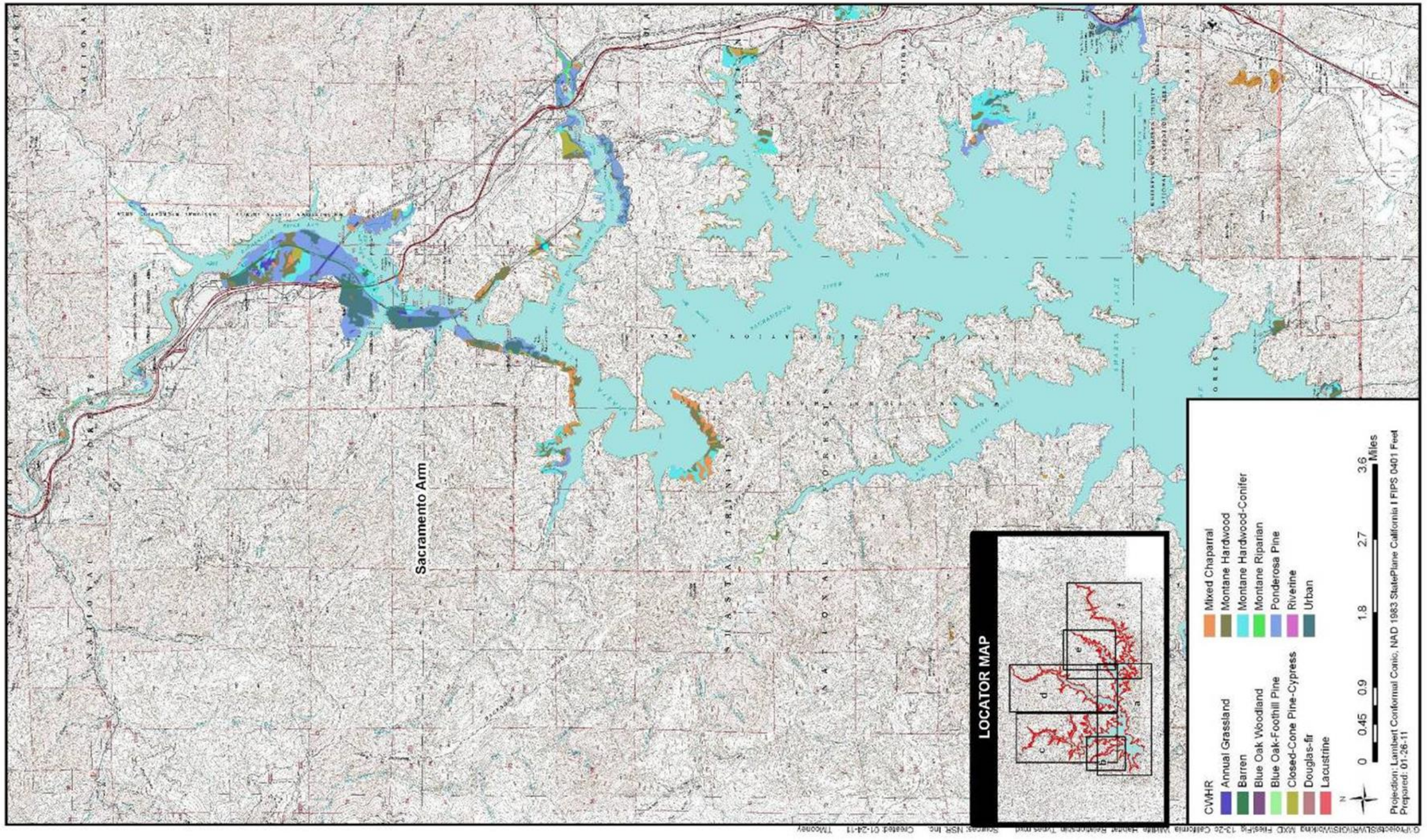

Figure 1-2c. California Wildlife Habitat Relationship Types

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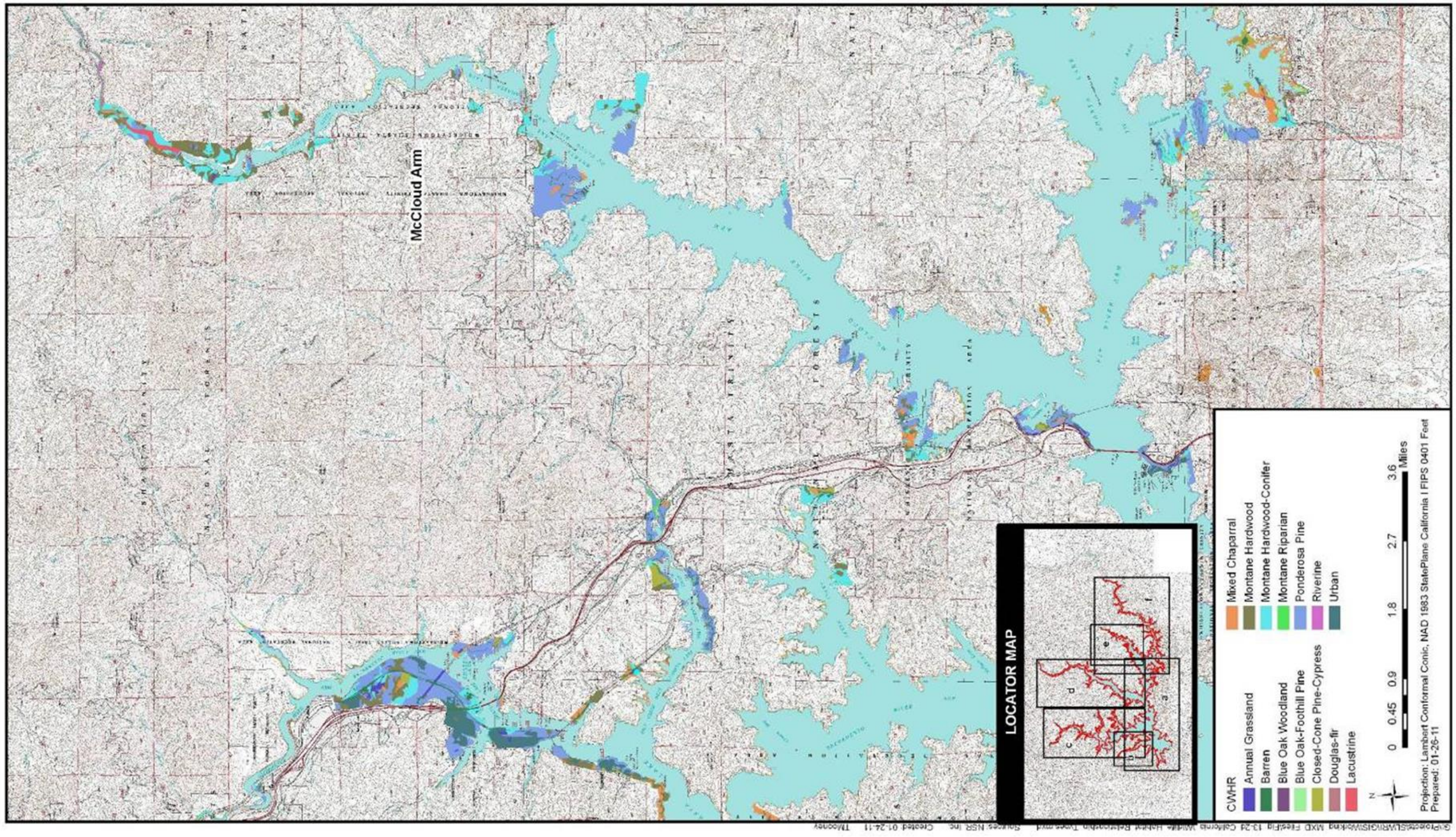

