

APPENDIX E

Lists of Species

Life History and Regulatory Status of Listed
Aquatic Invertebrates and Fish

LBAM Aquatic Invertebrate Listing Status and Life History

CRUSTACEANS

Shasta (Placid) crayfish

The Shasta (*Pacifastacus fortis*) crayfish is the only remaining crayfish species native solely to California. Shasta crayfish are active at night and remain hidden during the day. Unlike other crayfish, this species is primarily herbivorous, feeding upon the periphyton (composed of benthic algae and diatoms, flocculent organic detritus, and small benthic invertebrates) that forms a film on the surface of volcanic rock substrates. The Shasta crayfish is relatively sedentary, and lives in cool, spring-fed headwaters characterized by clean, volcanic cobbles and boulders overlying sand or gravel substrates (DFG 2000a).

It was once found throughout portions of Pit and Fall Rivers and Hat Creek in Shasta County. It is currently limited to smaller and more isolated stream sections of these watersheds. This species' current range (Shasta County) is not included within the immediate Program Area, but is located within the boundaries of the expanded Project Area (PG&E 2009). The Shasta crayfish is currently listed as a State of California and Federal Endangered Species (CDFG 2009a).

Conservancy fairy shrimp

Conservancy fairy shrimp occur in ephemeral pools of somewhat turbid fresh water (vernal pools) that form in the cool, wet months of the year. Their eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. Resting (summer) eggs are known as cysts and are able to withstand heat, cold, and prolonged dry periods. Some of the cysts may hatch when the vernal pools refill with rainwater, in the same or subsequent seasons. After hatching, fairy shrimp develop rapidly into adults, but these non-dormant populations often disappear early in the season, long before the vernal pools dry up. The species is typically observed from November to early April. The diet of conservancy fairy shrimp consists of algae, bacteria, protozoa, rotifers, and bits of organic detritus. This shrimp swims or glides upside down by beating its 11 pairs of swimming legs in a wave-like motion from head to tail (LSA Associates, Inc. 2004). They also use their legs to move edible food particle to their ventral food groove, and then toward the mouth.

Historically, the conservancy fairy shrimp (*Branchinecta conservation*) likely occurred throughout the Central Valley of California. Conservancy fairy shrimp populations are currently known from the following six localities: Vina Plains, Tehama County; south of Chico, Butte County; Jepson Prairie and near the Potrero Hills, Solano County; Sacramento National Wildlife Refuge, Glenn County; the Mapes Ranch in Stanislaus County; several localities in Merced County; and possibly, the Lockwood Valley in northern Ventura County (LSA Associates, Inc. 2004). Of these, only Solano County is located within the immediate Project Area, but the remaining counties are all located within the expanded Project Area. The conservancy fairy shrimp is currently listed as Federally Endangered (CDFG 2009a).

Longhorn fairy shrimp

The longhorn fairy shrimp is found in clear to turbid grass-bottomed vernal pools in grasslands and clear-water pools in sandstone depressions. All vernal pools inhabited by this species are filled by winter and spring rains and may remain inundated until June (Beacham et al. 2000). Like other fairy shrimp, the longhorn fairy shrimp is capable of living in vernal pools of relatively short duration (6 to 7 weeks in winter, 3 weeks in spring), and are omnivorous filter-feeders (Jones & Stokes 2006).

Only four disjunct populations of longhorn fairy shrimp (*Branchinecta longiantenna*) are known. These populations occur along the eastern margin of the central coast range from Concord, Contra Costa County south to Soda Lake in San Luis Obispo County: the Kellogg Creek watershed, the Altamont Pass area, the western and northern boundaries of Soda Lake on the Carrizo Plain, and Kesterson National Wildlife Refuge in the Central Valley (Beacham et al. 2000). The northern portion of the longhorn fairy shrimp's distribution lies within the immediate Project Area. The longhorn fairy shrimp is currently listed as a Federal Endangered Species (CDFG 2009a).

Riverside fairy shrimp

Suitable habitat for the Riverside fairy shrimp includes seasonal (vernal) pools of shallow freshwater. Life history and ecology of this species is similar to that of the other fairy shrimp found in the Project Area. Habitat is particularly limited for this species because it lives in the southern portion of the Project Area, where pool habitat was likely limited to begin with, and urban development in suitable habitat areas is rapid (USFWS 1993).

The Riverside fairy shrimp (*Streptocephalus woottoni*) occurs in California's Ventura, Los Angeles, Riverside, Orange, and San Diego counties, and Baja California, Mexico (CBD 2009). This species' distribution is south of the immediate Project Area, however, a portion of its range lies within the expanded Project Area (Ventura, Los Angeles, Orange, and San Diego Counties). The Riverside fairy shrimp is currently listed as a Federal Endangered Species (CDFG 2009a).

San Diego fairy shrimp

The life history of the San Diego fairy shrimp is similar to that described for other fairy shrimp found within the Project Area. This species, however, is adapted to living in a climate characterized by limited precipitation. A lack of hatching at higher temperatures (greater than 25°C; 77°F) protects the San Diego fairy shrimp from the infrequent summer storms that might be sufficient to stimulate development, but inadequate for the organisms to complete their life cycles. Similar to fairy shrimp species located further north, adult San Diego fairy shrimp are usually observed in winter and spring (January- March). However, the hatching period may be extended in years with early or late rainfall (USFWS 2002).

The San Diego fairy shrimp (*Branchinecta sandiegoensis*) is known to occur in vernal pools on chaparral covered mesas San Diego and Orange Counties, both of which are located south of the immediate Project Area, but lie within the expanded Project Area. This species is currently listed as Federally Endangered (CDFG 2009a).

Vernal pool tadpole shrimp

The vernal pool tadpole shrimp is similar to vernal pool fairy shrimp in that its eggs are laid in winter and can remain dormant for up to 10 years. In contrast to the fairy shrimp, the vernal pool tadpole shrimp is a predator that feeds on other invertebrates and amphibians in the pools. They may also eat some vegetation (CDPR 2009). The vernal pool tadpole shrimp (*Lepidurus packardii*) is found in the Central Valley from Shasta County to Merced County (CDPR 2009). The species' distribution is located outside of the immediate Project Area, but within the expanded Project Area. This species is currently listed as Federally Endangered (CDFG 2009a).

California freshwater shrimp

The California freshwater shrimp is found in pool areas of low-elevation, low-gradient streams, among exposed live tree roots (e.g., willows and alders) of undercut banks, overhanging woody debris, or

overhanging vegetation. These streams have low summer flows but may transport heavy runoff during the rainy season. The species feeds on decomposing plants and other detrital material (DFG 2000a).

The California freshwater shrimp (*Syncaris pacifica*) is the State's only native, stream-dwelling shrimp. It is currently found in 17 stream segments within Marin, Napa and Sonoma counties, all three of which are located within the immediate Project Area. Many of these stream segments are isolated from the others by barriers, dewatered areas and low quality habitat (DFG 2000a). This species is currently listed as a State and Federal Endangered Species (CDFG 2009a).

LBAM Fish Listing Status and Life History

SALMONIDS

Several anadromous salmonid species are found within the Project Area, each of which are characterized by the same general life history strategy. Adults of these species migrate from the ocean to freshwater to spawn in their natal streams. They typically spawn in the tails of glides or heads of riffles in areas with abundant small gravel to cobble sized substrate, depending on the species. Eggs are laid in a nest (redd) constructed by the female, where there are suitable combinations of velocity, depth, and substrate to provide adequate aeration to the eggs (Moyle 2002). After the fry emerge from the redd, they rear in the stream from a few months up to four years before undergoing smoltification (i.e., a physiological process associated with the osmoregulatory system that prepares the fish for the transition to sea water) and beginning their downstream migration. After emigration, salmonids spend 1-5 years in the productive marine environment before returning to their natal streams. The timing of migration, distribution, and status of the salmonids found in the Project Area differ among species, and are outlined for each species in the sections below.

Chinook salmon

Chinook salmon (*Oncorhynchus tshawytscha*) are characterized by two basic life history patterns, stream-type and ocean-type. Stream-type Chinook adults run up stream in spring or summer, before they have reached full maturity, and juveniles usually spend more than one year in freshwater. Ocean-type Chinook adults spawn soon after entering freshwater, in summer or fall, and juveniles spend a relatively short period of time in freshwater (3-12 months) (Moyle 2002). Because there is a great deal of variation between these two extremes, individual Chinook salmon runs are named based on the timing of their upstream spawning migration (Moyle 2002). The timing of migration, distribution, and status of the three listed populations found in the Project Area is outlined below.

Listed populations of Chinook salmon found within the Project Area include Sacramento winter-run and Central Valley spring-run Chinook, and the California Coastal Chinook ESUs. Winter-run Chinook salmon migrate upstream as immature fish in winter or spring (Dec-May, stream-type), and then spawn several months later in early summer (May-June) (Moyle et al. 1989). Juvenile outmigration typically occurs between September and January (Moyle 2002). Chinook salmon spend 2-5 years in the ocean before returning to their natal streams (Moyle 2002). Sacramento winter-run Chinook spawning is currently limited to habitat in the Sacramento River, immediately downstream from the Keswick Dam (Moyle et al. 1989), which is located within the immediate Project Area. The Sacramento winter-run Chinook salmon is currently listed as a State and Federal Endangered Species (CDFG 2009a, NMFS 2007a).

Spring-run Chinook begin their upstream migration as immature fish in spring and early summer (March-May, stream-type), and spawn in early fall (mid-September-October) (Moyle et al. 1989). Juvenile downstream migration peaks in winter (January-February) and then again in spring (April) (Moyle 2002). The Central Valley spring-run Chinook are found in the Sacramento-San Joaquin drainage, spawning primarily in

the middle reaches of the Feather, upper Sacramento, McCloud, and Pit Rivers (Moyle et al. 1989). Efforts are underway to restore spring-run Chinook salmon to the San Joaquin River, with the first fish to be released in 2012. All of these spawning locations are located within the immediate Project Area. The Central Valley spring-run Chinook is currently listed as a State and Federal Threatened Species (CDFG 2009a).

The California Coast Chinook originally included both fall- and spring-run Chinook, but the spring-run populations are currently believed to be extinct (NMFS 1999). Fall-run Chinook are characterized by the ocean-type life history strategy, migrating upstream in late summer or early fall. Juvenile outmigration peaks in spring (March-April) (Moyle 2002). This ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River to the Russian River, California, as well as six artificial propagation programs: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, and Mattole Salmon Group hatchery programs (CDFG 2009b). The southernmost portion of this ESU's distribution (Sonoma County) is located within the immediate Project Area, and the northern portion of its range lies within the boundaries of the expanded Project Area (Del Norte, Humboldt, and Mendocino Counties). This ESU is currently listed as a Federal Threatened Species (CDFG 2009a).

Coho salmon

Adult coho salmon (*Oncorhynchus kisutch*) begin their upstream migration to their spawning grounds in the fall and winter, cued by increases in stream flow resulting from fall and winter storms. After spawning the adult coho salmon die, completing their life cycle. Coho embryos develop and hatch from February through April, depending on water temperature and the time of spawning. Smoltification typically occurs after the first summer and winter spent in freshwater (Age 1+), but in some years, a significant proportion of smolts are Age 0+ fish (young-of-the-year). Most smolts migrate downstream to estuarine habitat in April and May and sometimes as late as June. The adult coho salmon return to their natal streams to spawn after rearing at sea for two years. Because coho salmon are characterized by a relatively rigid, three-year cycle, poor reproductive success in freshwater during any given year usually results in poor spawning runs three years later.

Two coho salmon ESUs are found in California: the So. Oregon/No. California Coast (SONCC) ESU and the Central California Coast (CCC) ESU. The SONCC ESU is found from Punta Gorda, California north to Cape Blanco, Oregon. The SONCC ESU's distribution lies outside the immediate Project Area. Portions of its range (Mendocino, Humboldt, and Del Norte Counties), however, are located within the expanded Project Area (CDFG 2004). The CCC ESU is found from Punta Gorda, CA south to the San Lorenzo River located in Santa Cruz County. The entirety of the CCC ESU's range lies within the immediate Project Area (i.e., Sonoma, Napa, Solano, Marin, Contra Costa, San Francisco, Alameda, San Mateo, Santa Clara, Santa Cruz Counties), with the exception of the portion of the range occurring in Mendocino County. The portion of the range in Mendocino County is included in the expanded Project Area (CDFG 2004). The SONCC Coho ESU is currently listed as a State and Federal Threatened Species. The CCC ESU is listed as a State and Federal Endangered Species (CDFG 2009a).

Steelhead

Five steelhead (*Oncorhynchus mykiss*) ESUs are included in the expanded Project Area: the Northern California ESU, Central California ESU, South/Central California ESU, Southern California ESU, and Central Valley ESU. Steelhead from these different ESUs all exhibit the same general life history strategy. Steelhead generally migrate upstream to spawn from January through April. After emergence the young steelhead may rear in the stream from a few months to four years, although the majority of fish undergo smoltification and outmigrate in their second or third year. Outmigration generally takes place from March through June, the peak varying from year to year as conditions vary. Steelhead may spend anywhere from 1 to 4 years rearing at sea before returning to spawn. Unlike Chinook and coho salmon, not all adult steelhead die

after spawning. Some return to the ocean and spawn as many as 4 times, at ages varying from 2 to 6 years. The distribution and status of each steelhead ESU is described individually below.

Northern California ESU

The Northern California ESU includes all naturally spawned populations of steelhead in California coastal river basins from Redwood Creek (inclusive) southward to the Russian River (exclusive), as well as fish produced at two artificial propagation programs: the Yager Creek Hatchery and the North Fork Gualala River Hatchery (Gualala River Steelhead Project) (NMFS 2007b). The portion of this ESU's range located in Sonoma County lies within the immediate Program Area. A Portion of the distribution located further north (in Humboldt, Mendocino, Lake, Napa, Glenn, Colusa, and Tehama Counties) is included in the expanded Project Area. This ESU is currently listed as Federally Threatened (CDFG 2009a).

Central California ESU

Central California Coast steelhead are found in California streams from the Russian River (inclusive) to Aptos Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chippis Island at the confluence of the Sacramento and San Joaquin Rivers. This ESU also includes steelhead found in tributary streams to the Suisun Marsh including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as Red Top Creek), but excludes the Sacramento-San Joaquin River Basin (NMFS 2007c). The majority of the range of Central California Coast steelhead is located within the immediate Project Area (Napa, Marin, Sonoma, San Francisco, Contra Costa, Alameda, San Mateo, Santa Clara, and Santa Cruz Counties). Fish from this ESU are also found in Lake, Mendocino, and San Joaquin Counties, at least portions of which lie within the expanded Project Area (NMFS 2005). This ESU is currently listed as Federally Threatened (CDFG 2009a).

South/Central California ESU

The South-Central Coast ESU includes steelhead found in three tributaries to Monterey Bay, the Pajaro, Salinas, and Carmel Rivers, and in small streams along the Big Sur Coast and San Luis Obispo County, south to but not including the Santa Maria River (NMFS 2007d). The portions of this ESU's range located in Monterey, San Benito, Santa Clara, and Santa Cruz Counties are located in the immediate Project Area, and the portion in San Luis Obispo County lies within the expanded Project Area (NMFS 2005). This ESU is currently listed as Threatened under the Endangered Species Act (CDFG 2009a).

Southern California ESU

The Southern California Coast Steelhead ESU is found in rivers ranging from the Santa Maria River in San Luis Obispo County south to Tijuana River at the U.S.-Mexico border (NMFS 2007e). The portion of this ESU's range that lies in Santa Barbara County is located within the immediate Project Area, and the remainder of its range lies within the boundaries of the expanded Project Area (NMFS 2005). The Southern California Coast Steelhead ESU is currently listed as Federally Endangered (CDFG 2009a).

Central Valley ESU

The Central Valley ESU includes all naturally spawned populations of steelhead in the Sacramento and San Joaquin Rivers and their tributaries, excluding those found in the San Francisco and San Pablo Bays and their tributaries (NMFS 2007a). Critical habitat has been designated for the Central Valley ESU in the following counties: Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Yuba, Sutter, Placer, Calaveras, San Joaquin, Stanislaus, Tuolumne, Merced, Alameda, and Contra Costa. Of these, Alameda and Contra Costa Counties are located in the immediate Project Area, and at least a portion of the remaining counties are found

within the expanded Project Area (NMFS 2005). This ESU is currently listed as Federally Threatened (CDFG 2009a).

GREEN STURGEON – SOUTHERN DPS

The green sturgeon (*Acipenser medirostris*) is a long-lived, anadromous fish that occurs in low numbers in the San Francisco Bay/Delta system (Moyle 2002). Adults begin their upstream migration in March (Fisheries Technical Working Group, FTWG), and enter the Sacramento River until the end of September (FTWG). Spawning occurs upstream of the Delta from February through July, with peak activity believed to occur from April to June (FTWG, Moyle et al. 1995). Green sturgeon spawning occurs predominately in the upper Sacramento River (NMFS 2002). Juvenile green sturgeon spend 1 to 3 years in freshwater prior to emigrating to the ocean (NMFS 2005). In freshwater, green sturgeon use the Sacramento River and its major tributaries, but migrate through and may forage and rear in the Delta (NMFS 2006).

The Southern DPS of green sturgeon consists of coastal and Central Valley populations south of the Eel River (NMFS 2006). The portion of the DPS's range in Solano and San Francisco Counties lies within the immediate Project Area, but the majority of its distribution is located within the boundaries of the expanded Project Area (Tehama, Glenn, Butte, Colusa, Yolo, and Sacramento Counties). On June 6, 2006, the Southern DPS (consisting of coastal and Central Valley populations south of the Eel River) of green sturgeon was listed as threatened (NMFS 2006).

DELTA SMELT

The delta smelt (*Hypomesus transpacificus*) is a small, euryhaline fish endemic to the Sacramento-San Joaquin Delta, including Suisun Bay (Moyle 2002). Generally, the species inhabits shallow, open water habitat, where freshwater inflow from the Delta system meets salt water from the Pacific Ocean via San Francisco Bay, usually upstream of the two parts per thousand (ppt) isohaline (X2) (Moyle 2002). Delta smelt usually occur in loose aggregations in portions of the water column with relatively low velocities. This species relies on its small size and transparency to hide from predators in turbid water due to its relatively poor swimming ability (Moyle 2002).

The species generally lives about one year, although a small proportion of the population may live to spawn in its second year. Upstream migration from brackish water to spawning areas in the upper Delta occurs between December and June. Spawning has been reported to occur from December through July (USFWS 1994) or late February through June (Bennett 2005), with a peak in April and May. In the several weeks after hatching, during which the swim bladder and fins develop, the larvae are washed downstream to the productive mixing zone where they feed on planktonic copepods, cladocerans, and amphipods (Moyle 2002).

The delta smelt's range Delta smelt are found only from the Suisun Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties (USFWS 2009). Contra Costa and Solano Counties are located in the immediate Project Area, and the remainder of the range lies within this expanded Project Area. The delta smelt was listed as a Federal Threatened Species in 1993 (CDFG 2009a), and was listed as Endangered by the State on March 4, 2009 (Associated Press 2009).

LONGFIN SMELT

The longfin smelt (*Spirinchus thaleichthys*) is a pelagic, euryhaline fish, which occupies different areas of the San Francisco Estuary depending on the time of year and lifestage (Moyle 2002). Adult longfin smelt tend to aggregate in Suisun Bay and the western Delta in late fall, and then spawn in freshwater areas immediately upstream during winter and early spring. Peak spawning occurs between February and April (USBR 2008). Longfin smelt generally reach maturity at Age 2, with most individuals dying shortly after spawning. Just after hatching, longfin smelt larvae move quickly into the upper part of the water column, and are swept downstream into more brackish areas of the estuary (Moyle 2002). The geographic distribution of larval

longfin smelt is closely associated with the location of the estuary's 2-ppt isohaline (X2), with the center of the distribution being seaward of X2 (USBR 2008). Juveniles migrate further downstream to Suisun Bay and low salinity habitats for growth and rearing (Moyle 2002). Longfin smelt feed primarily on planktonic copepods (Moyle 2002).

Longfin smelt populations in California have historically been documented in the San Francisco Estuary, Humboldt Bay, the Eel River Estuary, and the Klamath River Estuary. Currently, the largest spawning population occurs in the San Francisco Estuary, and populations in other areas of California appear to be small and possibly ephemeral (USBR 2008). The San Francisco Bay-Delta longfin smelt's range includes Alameda, Contra Costa, and San Francisco Counties, which are located within the immediate Project Area, as well as Sacramento and San Joaquin Counties, which lie within the expanded Project Area. This population was listed as threatened under the California Endangered Species Act on March 4, 2009 (Associated Press 2009).

TIDEWATER GOBY

The tidewater goby (*Eucyclogobius newberryi*) prefers still-water habitats within lagoons and estuaries, and is generally not found in areas subjected to wave-wash (from a breached berm) or strong currents (flows from a river). They are generally found in water less than 1 meter deep over soft, sandy bottoms, and can tolerate a wide range of salinities and temperatures (Swift et al. 1989, Swenson and McCray 1996). Juvenile and adult tidewater gobies feed almost exclusively upon benthic invertebrates (Swenson and McCray 1996). The tidewater goby is an annual species, with individuals spawning several times during the year, and peak spawning occurring in April or May.

The tidewater goby lives in brackish water habitats along the California coast from Tillas Slough (mouth of the Smith River, Del Norte County) near the Oregon border south to Cocklebur Canyon (northern San Diego County) (USFWS 2007). The central portion of the tidewater goby's range lies within the coastal regions of the immediate Project Area (Sonoma County to Santa Barbara County), and northern and southern portions of its range are included within the boundaries of the expanded Project Area. The tidewater goby was listed as "endangered" under the Endangered Species Act by the United States Fish and Wildlife Service in 1994. It has been proposed for downlisting to a threatened species because current laws and regulations as largely or entirely eliminated the large-scale destruction of its habitat, and the species is currently believed to occupy 106 localities (USFWS 2007).

SANTA ANA SUCKER

The Santa Ana sucker (*Catostomus santaanae*) is found in small- to medium-sized permanent streams with cool (< 22°C), flowing water, where flows range from slight to swift (Moyle 2002). They prefer gravel, rubble, and boulder substrates, and are often associated with algae. Santa Ana suckers feed primarily on algae (mostly diatoms) and detritus that they scrape from rocks and other surfaces. The streams in which Santa Ana suckers live are subject to periodic, severe flooding, which results in substantial, periodic declines in their populations. This species, however, is adapted to such conditions, and is able to repopulate quickly following flood events (Moyle et al. 1989). The adaptations that make this possible include a short generation time, high fecundity, and relatively prolonged spawning period. Spawning occurs from mid-March to early July, with a peak in April. Santa Ana suckers are relatively short-lived, typically maturing at age 2 and living through their third summer (Moyle 2002).