Figure 1-2d. California Wildlife Habitat Relationship Types

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Figure 1-2e. California Wildlife Habitat Relationship Types

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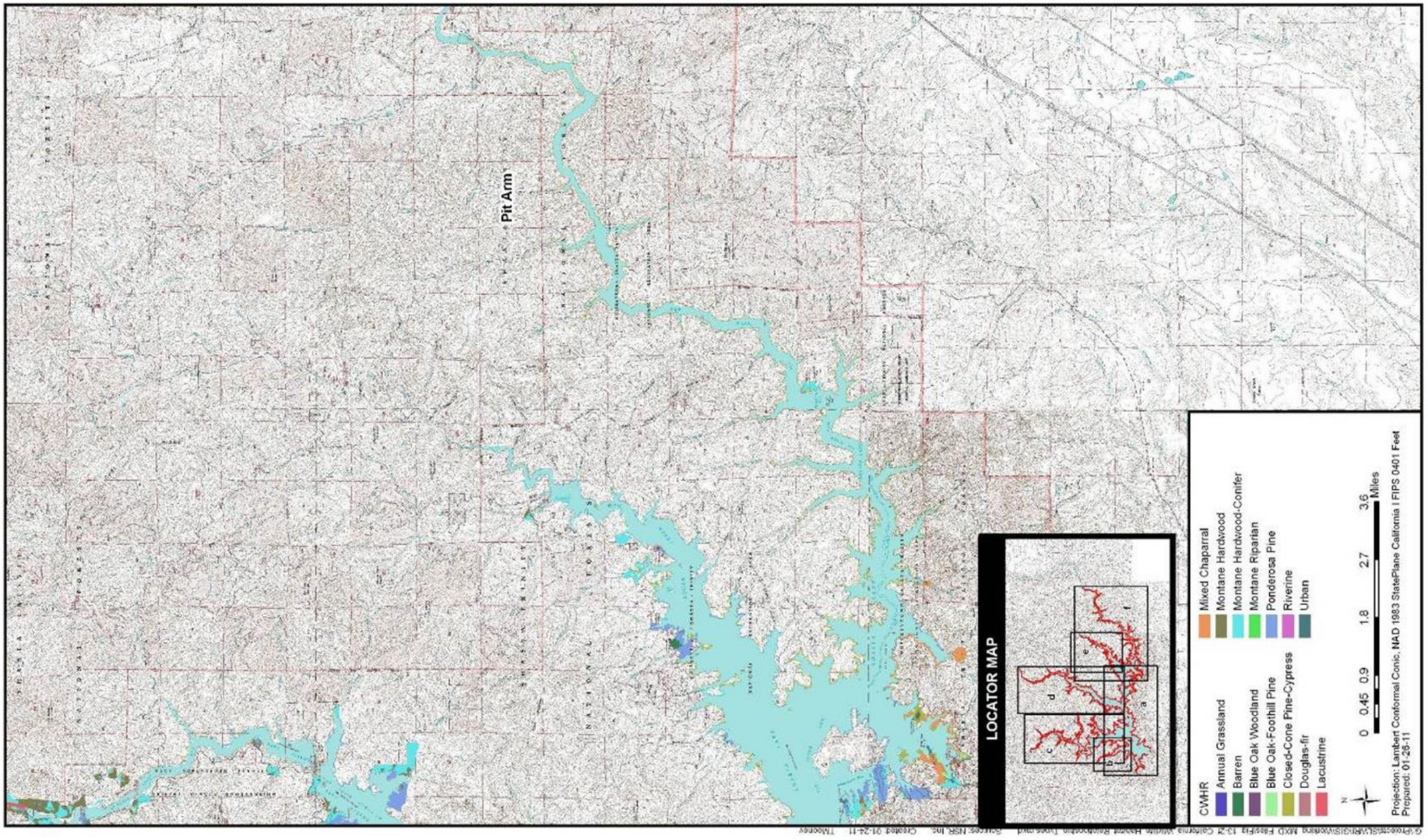

Figure 1-2f. California Wildlife Habitat Relationship Types

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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 nonvegetated human-made features 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 (I-5) near the upper Sacramento Arm and Shasta Lake confluence. Vegetation is usually not present, although sparse opportunistic 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 *(Q. lobata),* interior live oak *(Q. 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 *(Rhamnus 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 layer 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 (*P. 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*).