Santa Ana suckers occur in the Los Angeles, San Gabriel, Santa Ana, and Santa Clara River Systems in southern California. They are currently restricted to headwater areas of Los Angeles and San Gabriel Rivers, and occur only in the lower portions of the Santa Ana River (Moyle 2002). Portions of this species range in Ventura, Los Angeles, Orange, and Riverside Counties lie within the expanded Project Area (Moyle et al. 1989). The Santa Ana sucker is currently listed threatened under the Federal Endangered Species Act (CDFG 2009a, USFWS 2000).

UNARMORED THREESPINE STICKLEBACK

The unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*) is a small, territorial fish that lives in permanent streams along the southern California coast (DFG 2000b). This species lives in shallow, weedy pools and backwaters, or among emergent vegetation along stream margins, where water velocities are slow (Moyle 2002). It requires cool (< 23-24°C) waters, but is able to tolerate a wide range of salinities (Moyle 2002). Threespine sticklebacks are usually found in clear water, where vegetation used in building their nests can grow. They tend to school loosely, feeding primarily on benthic organisms and aquatic plants. Threespine sticklebacks can complete their entire life cycle in either fresh or salt water, or may migrate between the two environments (Moyle 2002). Most sticklebacks live for one year. They move into freshwater breeding areas in the spring and summer (April-July). Males build the nests and perform extensive parental care both during and after incubation (Moyle 2002).

This fish is currently restricted to the upper Santa Clara River drainage in Los Angeles and Ventura counties, San Antonio Creek on Vandenburg Air Force Base, San Luis Obispo County, and two introduced populations, one in San Felipe Creek (San Diego County) and the other in Honda Creek (Santa Barbara County), which are outside the historic range of the species (DFG 2000b, Moyle 2002). These areas lie within the expanded Project Area. The unarmored threespine stickleback is currently listed as a State and Federal Endangered Species (CDFG 2009a, USFWS 1970).

ROUGH SCULPIN

This small slender sculpin are generally restricted to spring-fed tributaries to the Pit River in northern California, especially Fall River, Tule River, Sucker Springs Creek, lower Hat Creek. They are found in large, spring fed streams with cool, deep, rapid flows and clear water. They are usually associated with sand or gravel substrates and beds of aquatic plants (Moyle 2002). Spawning occurs from September through January in Fall river, but from mid-February to early May in Hat Creek. Nests are constructed under rocks or logs in a variety of habitats and the male defends the eggs until they hatch. This species is listed as threatened under the California ESA (CDFG 2009a). This species is one of the first species to be protected by the California Fish and Game Commission in 1973, prior to the promulgation of the California Endangered Species Act.

SHORTNOSE SUCKER

Shortnose suckers are native to the upper Klamath River and Lost River basins in Northern California and Oregon. They live in large shallow lakes, like Clear Lake Reservoir in Modoc County, with large beds of aquatic vegetation, usually in water more than 4.5 feet deep, although they have been observed in Willow Creek, a tributary to Clear Lake Reservoir. This species feeds primarily on aquatic insects, with juveniles being more benthically oriented and adults feeding more on zooplankton. Spawning takes place primarily in tributary streams, but sometimes in springs in lakes from late February to early May. Spawning occurs in areas of moderately fast current, with depths generally of 1 to 3 feet, and large gravel or cobble substrate. Larvae move downstream to lakes as soon as they can swim, with peak movement from late April through early June. This species is listed as endangered under both the federal and state ESAs (USFWS 1988).

LOST RIVER SUCKER

Lost River suckers are native to the Lost River and upper Klamath River systems, typically associated with large lakes including Tule Lake and Clear Lake Reservoir. These lakes were historically cool and clear with large beds of aquatic vegetation. Lost River suckers feed predominantly on benthic invertebrates. They spawn in tributaries to these lakes when flows increase, generally sometime between early February through early April. Spawning occurs in riffles with gravel or cobble substrate, moderate velocities and depths of 8 inches to 5 feet. Larvae move downstream to reservoirs soon after hatching. This species is listed as endangered under both state and federal ESAs (CDFG 2009a, USFWS 1988 53 FR 27130 27134).

MODOC SUCKER

Modoc sucker are currently known from the Ash Creek and Turner Creek watersheds, two small watersheds in the upper Pit River basin. Modoc suckers are generally small, living in pools in small, often intermittent, headwater streams. These streams have moderate gradients, low summer flows and high spring flows. They feed predominantly on detritus and algae, with associated invertebrates. Spawning takes place between April and June in small tributaries after flows increase in response to snow melt. Spawning typically occurs in pool tails or riffles over fine gravel. This species is listed as endangered under both state and federal ESAs (CDFG 2009a, USFWS 1985a) 50 FR 24526 24530).

TUI CHUB

Tui chubs are a chunky, large-scaled fish with small mouths and short rounded fins. Adult body size ranges from 4 to 16 inches (10 to 40 cm), depending on the environment in which they live. Almost every isolated or partially isolated drainage system in California, Nevada and Oregon supports at least one distinctive forms or sub-species. Tui chubs occur in a variety of quiet water habitats from river backwaters to lakes. They prefer warm, alkaline waters with well developed weed beds and fine substrate bottoms, but can do well under a variety of conditions. Tui chub are omnivorous feeding on aquatic insects, plants, and detritus. Tui chub are iteroparous, spawning more than once in a year and over the course of their adult lives, which can be 20 or more years. Spawning occurs between late April and early July, but may vary by locality. Spawning takes place in water less than 4.5 feet deep (1.5 meters) over beds of aquatic vegetation or algae covered substrate. Two subspecies occurring within the expanded project area are listed as endangered under both the state and federal ESAs (CDFG 2009a, USFWS 1985b, USFWS 1970). These are the Owens tui chub, which occupies the Owens River basin, and the Mohave tui chub, which is restricted to a few isolated ponds within San Bernadino County in the Mohave River basin.

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Species List for Program Area from
California Natural Diversity Database (CNDDDB),
Lepidopteran Species Descriptions, and
T/E Distribution Maps

SPECIAL-STATUS WILDLIFE SPECIES – LBAM PROGRAM AREA

ESA-T (Fed Threatened)
ESA-E (Fed Endangered)
CESA-T (CA Threatened)
CESA-E (CA Endangered)
DFG-SSC (CA Dept. of Fish & Game – Species of Special Concern)

Yellow Highlight = Insects

** = lepidoptera

AMPHIBIANS

California tiger salamander (*Ambystoma californiense*) – ESA-T/DFG-SSC

Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) – ESA-E/CESA-E

southern torrent salamander (*Rhyacotriton variegates*) – DFG-SSC

Coast Range newt (*Taricha torosa torosa*) – DFG-SSC (Monterey Co. south only)

desert slender salamander (*Batrachoseps major aridus*) – ESA-E/CESA-E

relictual slender salamander (*Batrachoseps relictus*) – DFG-SSC

Kern Canyon slender salamander (*Batrachoseps simatus*) – CESA-T

Breckenridge Mountain slender salamander (*Batrachoseps sp. 1*) – DFG-SSC

Tehachapi slender salamander (*Batrachoseps stebbinsi*) – CESA-T

yellow-blotched salamander (*Ensatina eschscholtzii croceator*) – DFG-SSC

large-blotched salamander (*Ensatina klauberi*) – DFG-SSC

limestone salamander (*Hydromantes brunus*) – CESA-T

Mount Lyell salamander (*Hydromantes platycephalus*) – DFG-SSC

Shasta salamander (*Hydromantes shastae*) – CESA-T

Owens Valley web-toed salamander (*Hydromantes sp. 1*) – DFG-SSC

Scott Bar salamander (*Plethodon asupak*) – CESA-T

Del Norte salamander (*Plethodon elongates*) – DFG-SSC

Siskiyou Mountains salamander (*Plethodon stormi*) – CESA-T

western tailed frog (*Ascaphus truei*) – DFG-SSC

western spadefoot (*Spea hammondi*) – DFG-SSC

arroyo toad (*Anaxyrus californicus*) – ESA-E/DFG-SSC

Yosemite toad (*Anaxyrus canorus*) – DFG-SSC

black toad (*Anaxyrus exsul*) – CESA-T

northern leopard frog (*Lithobates pipiens*) – DFG-SSC

lowland leopard frog (*Lithobates yavapaiensis*) – DFG-SSC

northern red-legged frog (*Rana aurora aurora*) – DFG-SSC

foothill yellow-legged frog (*Rana boylei*) – DFG-SSC

Cascades frog (*Rana cascadae*) – DFG-SSC

California red-legged frog (*Rana draytonii*) – ESA-T/DFG-SSC

Sierra Madre yellow-legged frog (*Rana muscosa*) – ESA-E/DFG-SSC

Oregon spotted frog (*Rana pretiosa*) – DFG-SSC

Sierra Nevada yellow-legged frog (*Rana sierrae*) – DFG-SSC

REPTILES

western pond turtle (*Actinemys marmorata*) – DFG-SSC

northwestern pond turtle (*Actinemys marmorata marmorata*) – DFG-SSC

southwestern pond turtle (*Actinemys marmorata pallida*) – DFG-SSC

barefoot banded gecko (*Coleonyx switaki*) – CESA-T

blunt-nosed leopard lizard (*Gambelia sila*) – ESA-E/CESA-E

coast (San Diego) horned lizard (*Phrynosoma coronatum (blainvillii population)*) – DFG-SSC

coast (California) horned lizard (*Phrynosoma coronatum (frontale population)*) – DFG-SSC

flat-tailed horned lizard (*Phrynosoma mcallii*) – DFG-SSC

island night lizard (*Xantusia riversiana*) – ESA-T

Sierra night lizard (*Xantusia vigilis sierrae*) – DFG-SSC

Coronado skink (*Eumeces skiltonianus interparietalis*) – DFG-SSC

orange-throated whiptail (*Aspidoscelis hyperythra*) – DFG-SSC

black legless lizard (*Anniella pulchra nigra*) – DFG-SSC

silvery legless lizard (*Anniella pulchra pulchra*) – DFG-SSC

southern rubber boa (*Charina umbratica*) – ESA-T

Baja California rat snake (*Bogertophis rosaliae*) – DFG-SSC

California mountain kingsnake (San Bernardino population) (*Lampropeltis zonata (parvirubra)*) – DFG-SSC

California mountain kingsnake (San Diego population) (*Lampropeltis zonata (pulchra)*) – DFG-SSC

San Joaquin whipsnake (*Masticophis flagellum ruddocki*) – DFG-SSC

Alameda whipsnake (*Masticophis lateralis euryxanthus*) – ESA-T/CESA-T

Santa Cruz Island gopher snake (*Pituophis catenifer pumilus*) – DFG-SSC

coast patch-nosed snake (*Salvadora hexalepis virgultea*) – DFG-SSC

giant garter snake (*Thamnophis gigas*) – ESA-T/CESA-T

two-striped garter snake (*Thamnophis hammondi*) – DFG-SSC

south coast garter snake (*Thamnophis sirtalis ssp.*) – DFG-SSC

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) – ESA-E/CESA-E

northern red-diamond rattlesnake (*Crotalus ruber ruber*) – DFG-SSC

BIRDS

tule greater white-fronted goose (*Anser albifrons elgasi*) – DFG-SSC

redhead (*Aythya americana*) – DFG-SSC

brant (*Branta bernicla*) – DFG-SSC

Barrow's goldeneye (*Bucephala islandica*) – DFG-SSC

fulvous whistling-duck (*Dendrocygna bicolor*) – DFG-SSC

harlequin duck (*Histrionicus histrionicus*) – DFG-SSC

greater sage-grouse (*Centrocercus urophasianus*) – DFG-SSC

Mount Pinos sooty grouse (*Dendragapus fuliginosus howardi*) – DFG-SSC

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) – DFG-SSC

Catalina California quail (*Callipepla californica catalinensis*) – DFG-SSC

common loon (*Gavia immer*) – DFG-SSC

short-tailed albatross (*Phoebastria albatrus*) – ESA-E/DFG-SSC

fork-tailed storm-petrel (*Oceanodroma furcata*) – DFG-SSC

ashy storm-petrel (*Oceanodroma homochroa*) – DFG-SSC

black storm-petrel (*Oceanodroma melania*) – DFG-SSC

American white pelican (*Pelecanus erythrorhynchos*) – DFG-SSC

California brown pelican (*Pelecanus occidentalis californicus*) – ESA-E/CESA-E

least bittern (*Ixobrychus exilis*) – DFG-SSC

wood stork (*Mycteria Americana*) – DFG-SSC

California condor (*Gymnogyps californianus*) – ESA-E/CESA-E

northern goshawk (*Accipiter gentilis*) – DFG-SSC

Swainson’s hawk (*Buteo swainsoni*) – CESA-T

northern harrier (*Circus cyaneus*) – DFG-SSC

bald eagle (*Haliaeetus leucocephalus*) – CESA-E

American peregrine falcon (*Falco peregrinus anatum*) – CESA-E

yellow rail (*Coturnicops noveboracensis*) – DFG-SSC

California black rail (*Laterallus jamaicensis coturniculus*) – CESA-T

California clapper rail (*Rallus longirostris obsoletus*) – ESA-E/CESA-E

light-footed clapper rail (*Rallus longirostris levipes*) – ESA-E/CESA-E

Yuma clapper rail (*Rallus longirostris yumanensis*) – ESA-E/CESA-T

lesser sandhill crane (*Grus canadensis Canadensis*) – DFG-SSC

greater sandhill crane (*Grus canadensis tabida*) – CESA-T

western snowy plover (*Charadrius alexandrinus nivosus*) – ESA-T/DFG-SSC

mountain plover (*Charadrius montanus*) – DFG-SSC

black tern (*Chlidonias niger*) – DFG-SSC

gull-billed tern (*Gelochelidon nilotica*) – DFG-SSC

black skimmer (*Rynchops niger*) – DFG-SSC

California least tern (*Sternula antillarum browni*) – ESA-E/CESA-E

marbled murrelet (*Brachyramphus marmoratus*) – ESA-T/CESA-E

tufted puffin (*Fratercula cirrhata*) – DFG-SSC

Cassin’s auklet (*Ptychoramphus aleuticus*) – DFG-SSC

Xantus' murrelet (*Synthliboramphus hypoleucus*) – CESA-T

western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) – CESA-E

short-eared owl (*Asio flammeus*) – DFG-SSC

long-eared owl (*Asio otus*) – DFG-SSC

burrowing owl (*Athene cunicularia*) – DFG-SSC

elf owl (*Micrathene whitneyi*) – CESA-E

great gray owl (*Strix nebulosa*) – CESA-E

northern spotted owl (*Strix occidentalis caurina*) – ESA-T/DFG-SSC

Vaux's swift (*Chaetura vauxi*) – DFG-SSC

black swift (*Cypseloides niger*) – DFG-SSC

gilded flicker (*Colaptes chrysoides*) – CESA-E

Gila woodpecker (*Melanerpes uropygialis*) – CESA-E

olive-sided flycatcher (*Contopus cooperi*) – DFG-SSC

willow flycatcher (*Empidonax traillii*) – CESA-E

little willow flycatcher (*Empidonax traillii brewsteri*) – CESA-E

southwestern willow flycatcher (*Empidonax traillii extimus*) – ESA-E/CESA-E

vermilion flycatcher (*Pyrocephalus rubinus*) – DFG-SSC

loggerhead shrike (*Lanius ludovicianus*) – DFG-SSC

Island loggerhead shrike (*Lanius ludovicianus anthonyi*) – DFG-SSC

San Clemente loggerhead shrike (*Lanius ludovicianus mearnsi*) – ESA-E/DFG-SSC

least Bell's vireo (*Vireo bellii pusillus*) – ESA-E/CESA-E

Catalina Hutton's vireo (*Vireo huttoni unitti*) – DFG-SSC

gray vireo (*Vireo vicinior*) – DFG-SSC

purple martin (*Progne subis*) – DFG-SSC

bank swallow (*Riparia riparia*) – CESA-T

coastal cactus wren (*Campylorhynchus brunneicapillus sandiegensis*) – DFG-SSC (San Diego and Orange Counties only)

Clark's marsh wren (*Cistothorus palustris clarkae*) – DFG-SSC

San Clemente Bewick's wren (*Thryomanes bewickii leucophrys*) – DFG-SSC

coastal California gnatcatcher (*Polioptila californica californica*) – ESA-T/DFG-SSC

Bendire's thrasher (*Toxostoma bendirei*) – DFG-SSC

Crissal thrasher (*Toxostoma crissale*) – DFG-SSC

Le Conte's thrasher (*Toxostoma lecontei*) – DFG-SSC

yellow warbler (*Dendroica petechia brewsteri*) – DFG-SSC

saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) – DFG-SSC

yellow-breasted chat (*Icteria virens*) – DFG-SSC

Lucy's warbler (*Vermivora luciae*) – DFG-SSC

Santa Cruz Island rufous-crowned sparrow (*Aimophila ruficeps obscura*) – DFG-SSC

grasshopper sparrow (*Ammodramus savannarum*) – DFG-SSC

San Clemente sage sparrow (*Amphispiza belli clementeae*) – ESA-E/DFG-SSC

song sparrow ("Modesto" population) (*Melospiza melodia*) – DFG-SSC

Channel Island song sparrow (*Melospiza melodia graminea, sensu*) – DFG-SSC

Suisun song sparrow (*Melospiza melodia maxillaries*) – DFG-SSC

Alameda song sparrow (*Melospiza melodia pusillula*) – DFG-SSC

San Pablo song sparrow (*Melospiza melodia samuelis*) – DFG-SSC

Bryant's savannah sparrow (*Passerculus sandwichensis alaudinus*) – DFG-SSC

Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) – CESA-E

large-billed savannah sparrow (*Passerculus sandwichensis rostratus*) – DFG-SSC

San Clemente spotted towhee (*Pipilo maculatus clementae*) – DFG-SSC

summer tanager (*Piranga rubra*) – DFG-SSC

Oregon vesper sparrow (*Poocetes gramineus affinis*) – DFG-SSC

Kern red-winged blackbird (*Agelaius phoeniceus aciculatus*) – DFG-SSC

tricolored blackbird (*Agelaius tricolor*) – DFG-SSC

yellow-headed blackbird (*Xanthocephalus xanthocephalus*) – DFG-SSC

MAMMALS

- Alameda Island mole (*Scapanus latimanus parvus*) – DFG-SSC
- Buena Vista Lake shrew (*Sorex ornatus relictus*) – ESA-E/DFG-SSC
- Monterey shrew (*Sorex ornatus salarius*) – DFG-SSC
- southern California saltmarsh shrew (*Sorex ornatus salicornicus*) – DFG-SSC
- Suisun shrew (*Sorex ornatus sinuosus*) – DFG-SSC
- Santa Catalina shrew (*Sorex ornatus willetti*) – DFG-SSC
- salt-marsh wandering shrew (*Sorex vagrans halicoetes*) – DFG-SSC
- Mexican long-tongued bat (*Choeronycteris Mexicana*) – DFG-SSC
- lesser long-nosed bat (*Leptonycteris yerbabuena*) – ESA-E
- California leaf-nosed bat (*Macrotus californicus*) – DFG-SSC
- pallid bat (*Antrozous pallidus*) – DFG-SSC
- Townsend's big-eared bat (*Corynorhinus townsendii*) – DFG-SSC
- spotted bat (*Euderma maculatum*) – DFG-SSC
- western red bat (*Lasiurus blossevillii*) – DFG-SSC
- western yellow bat (*Lasiurus xanthinus*) – DFG-SSC
- western mastiff bat (*Eumops perotis californicus*) – DFG-SSC
- pocketed free-tailed bat (*Nyctinomops femorosaccus*) – DFG-SSC
- big free-tailed bat (*Nyctinomops macrotis*) – DFG-SSC
- pygmy rabbit (*Brachylagus idahoensis*) – DFG-SSC
- Oregon snowshoe hare (*Lepus americanus klamathensis*) – DFG-SSC
- San Diego black-tailed jackrabbit (*Lepus californicus bennettii*) – DFG-SSC
- western white-tailed jackrabbit (*Lepus townsendii townsendii*) – DFG-SSC
- riparian brush rabbit (*Sylvilagus bachmani riparius*) – ESA-E/CESA-E
- Sierra Nevada mountain beaver (*Aplodontia rufa californica*) – DFG-SSC
- Point Arena mountain beaver (*Aplodontia rufa nigra*) – ESA-E/DFG-SSC
- Point Reyes mountain beaver (*Aplodontia rufa phaea*) – DFG-SSC

Nelson's antelope squirrel (*Ammospermophilus nelsoni*) – CESA-T

San Bernardino flying squirrel (*Glaucomys sabrinus californicus*) – DFG-SSC

Mohave ground squirrel (*Spermophilus mohavensis*) – CESA-T

Dulzura pocket mouse (*Chaetodipus californicus femoralis*) – DFG-SSC

northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*) – DFG-SSC

pallid San Diego pocket mouse (*Chaetodipus fallax pallidus*) – DFG-SSC

Marysville California kangaroo rat (*Dipodomys californicus eximius*) – DFG-SSC

Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*) – ESA-E/CESA-E

giant kangaroo rat (*Dipodomys ingens*) – ESA-E/CESA-E

San Bernardino kangaroo rat (*Dipodomys merriami parvus*) – ESA-E/DFG-SSC

short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*) – DFG-SSC

Fresno kangaroo rat (*Dipodomys nitratoides exilis*) – ESA-E/CESA-E

Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*) – ESA-E/CESA-E

Stephens' kangaroo rat (*Dipodomys stephensi*) – ESA-E/CESA-T

big-eared kangaroo rat (*Dipodomys venustus elephantinus*) – DFG-SSC

white-eared pocket mouse (*Perognathus alticolus alticolus*) – DFG-SSC

Tehachapi pocket mouse (*Perognathus alticolus inexpectatus*) – DFG-SSC

Salinas pocket mouse (*Perognathus inornatus psammophilus*) – DFG-SSC

Palm Springs pocket mouse (*Perognathus longimembris bangsi*) – DFG-SSC

Los Angeles pocket mouse (*Perognathus longimembris brevinasus*) – DFG-SSC

Jacumba pocket mouse (*Perognathus longimembris internationalis*) – DFG-SSC

Pacific pocket mouse (*Perognathus longimembris pacificus*) – ESA-E/DFG-SSC

white-footed vole (*Arborimus albipes*) – DFG-SSC

Sonoma tree vole (*Arborimus pomo*) – DFG-SSC

Mohave river vole (*Microtus californicus mohavensis*) – DFG-SSC

San Pablo vole (*Microtus californicus sanpabloensis*) – DFG-SSC

south coast marsh vole (*Microtus californicus stephensi*) – DFG-SSC

Owens Valley vole (*Microtus californicus vallicola*) – DFG-SSC

San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) – DFG-SSC

riparian (=San Joaquin Valley) woodrat (*Neotoma fuscipes riparia*) – ESA-E/DFG-SSC