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

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

Riparian Woodland Riparian woodlands along the upper Sacramento River are composed of the cottonwood willow riparian and valley oak riparian land cover types. The composition of dominant species differs between these two land cover types, but the riparian tree species provide similar functions and values for wildlife. Although riparian woodlands along the upper Sacramento River typically occur in narrow or discontinuous patches, this cover type provides important value for wildlife and supports a great abundance of both common and listed species of birds, mammals, reptiles, amphibians, and invertebrates. Aside from ornamental or landscape trees associated with farms or isolated trees in fields and along roadsides, riparian woodlands provide the only overstory and midstory vegetation. Overstory trees may be used for nesting and roosting by numerous raptors, including Swainson's hawk (*Buteo swainsoni*), white-tailed kite (*Elanus leucurus*), red-tailed hawk (*Buteo jamaicensis*), barn owl (*Tyto*

alba), great horned owl (*Bubo virginianus*), and American kestrel (*Falco sparverius*). Riparian woodlands also provide important nesting and foraging cover for resident, migratory, and wintering songbirds, and they support several species of mammals and provide cover and foraging habitat for reptiles and amphibians. Elderberry shrubs, which provide habitat for the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), also may be associated with this community type.

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

Oak Woodland Oak and other hardwood habitats at low and middle elevations are important for many wildlife species found along the upper Sacramento River. Oak woodland is one of the most biologically diverse communities in California (Allen-Diaz et al. 2007). Oaks provide shelter, through shading and within trunk cavities, for a variety of wildlife in an otherwise open, dry landscape. Large acorn crops and a diverse insect fauna provide high-quality food for a wide variety of amphibians, reptiles, birds, and mammals.

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

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

This circumstance is reflected by the high number of species that are endemic to vernal pools.

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

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

Extended Study Area

The extended study area extends from RBPP south (downstream along the Sacramento River) to the Delta. It also includes the Bay-Delta area and portions of the American and San Joaquin River basins. This extended study area includes CVP and SWP dams and other facilities, rivers downstream from the dams that affect Sacramento River and Delta inflows, and the CVP/SWP service areas. These reservoirs and tributaries include Lake Oroville, Folsom Lake, San Luis Reservoir, New Melones Reservoir, and Trinity Lake, and portions of the Trinity, Feather, American, and Stanislaus Rivers. The CVP/SWP service areas include much of the Sacramento and San Joaquin Valleys and substantial portions of the Bay Area and of Southern California (Figure 1-3).

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

Figure 1-3. Central Valley Project and State Water Project Service Areas

Lower Sacramento River and Delta

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

The mature valley oak woodland and savanna and other mature riparian forest community types provide nesting and foraging habitat for raptors, such as Swainson's hawk, white-tailed kite, red-tailed hawk, barn owl, great horned owl, and American kestrel. The riparian woodlands also function as wildlife movement corridors and provide important nesting and foraging cover for resident, migratory, and wintering songbirds; in addition, they support several species of mammals and provide cover and foraging habitat for reptiles and amphibians. Elderberry shrubs also may be associated with this community type.

Although riparian woodlands in the extended study area typically occur in narrow or discontinuous patches, this cover type provides important values for wildlife and supports a great abundance of both common and listed species of birds, mammals, reptiles, amphibians, and invertebrates.

Drought conditions and conversion of natural habitats to agricultural and urban uses have contributed to declines in the numbers of waterfowl and shorebirds using the Sacramento River region. These declines were caused by unfavorable breeding ground conditions during the late 1950s and the mid-1980s.

Waterfowl and shorebird populations recovered appreciably after these periods of decline. Today, private duck clubs and Federal and State refuges in the Sacramento River region provide essential habitat for wintering waterfowl and shorebirds in the Sacramento River region. Approximately 60 percent of the Pacific Flyway waterfowl population winters in the Sacramento River region. The Sacramento River region is particularly important to shorebirds in spring, when shorebirds use wetlands in the valley as staging areas during migration to northern breeding grounds.

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

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

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

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

concentrations of aquatic invertebrate and mollusks that serve as the primary food source of shorebirds.

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

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

Resident and migratory waterfowl and shorebirds suffered perhaps the largest declines resulting from development and agriculture in the Delta. The declines in resident and migratory waterfowl populations before the early 20th century have been attributed to hunting and the large-scale reclamation of tidal marshes that occurred between 1860 and 1910. Changes in agricultural cropping patterns since the 1970s have increased the quality of waterfowl and shorebird habitat in the Delta. As a result, populations of waterfowl and shorebirds in the Delta have been increasing. Waterfowl and shorebirds forage primarily in natural and artificial wetlands and agricultural lands. The Delta supports approximately 10 percent of the Central Valley's wintering waterfowl and shorebird populations (CALFED 2000c). Several waterfowl species are particularly dependent on the Delta, including tundra swans (*Cygnus columbianus*), greater white-fronted geese (*Anser albifrons*), snow geese (*Chen caerulescens*), greater sandhill cranes, northern pintails (*Anas acuta*), and mallards (*Anas platyrhynchos*). More than 30 species of shorebirds regularly use the Delta; 6 species nest in the Delta, and the rest overwinter there or pass through during spring and fall migration (CALFED 2000c). Important foraging habitats include permanent saline, brackish, and freshwater marshes; seasonal wetlands; and agricultural cropland. Large seasonal wetlands managed for waterfowl are located in the northwestern part of the Delta region, west of the Sacramento Deep Water Ship Channel. These seasonal freshwater wetlands are of great importance to migratory waterfowl and shorebird populations for the forage that they provide during fall, winter, and spring, when bird populations in the Delta increase dramatically.

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

species of raptors. More importantly, remnant native vegetation patches are likely to support a high diversity of wildlife species.

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

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

Special-Status Species

Special-status species addressed in this section include animals that are legally protected or are otherwise considered sensitive by Federal, State, or local resource conservation agencies and organizations. Specifically, 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; or by USFS as sensitive, endemic, or needing additional survey or management actions; animals protected by the California Fish and Game Code; and those designated as MSCS covered species by CALFED.

Primary Study Area

Shasta Lake and Vicinity 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 the U.S. Department of the Interior, Bureau of Land Management (BLM), CDFW, California Department of Water Resources (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 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 North State Resources (NSR) since 2002 were used to determine the likelihood of their presence in the primary study area above Shasta Dam (Table 1-4).

The survey and manage species include species listed in the most current survey and manage species list used by the Northwest Forest Plan Survey and Manage Program. This list includes species from the annual review for survey and manage species that was completed in compliance with the 2001 record of decision (ROD) for amendments to the survey and manage, protection buffer, and other mitigation measures standards and guidelines. Compliance with this ROD is conducted by completion of an annual species review and category assignment.