San Diego desert woodrat (*Neotoma lepida intermedia*) – DFG-SSC

Monterey dusky-footed woodrat (*Neotoma macrotis Luciana*) – DFG-SSC

southern grasshopper mouse (*Onychomys torridus Ramona*) – DFG-SSC

Tulare grasshopper mouse (*Onychomys torridus tularensis*) – DFG-SSC

Anacapa Island deer mouse (*Peromyscus maniculatus anacapae*) – DFG-SSC

San Clemente deer mouse (*Peromyscus maniculatus clementis*) – DFG-SSC

salt-marsh harvest mouse (*Reithrodontomys raviventris*) – ESA-E/CESA-E

Point Reyes jumping mouse (*Zapus trinotatus orarius*) – DFG-SSC

Santa Catalina Island fox (*Urocyon littoralis catalinae*) – ESA-E/CESA-T

San Clemente Island fox (*Urocyon littoralis clementae*) – CESA-T

San Nicolas Island fox (*Urocyon littoralis dickeyi*) – CESA-T

San Miguel Island fox (*Urocyon littoralis littoralis*) – ESA-E/CESA-T

Santa Cruz Island fox (*Urocyon littoralis santacruzae*) – ESA-E/CESA-T

Santa Rosa Island fox (*Urocyon littoralis santarosae*) – ESA-E/CESA-T

San Joaquin kit fox (*Vulpes macrotis mutica*) – ESA-E/CESA-T

Sierra Nevada red fox (*Vulpes vulpes necator*) – CESA-T

southern sea otter (*Enhydra lutris nereis*) – ESA-T

California wolverine (*Gulo gulo*) – CESA-T

southwestern river otter (*Lontra canadensis Sonora*) – DFG-SSC

Humboldt marten (*Martes americana humboldtensis*) – DFG-SSC

Pacific fisher (*Martes pennanti (pacifica) DPS*) – DFG-SSC

American badger (*Taxidea taxus*) – DFG-SSC

Channel Islands spotted skunk (*Spilogale gracilis amphiala*) – DFG-SSC

Yuma mountain lion (*Puma concolor browni*) – DFG-SSC

Guadalupe fur-seal (*Arctocephalus townsendi*) – ESA-T/CESA-T

Steller (=northern) sea-lion (*Eumetopias jubatus*) – ESA-T

peninsular bighorn sheep (*Ovis canadensis nelsoni* DPS) – ESA-E/CESA-T

Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*) – ESA-E/CESA-E

FISHES

river lamprey (*Lampetra ayresii*) – DFG-SSC

Kern brook lamprey (*Lampetra hubbsi*) – DFG-SSC

Klamath River lamprey (*Lampetra similis*) – DFG-SSC

Goose Lake lamprey (*Lampetra tridentata* ssp. 1) – DFG-SSC

green sturgeon (*Acipenser medirostris*) – ESA-T/DFG-SSC

coast cutthroat trout (*Oncorhynchus clarkii clarkia*) – DFG-SSC

pink salmon (*Oncorhynchus gorbuscha*) – DFG-SSC

chum salmon (*Oncorhynchus keta*) – DFG-SSC

coho salmon - southern Oregon /

northern California ESU (*Oncorhynchus kisutch*) – ESA-T/DFG-SSC

coho salmon - central California coast (*Oncorhynchus kisutch*) – ESA-E/CESA-E

Eagle Lake rainbow trout (*Oncorhynchus mykiss aquilarum*) – DFG-SSC

Kern River rainbow trout (*Oncorhynchus mykiss gilberti*) – DFG-SSC

steelhead - Klamath Mountains (*Oncorhynchus mykiss irideus*)- DFG-SSC

steelhead - south/central California Coast (*Oncorhynchus mykiss irideus*) – ESA-T/DFG-SSC

steelhead - Central Valley (*Oncorhynchus mykiss irideus*) – ESA-T

steelhead - northern California (*Oncorhynchus mykiss irideus*) – ESA-T/DFG-SSC

summer-run steelhead trout (*Oncorhynchus mykiss irideus*) – DFG-SSC

southern steelhead – southern California (*Oncorhynchus mykiss irideus*) – ESA-E/DFG-SSC

Goose Lake redband trout (*Oncorhynchus mykiss* ssp. 1) – DFG-SSC

McCloud River redband trout (*Oncorhynchus mykiss* ssp. 2) – DFG-SSC

chinook salmon - Central Valley fall / late fall-run (*Oncorhynchus tshawytscha*) – DFG-SSC

chinook salmon - California coastal (*Oncorhynchus tshawytscha*) – ESA-T

chinook Salmon - spring-run Klamath-Trinity Rivers pop. (*Oncorhynchus tshawytscha*) – DFG-SSC

spring-run chinook salmon (*Oncorhynchus tshawytscha spring-run*) – ESA-T/CESA-T

chinook salmon winter-run (*Oncorhynchus tshawytscha winter-run*) – ESA-E/CESA-E

Delta smelt (*Hypomesus transpacificus*) – ESA-T/CESA-T

longfin smelt (*Spirinchus thaleichthys*) – DFG-SSC

eulachon (*Thaleichthys pacificus*) – DFG-SSC

Lahontan Lake tui chub (*Gila bicolor pectinifer*) – DFG-SSC

Owens tui chub (*Gila bicolor snyderi*) – ESA-E/CESA-E

Eagle Lake tui chub (*Gila bicolor ssp. 1*) – DFG-SSC

Goose Lake tui chub (*Gila bicolor thalassina*) – DFG-SSC

blue chub (*Gila coerulea*) – DFG-SSC

arroyo chub (*Gila orcuttii*) – DFG-SSC

Clear Lake hitch (*Lavinia exilicauda chi*) – DFG-SSC

Pit roach (*Lavinia symmetricus mitrulus*) – DFG-SSC

Navarro roach (*Lavinia symmetricus navarroensis*) – DFG-SSC

Gualala roach (*Lavinia symmetricus parvipinnis*) – DFG-SSC

San Joaquin roach (*Lavinia symmetricus ssp. 1*) – DFG-SSC

Tomales roach (*Lavinia symmetricus ssp. 2*) – DFG-SSC

Red Hills roach (*Lavinia symmetricus ssp. 3*) – DFG-SSC

Monterey roach (*Lavinia symmetricus subditus*) – DFG-SSC

hardhead (*Mylopharodon conocephalus*) – DFG-SSC

Sacramento splittail (*Pogonichthys macrolepidotus*) – DFG-SSC

Santa Ana speckled dace (*Rhinichthys osculus ssp. 3*) – DFG-SSC

Owens sucker (*Catostomus fumeiventris*) – DFG-SSC

Modoc sucker (*Catostomus microps*) – ESA-E/CESA-E

Goose Lake sucker (*Catostomus occidentalis lacusanserinus*) – DFG-SSC

mountain sucker (*Catostomus platyrhynchus*) – DFG-SSC
Santa Ana sucker (*Catostomus santaanae*) – ESA-T/DFG-SSC
Klamath largescale sucker (*Catostomus snyderi*) – DFG-SSC
shortnose sucker (*Chasmistes brevirostris*) – ESA-E/CESA-E
Lost River sucker (*Deltistes luxatus*) – ESA-E/CESA-E
unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*) – ESA-E/CESA-E
Sacramento perch (*Archoplites interruptus*) – DFG-SSC
Russian River tule perch (*Hysterocarpus traski pomo*) – DFG-SSC
tidewater goby (*Eucyclogobius newberryi*) – ESA-E/DFG-SSC
rough sculpin (*Cottus asperimus*) – CESA-T
bigeye marbled sculpin (*Cottus klamathensis macrops*) – DFG-SSC
reticulate sculpin (*Cottus perplexus*) – DFG-SSC

INVERTEBRATES

Morro shoulderband (=banded dune) snail (*Helminthoglypta walkeriana*) – ESA-E
Trinity bristle snail (*Monadenia infumata setosa*) – CESA-T
Conservancy fairy shrimp (*Branchinecta conservation*) – ESA-E
longhorn fairy shrimp (*Branchinecta longiantenna*) – ESA-E
vernal pool fairy shrimp (*Branchinecta lynchi*) – ESA-T
San Diego fairy shrimp (*Branchinecta sandiegonensis*) – ESA-E
Riverside fairy shrimp (*Streptocephalus woottoni*) – ESA-E
vernal pool tadpole shrimp (*Lepidurus packardi*) – ESA-E
Shasta crayfish (*Pacifastacus fortis*) – ESA-E/CESA-E
California freshwater shrimp (*Syncaris pacifica*) – ESA-E/CESA-E
Zayante band-winged grasshopper (*Trimerotropis infantilis*) – ESA-E
Ohlone tiger beetle (*Cicindela ohlone*) – ESA-E
valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) – ESA-T
Delta green ground beetle (*Elaphrus viridis*) – ESA-T

Mount Hermon (=barbate) June beetle (*Polyphylla barbata*) – ESA-E

Delhi Sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*) – ESA-E

**Lange's metalmark butterfly (*Apodemia mormo langei*) – ESA-E

**San Bruno elfin butterfly (*Callophrys mossii bayensis*) – ESA-E

**El Segundo blue butterfly (*Euphilotes battoides allyni*) – ESA-E

**Smith's blue butterfly (*Euphilotes enoptes smithi*) – ESA-E

**Bay checkerspot butterfly (*Euphydryas editha bayensis*) – ESA-T

**quino checkerspot butterfly (*Euphydryas editha quino*) – ESA-E

**Kern primrose sphinx moth (*Euproserpinus euterpe*) – ESA-T

**Palos Verdes blue butterfly (*Glaucopsyche lygdamus palosverdesensis*) – ESA-E

**Mission blue butterfly (*Plebejus icarioides missionensis*) – ESA-E

**lotis blue butterfly (*Plebejus idas lotis*) – ESA-E

**Laguna Mountains skipper (*Pyrgus ruralis lagunae*) – ESA-E

**callippe silverspot butterfly (*Speyeria callippe callippe*) – ESA-E

**Behren's silverspot butterfly (*Speyeria zerene behrensii*) – ESA-E

**Hippolyta fritillary (*Speyeria zerene hippolyta*) – ESA-T

**Myrtle's silverspot (*Speyeria zerene myrtleae*) – ESA-E

Black abalone (*Haliotis cracherodii*) – ESA-E

White abalone (*Haliotis sorenseni*) – ESA-E

LBAM Federally Listed Lepidopteran Species Status and Life Histories

Lange's metalmark butterfly (*Apodemia mormo langei*)

The Lange's metalmark butterfly is federally listed on the Endangered Species Act as endangered (Federal Register 1976). Critical habitat has been proposed for this species (Federal Register 1977), but has not been designated. Lange's metalmark butterfly was historically restricted to sand dunes along the southern bank of the Sacramento-San Joaquin River. Currently, this species is found only at Antioch Sand Dunes in Contra Costa County (USFWS 2008c).