Table 1-4. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area

Common Name	Scientific Name	Status	Potential for Occurrence
Shasta sideband	*Monadenia troglodytes troglodytes*	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 from Potter Creek north.
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.
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 Klamath Province. Potentially occurring in mixed conifer and conifer/woodland habitats (riparian and/or riverine habitats). Only known from the southeastern Klamath Mountains region. Known occurrences in the Shasta Lake and vicinity portion of the study area.

Table 1-4. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area (contd.)

Common Name	Scientific Name	Status	Potential for Occurrence
Shasta salamander	*Hydromantes shastae*	CT, USFS S, S&M, MSCS m, BLMS	Only known from the southeastern Klamath Mountains region. 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).
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. A habitat assessment has been prepared to determine habitat suitability in the vicinity of Shasta Lake. Species has not been recorded in Shasta County since 1926 (University of Michigan Museum of Zoology 2009).
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.
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. 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.

Table 1-4. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area (contd.)

Common Name	Scientific Name	Status	Potential for Occurrence
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.
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.
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. Shasta Lake is one of the few known breeding sites in interior 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. The species was observed in the Shasta Lake and vicinity portion of the primary study area by NSR biologists in June 2008.

Table 1-4. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area (contd.)

Common Name	Scientific Name	Status	Potential for Occurrence
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*	USFS S	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.
Western mastiff bat	*Eumops perotis*	CSC, MSCS m*, BLMS *californicus subspecies only	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	Mixed evergreen forests with abundant cavities for denning and nesting and open areas for foraging.
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. 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

The current survey and manage species list is from the December 2003 annual status review and includes species included in the Survey and Manage Standards and Guidelines and Category Assignment (BLM December 2003). For the purposes of this evaluation, survey and manage 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 predisturbance (i.e., preproject) 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.

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. Figures 1-4a through 1-4f depict the known locations of special-status wildlife species in the primary study area above Shasta Dam located during various surveys conducted by NSR and recent USFS records. Figures 1-4a through 1-4f depict the known locations of special-status terrestrial mollusks.

Summary of Wildlife Investigations Because wildlife studies are ongoing, technical memoranda describing methods, results, and conclusions in detail will be provided in the Final Environmental Impact Statement.

Terrestrial Mollusk Surveys (Survey and Manage) Reclamation has conducted three survey efforts to survey and manage terrestrial mollusk species in the Shasta Lake and vicinity portion of the primary study area. These include protocol-level efforts during 2002–2003 and 2005 along selected portions of the Shasta Lake shoreline and current protocol-level efforts initiated 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. Four survey and manage terrestrial mollusk species have been found to date: Shasta sideband (*Monadenia troglodytes troglodytes*), Wintu sideband (*Monadenia troglodytes wintu),* Shasta chaparral (*Trilobopsis roperi*), and Shasta hesperian (*Vespericola shasta*). Collectively, 29, 2, 29, and 73 locations of Shasta sideband, Wintu sideband, Shasta chaparral, and Shasta hesperian, respectively, have been found (Figures 1-5a through 1-5f).

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 2006–2007 along selected portions of the Shasta Lake shoreline and current efforts initiated in 2010 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. Shasta salamanders have been found at 39 locations. These findings and other known locations show that this species occurs in all arms of Shasta Lake in both limestone and nonlimestone habitats (Figures 1-4a through 1-4f).

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. 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 were located and 54 osprey nests were located (Figures 1-4a through 1-4f). Reclamation is currently working with USFS to update this data set, because several bald eagle nesting pairs are no longer active and/or have moved to new locations.

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.

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 2012, providing additional species distribution and habitat-use information (Figures 1-4d through 1-4f). The nesting purple martin population has totaled 18, 21, 24, 28, 42, and 27 pairs during 2007 through 2012, respectively. Most nest sites occur in flooded snags located in the reservoir; however, recent monitoring results show an increase in use of upland nest sites. Limited historical purple martin survey information available 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 somewhat large increase in 2011, and then generally returned to 2009 and 2010 levels in 2012. Considering historical information and the 2007-2012 monitoring results, the nesting purple martin population has remained somewhat stable and increased overall.

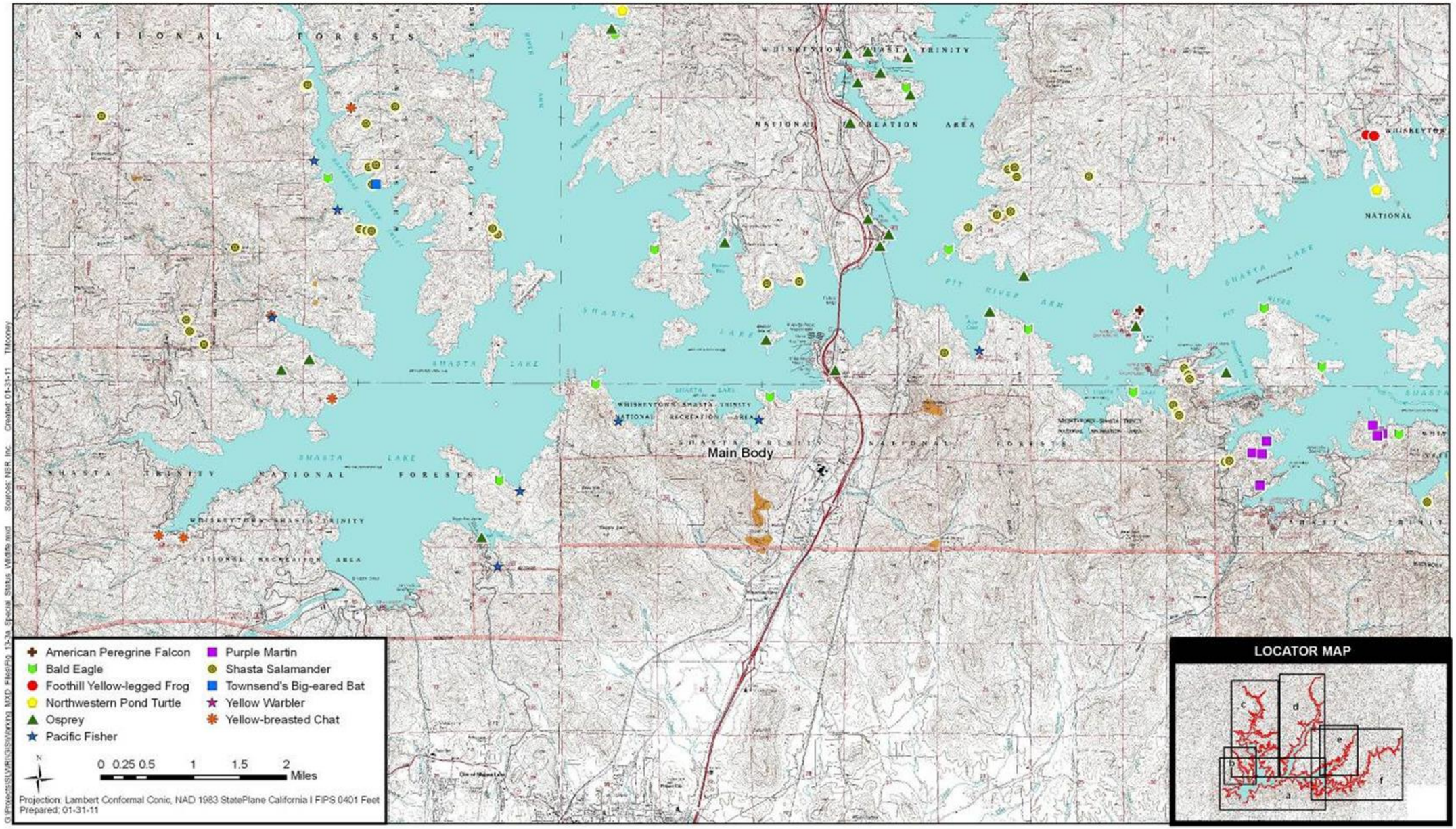

Figure 1-4a. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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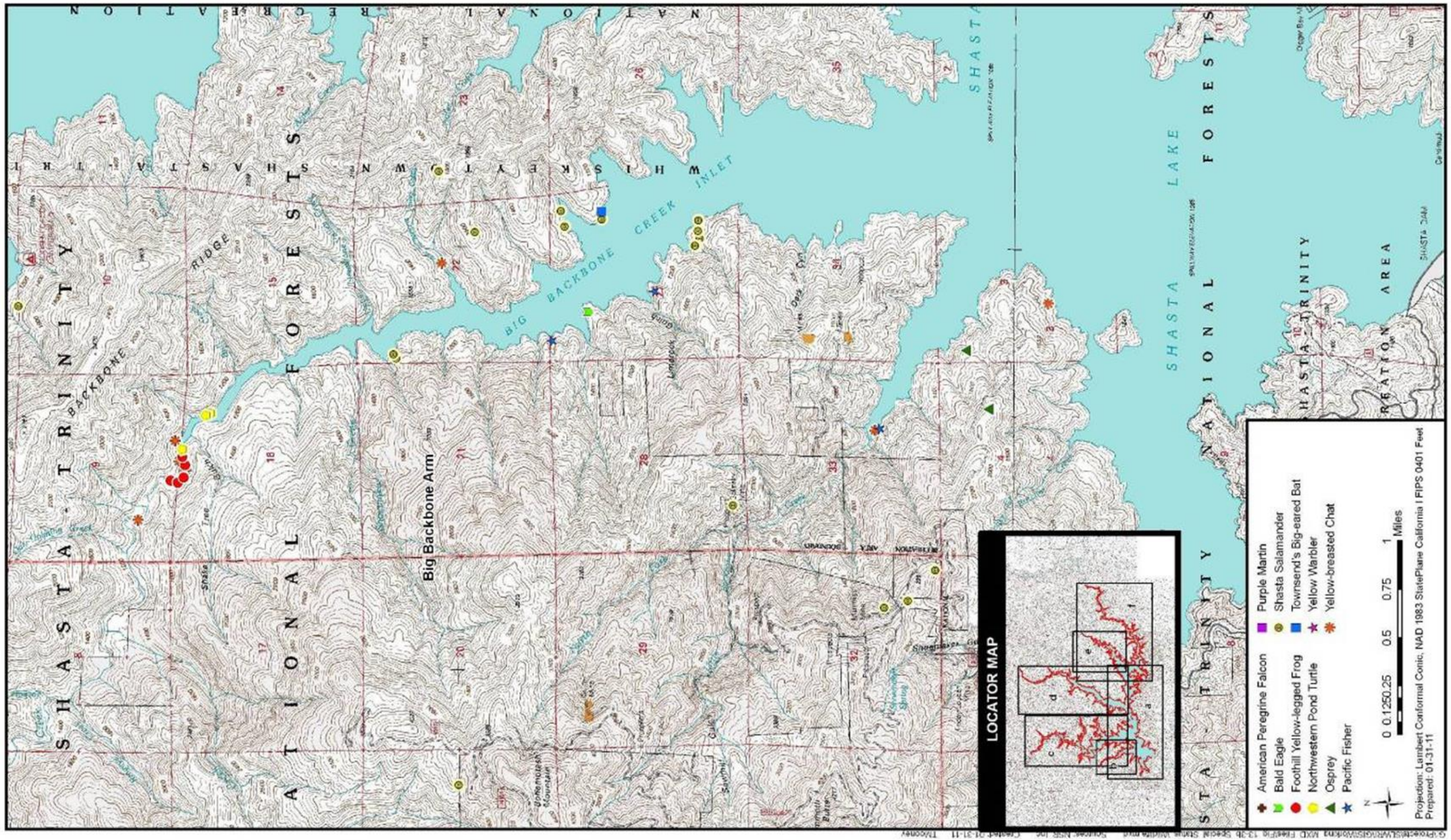