Lange's metalmark has only one generation a year. All the life stages of Lange's metalmark butterflies are found close to the obligate larval food plant, naked buckwheat (*Eriogonum nudum* var. *auriculatum*) (USFWS 2008c). The eggs are deposited on buckwheat throughout the mating flight period during August and September. Larvae hatch during the rainy months. The adults may use buckwheat and various species in the sunflower family for nectar (2008b).

All known populations of the Lange's metalmark butterfly occur in the immediate Program Area.

San Bruno elfin butterfly (*Callophrys mossii bayensis*)

The San Bruno elfin butterfly is federally listed under the Endangered Species Act as endangered (Federal Register 1976). Critical habitat has been proposed for this species (Federal Register 1977), but not been designated.

The San Bruno elfin is found only in counties around San Francisco Bay. This species is found at rocky outcrops and cliffs in coastal scrub in the coastal mountains at elevations from 200 to 5,000 feet where its larval food plant, broadleaf stonecrop (*Sedum spathulifolium*), grows (Shepherd, et al. 2005; Caterino 2009). The largest existing colony is on San Bruno Mountain in San Mateo County. There are other populations in San Mateo County, as well as in Marin and Contra Costa counties.

The adult flight period extends from late February to mid-April, usually peaking in March and early April. Eggs are laid on the host plant and hatch within five to seven days (Shepherd, et al. 2005). The first and second larval instars feed by tunneling into the succulent leaves of the host plant. The third and fourth instars move up to the flowers of the food plant and feed while they are tended by several species of ants that protect them from predators in return for honeydew produced by the larvae. This species pupates in loose soil and litter at the base of the larval food plant. Diapause in the San Bruno elfin occurs in the pupal stage and lasts from June until the following February (Shepherd, et al. 2005). The adults then emerge and mate. The food sources for adults has not been fully determined but may be shrubs that vary with the location.

All known populations of the San Bruno elfin butterfly occur in the immediate Program Area.

El Segundo blue butterfly (*Euphilotes battoides allyni*)

The El Segundo blue butterfly is federally listed as endangered (Federal Register 1976). Critical habitat has been proposed for this species (Federal Register 1977), but has not been designated. The historical range of this butterfly was the El Segundo sand dunes, which formerly covered about 4.5 square miles in Los Angeles County (USFWS 1998a), including interrupted extensions to the north into what is present-day Ocean Park, and southerly to Malaga Cove in Palos Verdes. The El Segundo blue is now restricted to four locations in

what is left of those dunes (USFWS 2008a). The butterfly is found only where its host plant, seacliff buckwheat (*Eriogonum parviflorum*) grows.

The El Segundo blue emerges during summer, when its host plant flowers. Adults are active from mid-June to early September, depending on the weather. The adult life of these butterflies lasts only a few days, during which time they mate and lay eggs. The eggs hatch within a week or so of their deposition. The larvae feed on the flower heads of the host plant for approximately one month before they enter the pupal stage, which usually lasts until the following summer. However, some pupae may remain in diapause for two years or more (USFWS 2008a).

All known populations of the El Segundo blue butterfly occur in the immediate Program Area.

Smith's blue butterfly (*Euphilotes enoptes smithi*)

The Smith's blue butterfly is federally listed under the Endangered Species Act as endangered (Federal Register 1976). Critical habitat has been proposed for this species (Federal Register 1977), but has not been designated.

Smith's blue butterfly historically ranged along the coast from Monterey Bay south through Big Sur to near Point Gorda, occurring in scattered populations in association with coastal dune, coastal scrub, chaparral, and grassland habitats (Caterino 2009). Smith's blues are found in coastal sand dunes and cliff/chaparral areas along the central California coast in Monterey, Santa Cruz, and San Mateo Counties.

Smith's blues spend their entire lives in association with two species of buckwheat, seacliff buckwheat (*Eriogonum parvifolium*) and seaside buckwheat (*Eriogonum latifolium*) (USFWS 2006). The larvae feed only on these plants, which are also the primary nectar sources for adults. The butterflies generally spend their lifetime within 200 feet of the host plant on which they emerged. The adults emerge in late summer and early autumn to mate and lay eggs on the flowers of these host plants. Adults are active for four to ten weeks, but the flight period can vary between locations and from one year to the next (USFWS 2006). The eggs hatch in four to eight days, and the larvae begin to feed on the flowers of the plant. Ants help the larvae survive by protecting them from predatory spiders and parasitic wasps in return for a sugary substance the caterpillar excretes from the surface of its abdomen. Following about a month of feeding and development, the larvae pupate, sheltering in the layer of litter beneath the buckwheat plants. Pupae remain dormant until the following year, when the new adults emerge.

All known populations of the Smith's blue butterfly occur in the immediate Program Area.

Bay checkerspot butterfly (*Euphydryas editha bayensis*)

See Section 10.1.2.2 of LBAM EIR

Quino checkerspot butterfly (*Euphydryas editha quino*)

The quino checkerspot butterfly is listed under the Endangered Species Act as endangered (Federal Register 1997a). Critical habitat has been designated for this species (Federal Register 2002) and a revision of the designated critical habitat has been proposed (Federal Register 2008).

The quino checkerspot once was found from the Santa Monica Mountains south to the northern parts of Baja California. There are now only a few known U.S. populations, all in southwestern Riverside and San Diego counties.

Adults emerge over several weeks, so the flying period can extend from late-February to mid-April, although individuals only live for two weeks or less (Federal Register 2002). Mating and egg-laying occur during this period. The eggs hatch about a week and a half after laying and the larvae begin feeding immediately. The larvae may use either dwarf plantain (*Plantago erecta*) or exserted Indian paintbrush (*Castilleja exserta* spp. *exserta*; = purple owl's clover), both of which may be common in meadows and upland sage scrub/chapparral habitat. These plants are annuals which die back in the summer and the larvae thus have a period of summer diapause during which they do not feed. Based on laboratory studies, larvae can apparently go in and out of diapause over multiple years (Federal Register 2002). Secondary host species can be important if the primary host is not available for all larval stages (Federal Register 2002). In the late winter and early spring, the host plants appear again and the larvae commence feeding again before entering a short pupal phase. Adult quino checkerspots feed primarily on nectar from annuals (their flight period is too early in the season for most perennials to be in bloom) including goldfields (*Lasthenia* sp.), cryptantha (*Cryptantha* sp.), gilia (*Gilia* sp.), linanthus (*Linanthus* sp.), and trefoil (*Lotus* sp.).

All known populations of the quino checkerspot butterfly occur in the immediate Program Area.

Kern primrose sphinx moth (*Euproserpinus euterpe*)

See Section 10.1.2.2 of LBAM EIR

Palos Verdes blue butterfly (*Glaucopsyche lygdamus palosverdesensis*)

The Palos Verdes blue butterfly is federally listed as endangered (Federal Register 2008c). Critical habitat has been designated for this species (Federal Register 2008c).

Historically, the Palos Verdes Blue was known to occur throughout the Palos Verdes Peninsula, in Los Angeles County. Throughout the 1980' and up until 1993, the species was not observed and thought to be extinct, however, in 1994, the species was discovered on the Defense Fuel Support in San Pedro. The Palos Verdes Blue currently occurs here and in the former Palos Verdes naval housing area (USFWS 2008c).

The Palos Verdes Blue prefers coastal sage scrub habitat. Habitat elements that this butterfly requires are dependent on two known larval hostplants, Santa Barbara milkvetch (*Astragalus trichopodus* var. *lonchus*) and common deerweed (*Lotus scoparius*) (USFWS 2008c).

The Palos Verdes Blue has a single adult flight period extending from late January through early May (USFWS 2008c). Females lay their eggs during the adult flight season and deposited in the flower heads of either deerweed or locoweed, where the caterpillars will feed. When the larvae are mature, they relocate to the base of the food plant and pupation occurs. The pupae remain dormant through the summer and winter, emerging as adult butterflies early the following spring (Black and Vaughan 2005).

All known populations of the Palos Verdes blue butterfly occur in the immediate Program Area.

Mission blue butterfly (*Plebejus icarioides missionensis*)

The Mission blue butterfly is federally listed as endangered (Federal Register 1976). Critical habitat has been proposed for this species (Federal Register 1977), but has not been designated. Historically, the Mission blue butterfly was widespread along the San Francisco and Marin peninsulas, however, currently this species is now restricted to a few localities from Twin Peaks, Fort Baker in Marin County, and the majority of the populations found in the San Bruno mountains in San Mateo County (USFWS 200b).

The Mission blue butterfly occupies coastal chaparral, coastal scrub, and coastal grasslands. Habitat elements that are crucial in supporting this species are the presence of the larval host plant silver lupine (*Lupinus*

albifrons), summer lupine (*L. formosus*), and many-colored lupine (*L. versicolor*) and the availability of nectar resources from hairy false goldenaster (*Heterotheca villosa*), bluedicks (*Dichelostemma capitatum*), and seaside buckwheat (*Eriogonum latifolium*) (USFWS 2007a, Shepherd, et al. 2005).

The Mission blue butterfly has a single generation per year. This butterfly's adult flight season takes place during late March through early July, depending on location and climatic conditions. Females lay their eggs during the adult flight season. After hatching, larvae begin to feed immediately on flowers and the inner tissue of the host plant's leaves before entering diapause to pass through the winter. In the spring, larvae emerge from their dormant state and resume feeding before pupating in the soil beneath the host plant (USFWS 2007a).

All known populations of the Mission blue butterfly occur in the immediate Program Area.

Lotis blue butterfly (*Plebejus idas lotis*)

The lotis blue butterfly is federally listed as endangered (Federal Register 1976). Critical habitat has been proposed for this species, but has not been designated (Federal Register 1977). This butterfly was historically found in several coastal localities in Mendocino, northern Sonoma, and northern Marin (USFWS 1985). The lotis blue butterfly is one of the rarest butterflies in the world and has not been observed since 1983 (USFWS 2007b).

The lotis blue butterfly's preferred habits are wet meadows and sphagnum willow bogs. Little is known about this butterfly's larval food plant because larva has not been observed feeding, however, evidence suggests that the seaside bird's foot trefoil (*Lotus formosissimus*) could likely be the host plant, though it has not been confirmed. Lupine species associated with this butterfly's habitat are other possible food sources (USFWS 2007b).

Little is known about the life history of lotis blue and therefore its life history is based on what is known about the northern blue butterfly, a closely related species. The lotis blue butterfly has a single generation per year. Flight season for this butterfly takes place during the months of mid-April through early July (USFWS 1985). Females lay their eggs during the adult flight season. After hatching, larvae begin to feed immediately before entering diapause to pass through the winter. In the spring, larvae emerge from their dormant state and begin feeding for four to six weeks before pupating (USFWS 2007b).

All recorded populations of the lotis blue butterfly were in the immediate Program Area.

Laguna Mountains skipper (*Pyrgus ruralis lagunae*)

The Laguna Mountains skipper is federally listed as endangered (Federal Register 1997a). Critical habitat has been designated for this species (Federal Register 2006). The Laguna Mountains skipper is restricted to the Laguna Mountains and Mt. Palomar in San Diego County, California. This butterfly prefers open montane meadow habitats between 4,000 and 6,000 feet altitude within yellow pine forests of the Laguna Mountains and Mount Palomar (Federal Register 1997a).