Figure 1-4b. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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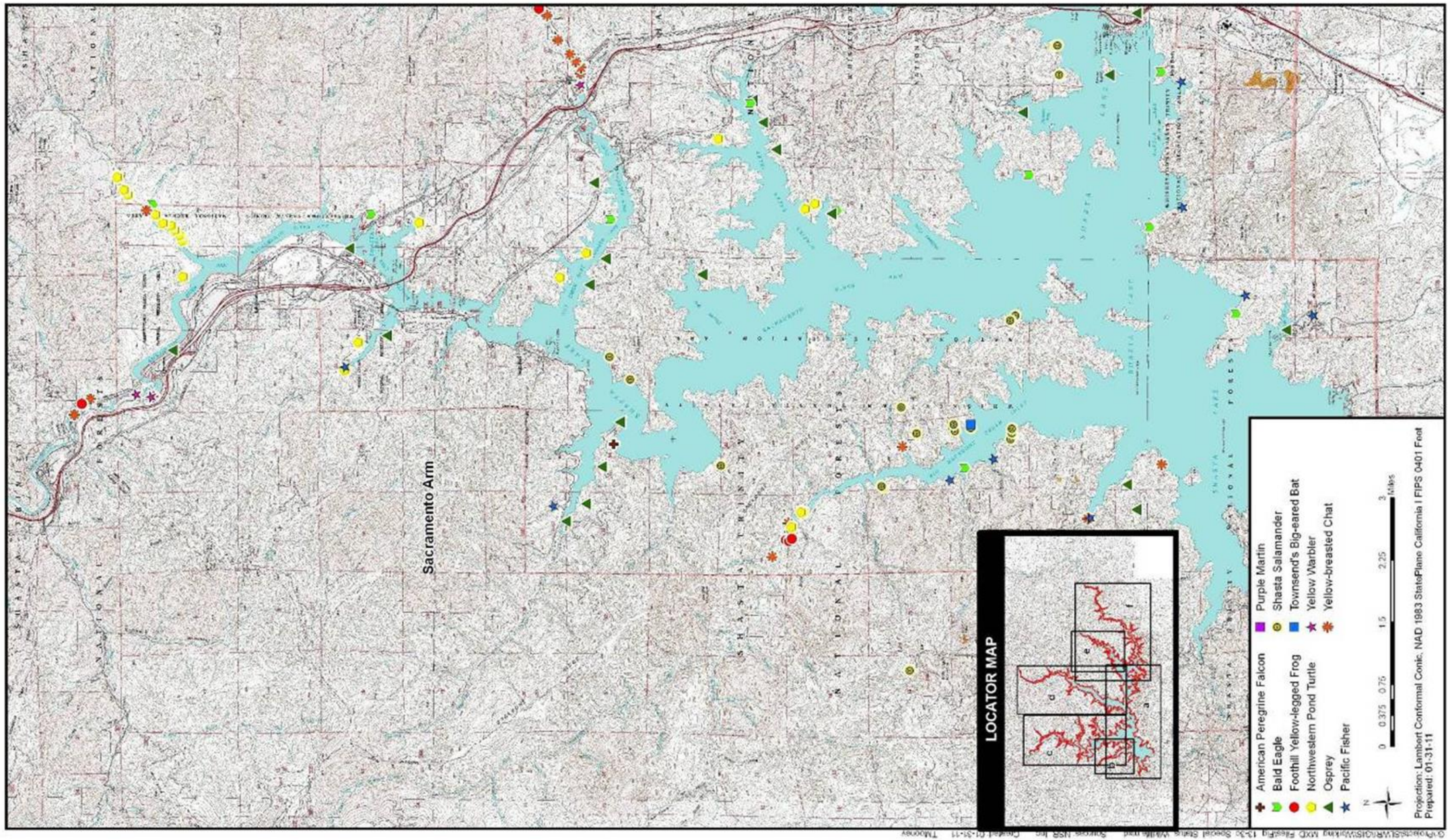

Figure 1-4c. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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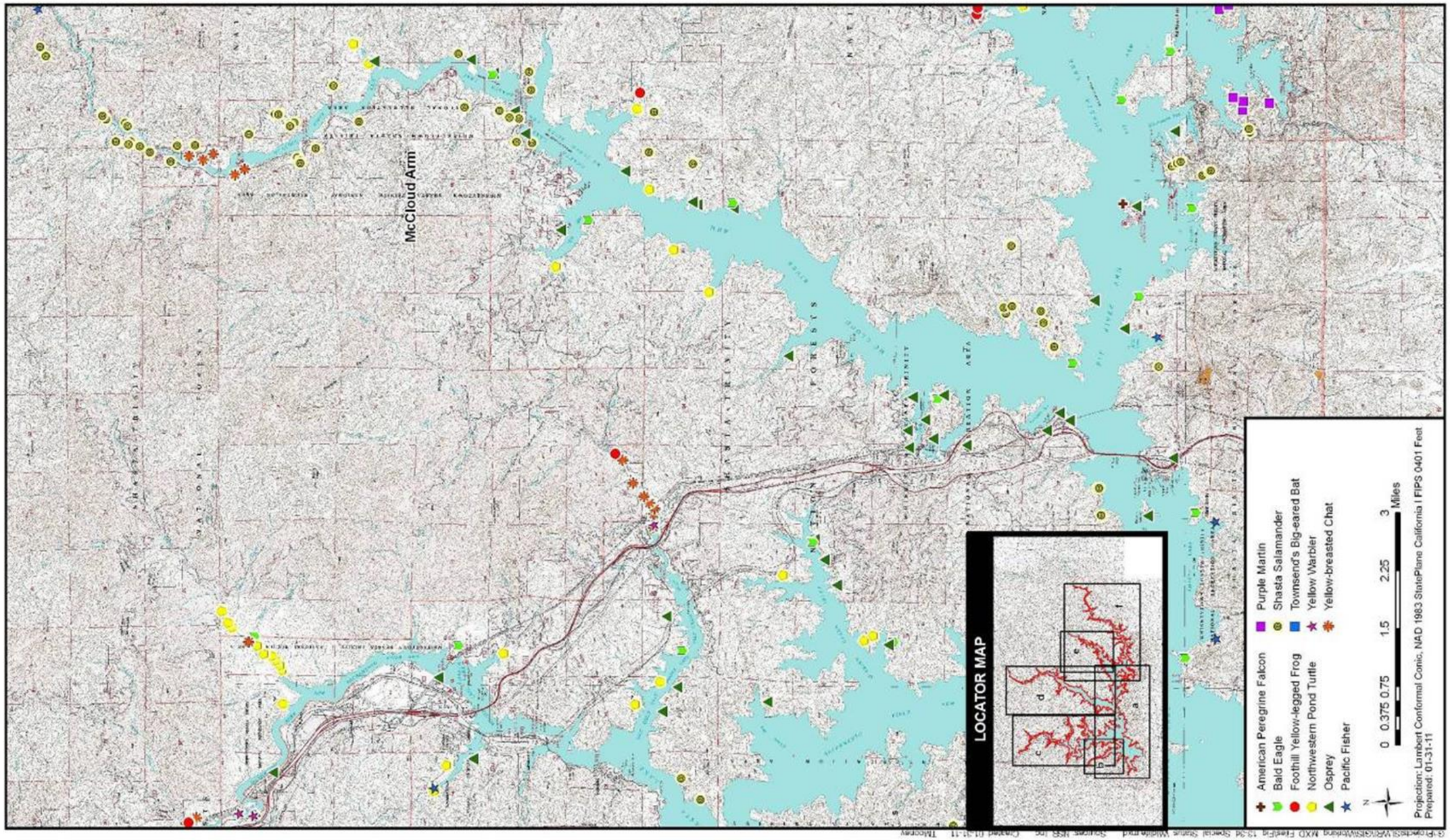

Figure 1-4d. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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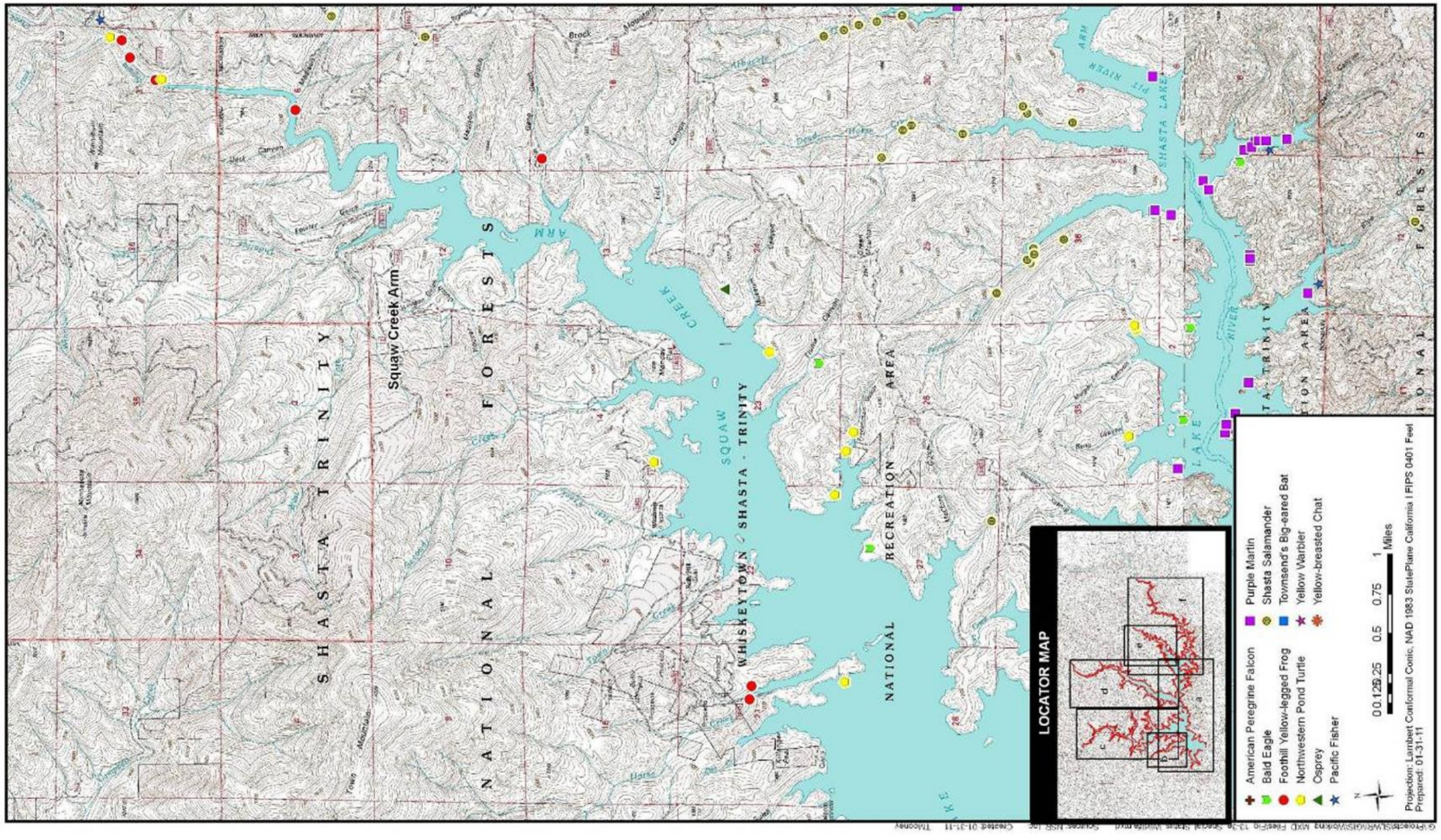