The larvae of the Laguna Mountains Skipper feed solely on Cleveland's horkelia (*Horkelia clevelandii*) which is this butterfly's primary food source (USFWS 2008a). This butterfly has two adult flight seasons each year during which the butterflies mate, one in mid spring (April to May) and a second in late summer (June to late July). Adults lay eggs on the underside of horkelia leaves, apparently preferring plants on thin rocky soils. This species diapauses as a full grown larva and may live approximately 10 to 20 days in the adult stage (Federal Register 1997a).

All known populations of the Laguna Mountains skipper occur in the immediate Program Area.

Callippe silverspot butterfly (*Speyeria callippe callippe*)

The callippe silverspot butterfly is federally listed as endangered (Federal Register 1997b). Critical habitat has been proposed for this species (Federal Register 1978, 1980), but has not been designated. The historic range for this butterfly extended over much of the San Francisco Bay region, primarily in grassland habitat (Shepherd, et al. 2005). The species was known to occur in seven major populations, however, it is now known only from the San Bruno mountains and an undisclosed city park in Alameda County (Caterino 2009).

The callippe silverspot prefers native grassland and adjacent habitats in the San Francisco Bay region. Females lay their eggs on the dry remains of the larval food plant, Johnny-jump-up (*Viola pedunculata*) or on the surrounding debris. After hatching, the larvae wander a short distance and spin a silk pad where they remain inactive through fall and winter. Following the winter rains, the larvae emerge and immediately seek out to feed on their host plant. The larvae molt into the pupal stage after two to three months of feeding. The butterfly emergence occurs two weeks after the pupal stage begins. Adults live for approximately three weeks (Caterino 2009; Shepherd, et al. 2005). The primary food for the adult butterflies is floral nectar (Caterino 2009). Depending upon environmental conditions, egg-laying occurs from mid-May to late July (Shepherd, et al. 2005).

All known populations of the callippe silverspot butterfly occur in the immediate Program Area.

Oregon silverspot (*Speyeria callippe hippolyta*)

The Oregon silverspot butterfly is federally as threatened (Federal Register 1980b). Critical habitat has been designated for this species, but is only in Oregon (Federal Register 1980b). The Oregon silverspot is historically known to inhabit coastal habitat ranging from northern California to Oregon and up to southern Washington. It is now extirpated from Washington State and found at only a few sites in California and Oregon. Currently, populations for this butterfly exist at six sites from the counties of Del Norte at Lake Earl, Lane at Rock Creek, Big Creek, and Bray Point, Tillamook at Cascade head and Mt. Hebo, and Clatsop at Clatsop Plains (USFWS 2001)

The Oregon silverspot occupies three types of habitats: coastal salt spray meadows, stabilized dunes, or montane meadows. The butterfly's primary larval host plant is the hooked-spur violet (*Viola adunca*). Adults emergence starts in July through September to mate. The eggs are laid during the fall and hatch shortly thereafter. The larvae feed on the lining of the eggshell and enter a dormant state upon which they pass winter. Larvae resume feeding in the spring, until the late spring or summer when they pupate. Their pupation time is short and adults soon emerge to continue the cycle. Primary food sources for this butterfly are early blue violets, however Aleutian violets, and other *Viola* sp. are known to serve as secondary food plants (USFWS2001).

All known California populations of the Oregon silverspot butterfly occur in the immediate Program Area.

Behren's silverspot butterfly (*Speyeria zerene behrensi*)

The Behren's silverspot butterfly is federally listed as endangered (Federal Register 1997b). No critical habitat has been proposed for this species. The Behren's silverspot butterfly is historically known from Sonoma County near the mouth of the Russian River and northward along the coast of southern Mendocino County near Point Arena. (USFWS 2003). Currently, this butterfly is known to occur in the Point Arena area.

The Behren's silverspot butterfly prefers coastal terrace prairie habitat found along the western coast of Mendocino and Sonoma counties. Habitat elements that are crucial in supporting this species are the presence of the larval host plant (*Viola* sp.) and the availability of nectar sources such as yellow bush lupine and species of thistles, the butterflies' primary food source (USFWS 2003).

The adult flight period of the Behren's silverspot butterfly occurs from July to August, during which time males search open areas for newly emerged females. Females primarily lay their eggs on the larval host plant. After hatching, the larvae wander a short distance and spin a silk pad where they remain inactive through fall and winter. At the end of their diapause in the spring, the larvae immediately seek fresh leaves from the host food plant. Before forming a pupa, the larvae pass through five life stages. Adults emerge in approximately 14 days and live up to about 21 days (USFWS 2003).

All known populations of the Behren's silverspot butterfly occur in the immediate Program Area.

Myrtle's silverspot (*Speyeria zerene myrtleae*)

The Myrtle's silverspot butterfly is federally listed as endangered (Federal Register 1992). No critical habitat has been designated for this species. This butterfly was historically located in dunes and bluffs from Point Ano Nueva in San Mateo County north to the river mouth of the Russian River in Sonoma County. Other historical records for this butterfly are known from Point Reyes Station in Marin County (USFWS 1998b, USFWS 2009a). Currently, four populations are known from coastal dune and grassland habitats found in Point Reyes National Seashore at Tomales Point and North Beach and in Marin County and east of Bodega Bay (USFWS 2009).

Myrtle's silverspot occurs in coastal dune or prairie habitat from Marin to San Mateo counties and prefers areas that are sheltered by the prevailing winds. Habitat elements that are crucial in supporting this species are the presence of the larval host plant (*Viola* sp.) and the availability of nectar sources such as western pennyroyal, gumweed, seaside daisy, and yellow sand verbena, the butterflies' primary food source (USFWS 2009).

Females are single-brooded and lay their eggs in the debris and dried stems of *Viola adunca*, the larval food plants. Larvae will emerge from their pupae from mid-June to mid-July. After hatching, the larvae wander a short distance and spin a silk pad where they remain inactive through fall and winter. At the end of their diapause in the spring, the larvae immediately seek fresh leaves from the host food plant. After seven to ten weeks, the larvae form their pupa within a chamber of leaves drawn together with silk. Adults may emerge in about two weeks and can live for three weeks. The adult flight season may range from late June to early September (USFWS 1998b, 2009).

All known populations of the Myrtle's silverspot butterfly occur in the immediate Program Area.

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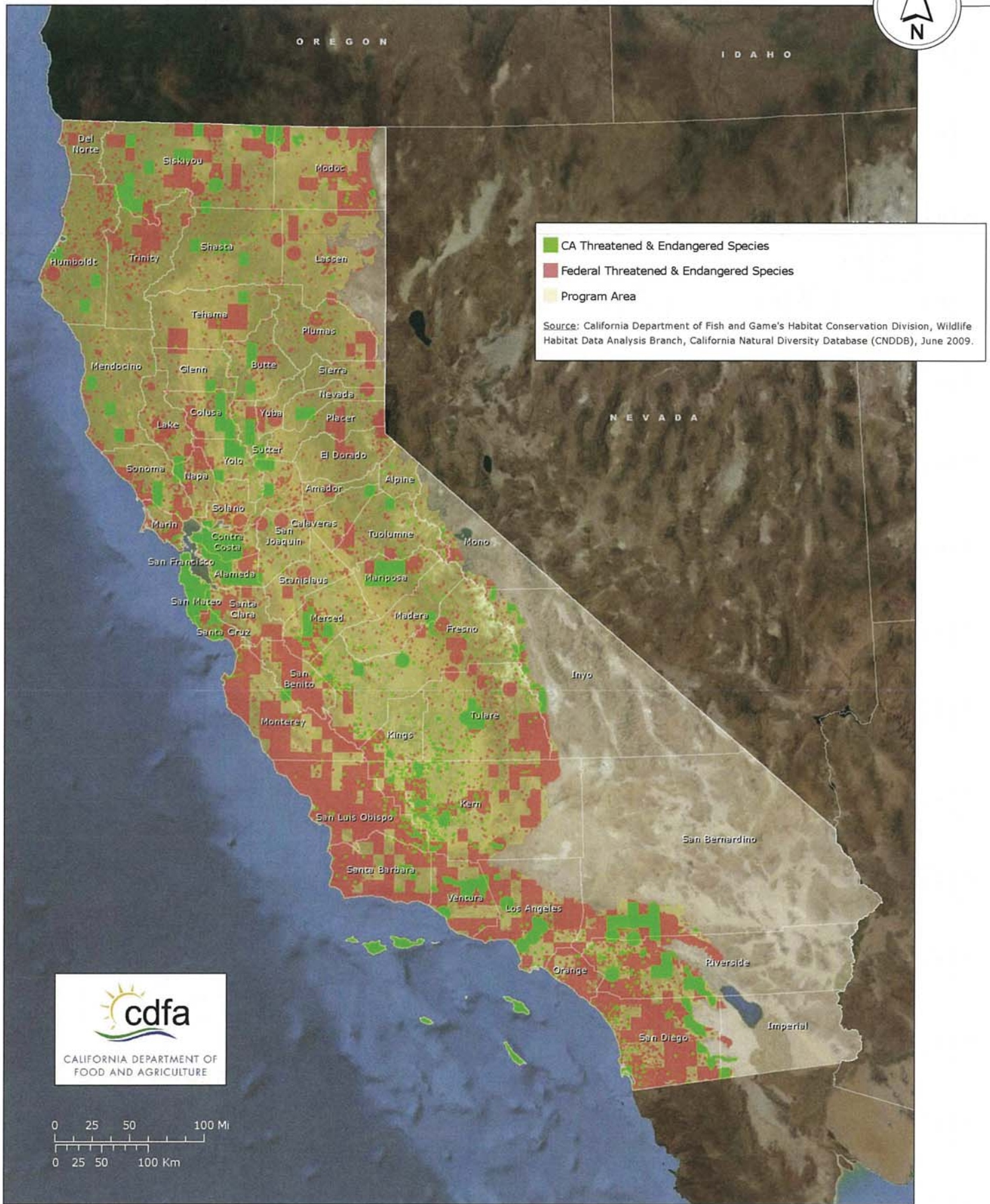
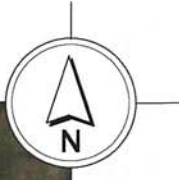
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United States Fish and Wildlife Service. 2008b. Lange's metalmark butterfly (*Apodemia mormo langei*), Antioch Dunes evening-primrose (*Oenothera deltoides* subsp. *howellii*), Contra Costa wallflower (*Erysimum capitatum* var. *angustatum*) 5-Year Review: Summary and Evaluation. June, 2008.