Figure 1-4e. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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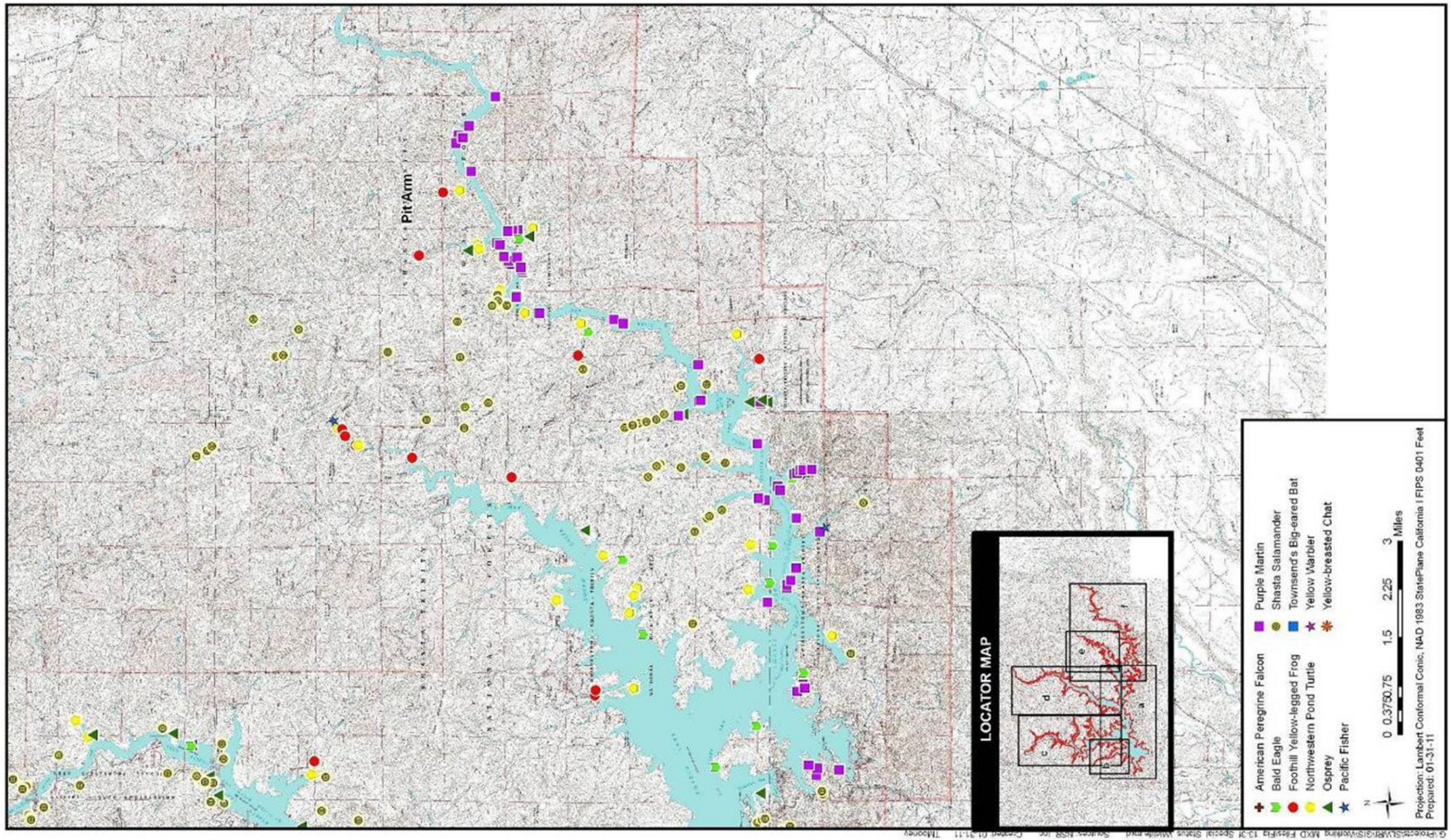

Figure 1-4f. Special-Status Wildlife Occurring in Shasta Lake and Vicinity

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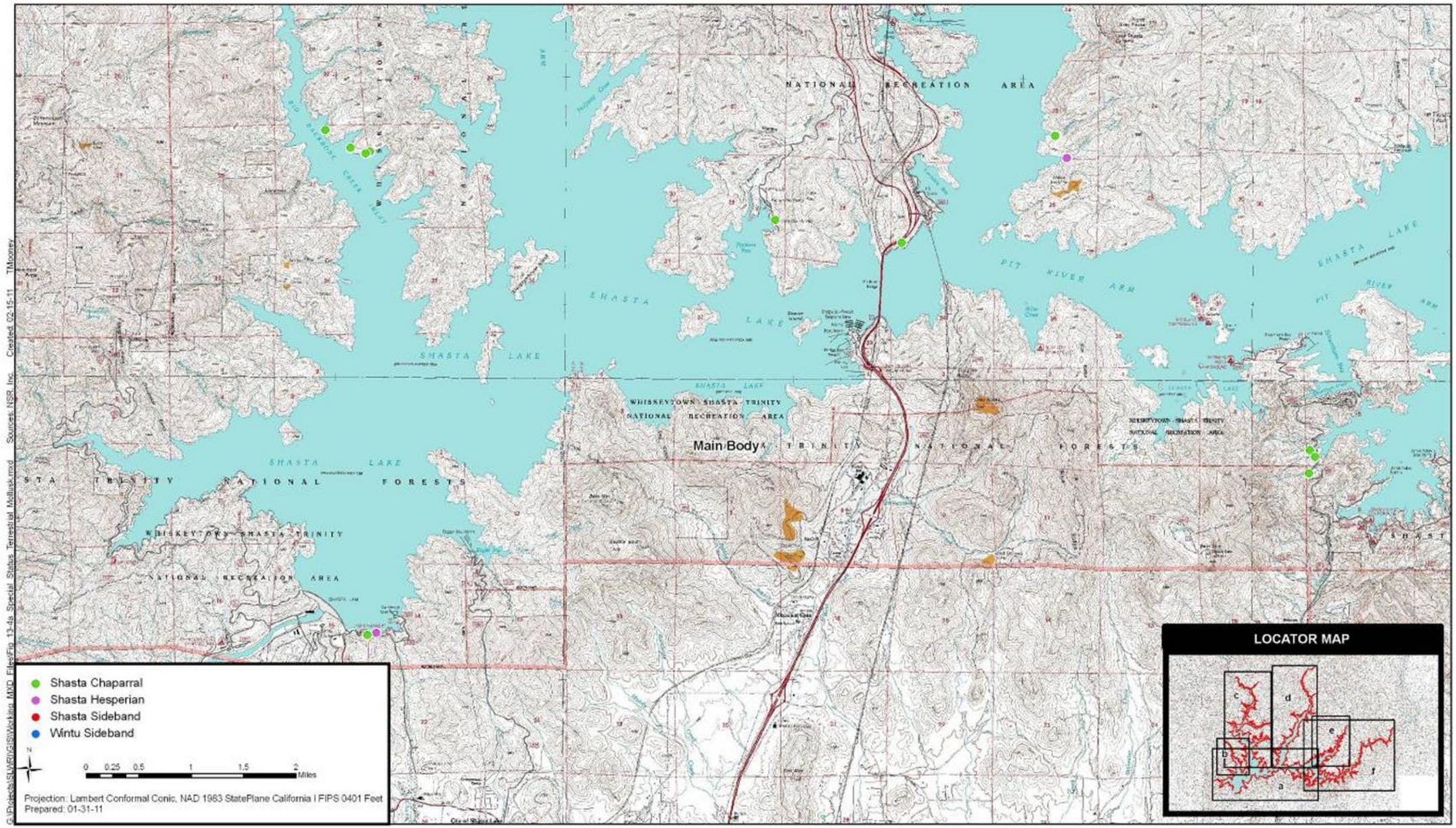

Figure 1-5a. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity

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