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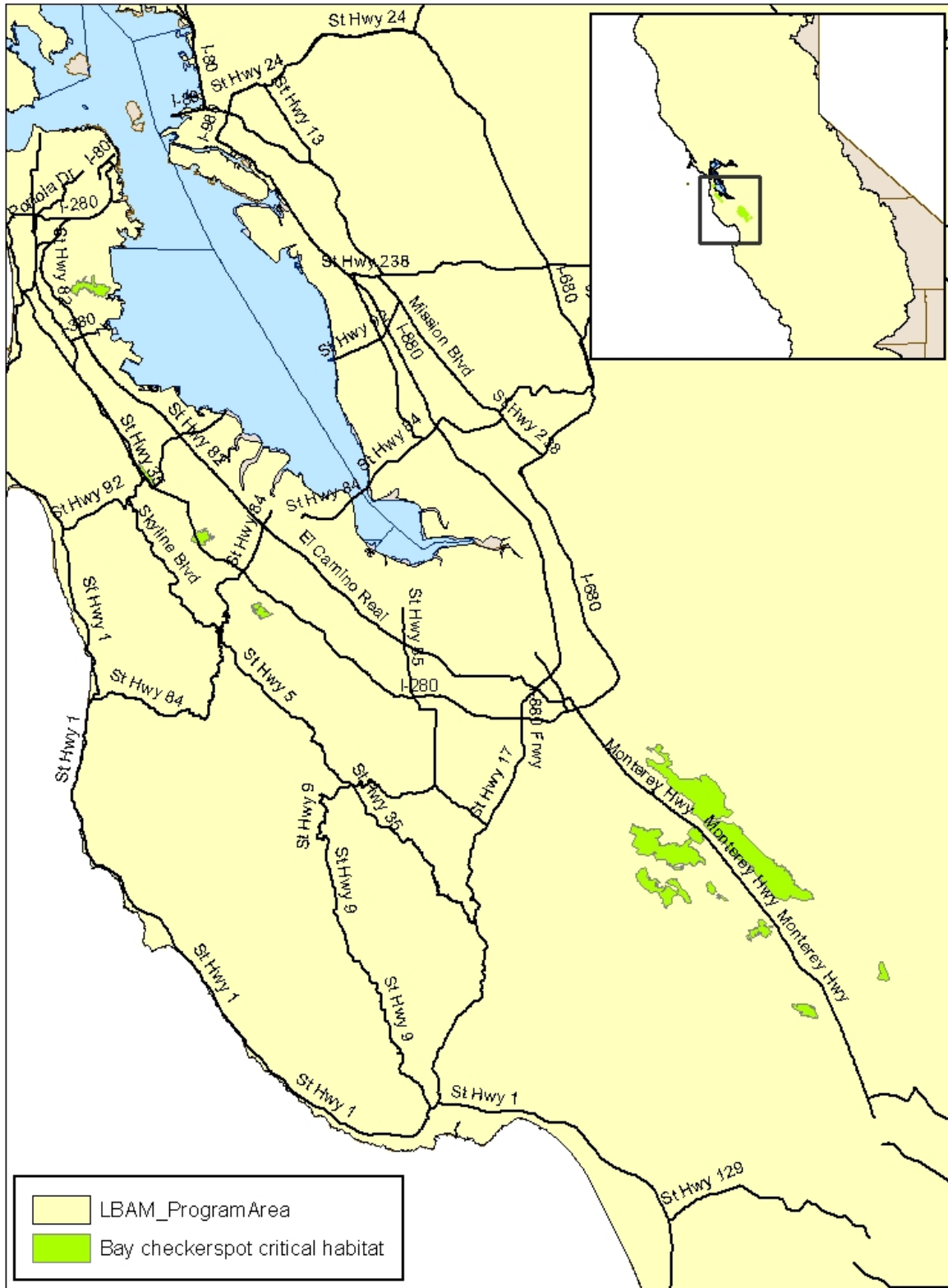
United States Fish and Wildlife Service. 2009. Myrtle's silverspot butterfly (*Speyeria zereene myrtleae*) 5-Year Review: Summary and Evaluation. January, 2009.

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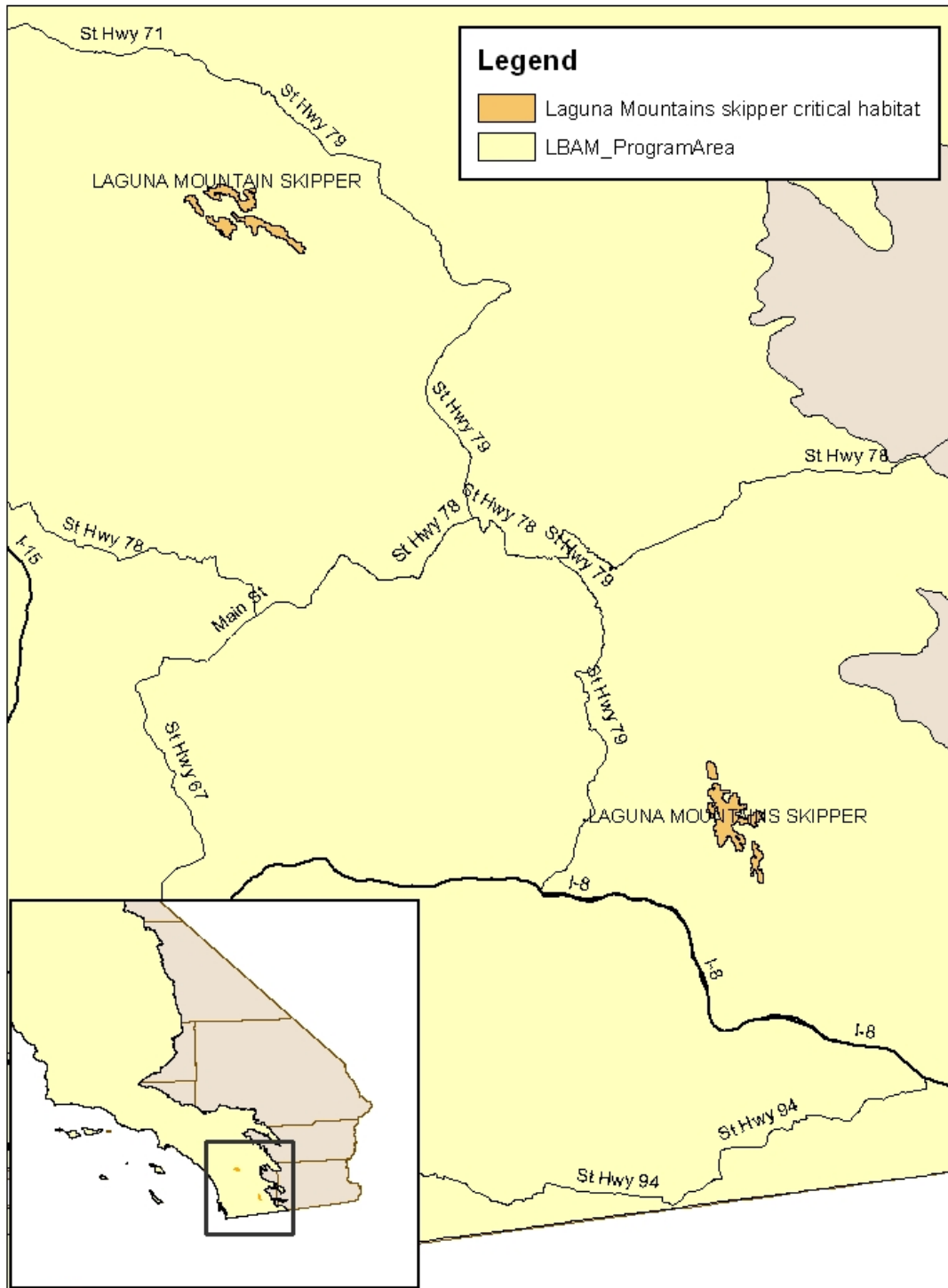


Light Brown Apple Moth Eradication Program PEIR
Figure E-1: Threatened/Endangered Species within the Program Area

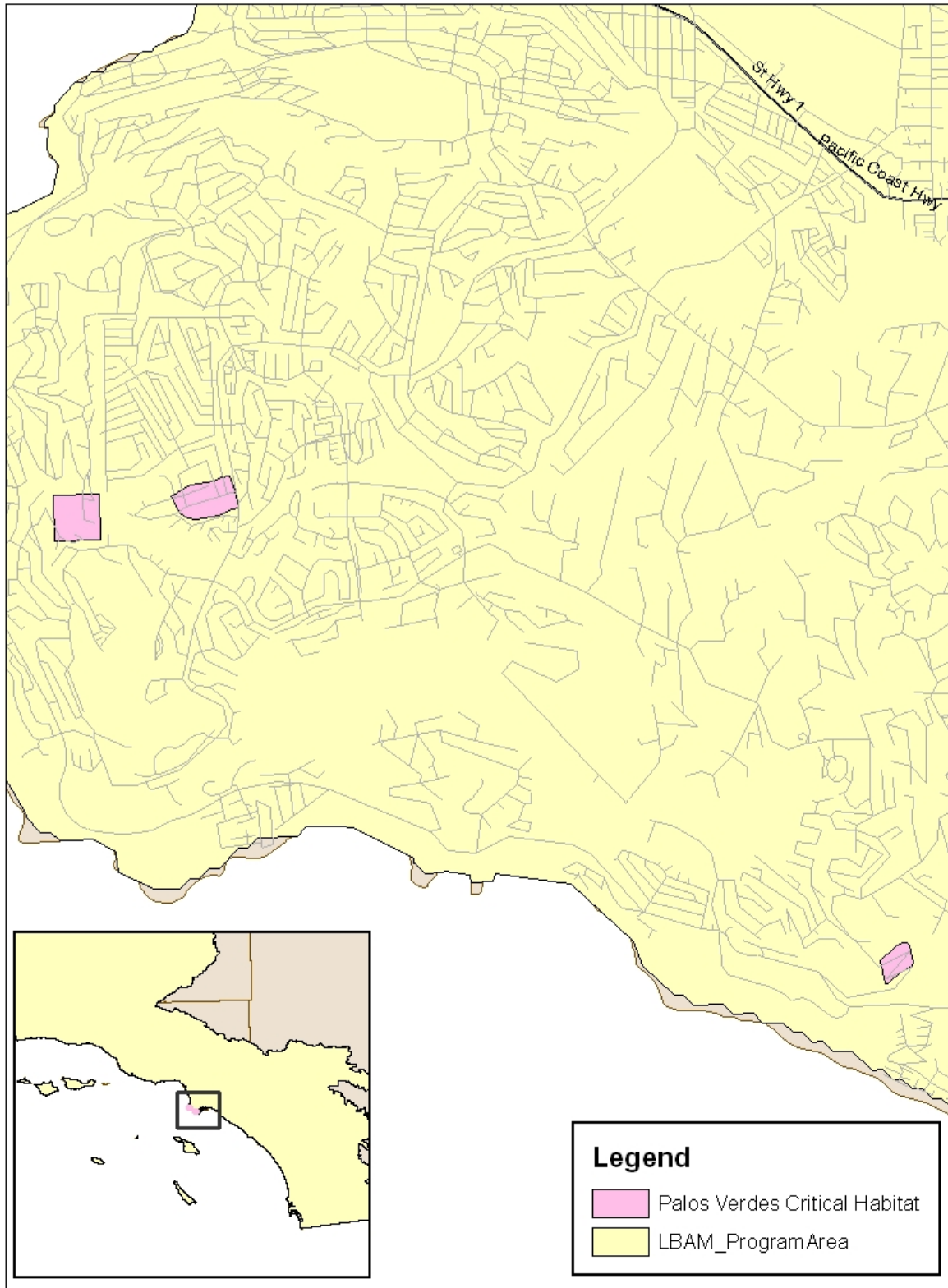
Bay checkerspot butterfly critical habitat



Laguna Mountain skipper critical habitat



Palos Verdes blue butterfly critical habitat



quino checkerspot butterfly critical habitat

