5.3 Bay Delta and Central Coast Province

"The Sacramento-San Joaquin River Delta is the grand confluence of California's waters, the place where the state's largest rivers merge in a web of channels—and in a maze of controversy. The Delta is a zone where the wants of a modern society come into collision with each other and with the stubborn limitations of a natural system. In 2009, seeking an end to decades of conflict over water, the Legislature established the Delta Stewardship Council with a mandate to resolve long-standing issues."

-The Delta Plan, 2013

Because of the conservation and management complexities and challenges facing the Bay Delta, the SWAP technical team implemented a focused approach to identifying pressures, conservation targets, and conservation strategies for the region. An interdisciplinary team representing CDFW (from Marine Region, Bay Delta Region, Water Branch, and Fisheries Branch), the Sacramento-San Joaquin Delta Conservancy, and the U.S. Fish and Wildlife Service (USFWS) worked with experts from the San Francisco Bay Joint Venture and the Central Valley Joint Venture to develop conservation strategies for the SWAP update. This SWAP regional team recognized that this task required a unique melding of regional boundaries and general habitat types, designated as the *Bay Delta Conservation Unit,* for the SWAP update (see Figure 1.5-4). The boundary for this conservation unit consists of the entire San Francisco Bay and portions of the San Francisco Bay (HUC 1805), Sacramento River (HUC 1802) and San Joaquin River (HUC 1804). The boundary includes areas of tidal influence, areas of salt marsh vegetation, and lowland elevations behind dikes/levees. In addition, the area was increased to roughly incorporate a 1-meter sea-level rise to take climate change into account.

In addition, the SWAP regional team recognized that a critical step for developing conservation strategies for an area as broad, complex, and diverse as the Bay Delta was to first gather existing peer reviewed published literature on the San Francisco Bay and Delta. Due to broad user group interests, complex biological interactions, and diverse habitats of the Bay Delta, several organizations and agencies have published studies, reports, and restoration plans for the region. The SWAP regional team assembled a list of the most relevant environmental planning documents for review and synthesis. These documents are called "reference documents" in the discussion below.

The SWAP technical team developed targets and conservation strategies based on their discussion within the reference documents. The SWAP update team also developed conservation strategies that the team identified as being underrepresented in the reference documents but warranted specific attention. For example, a climate change strategy was identified as important by the SWAP regional team, but it did not appear frequently in the reference documents. Furthermore, the interdisciplinary and iterative approach allowed the SWAP regional team to evaluate baseline concepts in concert with outside representatives from

the scientific community, fill in areas where concepts appeared to be lacking, and develop conservation strategies for a target that provides broad ecosystem benefits. The following reference documents were reviewed and synthesized by the SWAP regional team to develop targets and conservation strategies presented in this chapter.

- Restoring the Estuary: Implementation Strategy of the San Francisco Bay Joint Venture — A Strategic Plan for the Restoration of Wetlands and Wildlife in the San Francisco Bay Area (San Francisco Bay Joint Venture 2001).
- San Francisco Bay Subtidal Habitat Goals Report: Conservation Planning for the Submerged Areas of the Bay (California State Coastal Conservancy 2010).
- Bay Delta Conservation Plan (Working Draft) (California Department of Water Resources [DWR] et al. 2013).
- Central Valley Joint Venture Implementation Plan – Conserving Bird Habitat (USFWS 2006).
- The Delta Plan: Ensuring a Reliable Water Supply for California, a Healthy Delta Ecosystem, and a Place of Enduring Value (Delta Stewardship Council 2013).
- Sacramento-San Joaquin Delta Native Fishes Recovery Plan (USFWS 1995).
- Suisun Marsh Habitat Management, Preservation, and Restoration Plan (U.S. Bureau of Reclamation [USBR] et al. 2013).
- Baylands Ecosystem Habitat Goals: A Report of Habitat Recommendations Prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project (1999).
- The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian Associated Birds in California (Riparian Habitat Joint Venture [RHJV] 2004).
- Conservation Strategy for Restoration of the Sacramento-San Joaquin Delta, Sacramento Valley, and San Joaquin Valley Regions (CDFW et al. 2014).
- California Marine Life Protection Act Initiative. San Francisco Bay Options Report: Considering MPA Planning (CDFW 2011).
- 2012 Central Valley Flood Protection Plan (DWR 2012).
- State of the State's Wetlands: 10 Years of Challenges and Progress (California Natural Resources Agency [CNRA] 2010).
- The Baylands and Climate Change: What We Can Do. The 2014 Science Update to the Baylands Ecosystem Habitat Goals (San Francisco Bay Area Wetlands Ecosystem Goals Project 2014).

5.3.1 Geophysical and Ecological Description of the Province

Bay Delta

Encompassing 1,600 square miles of waterways, the San Francisco Bay and Delta (Figure 5.3-1) together form the West Coast's largest estuary and the second-largest estuary in the nation. It is sometimes referred to as the San Francisco Bay Estuarine Complex. Much of the region,

combined with the Central Valley, is part of a vast hydrological system that drains 40 percent of the state's fresh water. This water, falling as either rain or snow over much of the northern and central parts of the state, drains along the Sacramento and San Joaquin rivers into the Delta. In the Delta, fresh water from these rivers mixes with salt water from San Francisco Bay, creating a rich and diverse aquatic ecosystem.

The Bay Delta has two subregions: the San Francisco Bay Area and the Delta. The San Francisco Bay Area subregion is the most densely populated area of the state outside of the Southern California metropolitan region. It consists of the low-lying baylands, aquatic environments, and watersheds that drain into San Francisco Bay. Low coastal mountains surround San Francisco Bay, with several peaks rising above 3,000 feet. The region receives 90 percent of its surface water from the Sierra Nevada via major Central Valley rivers that feed the Delta. Other rivers draining into the Bay include the Napa and Petaluma rivers and Sonoma, Petaluma, and Coyote creeks. The Bay Area has relatively cool, often foggy summers and cool winters, strongly influenced by marine air masses. Rain falls almost exclusively during the winter season (October to April) and averages 15 to 25 inches annually, with occasional snowfall at higher elevations. Rainwater runs off rapidly, and most of the smaller streams are dry by the end of the summer.

Patricia Bratcher, CDFW

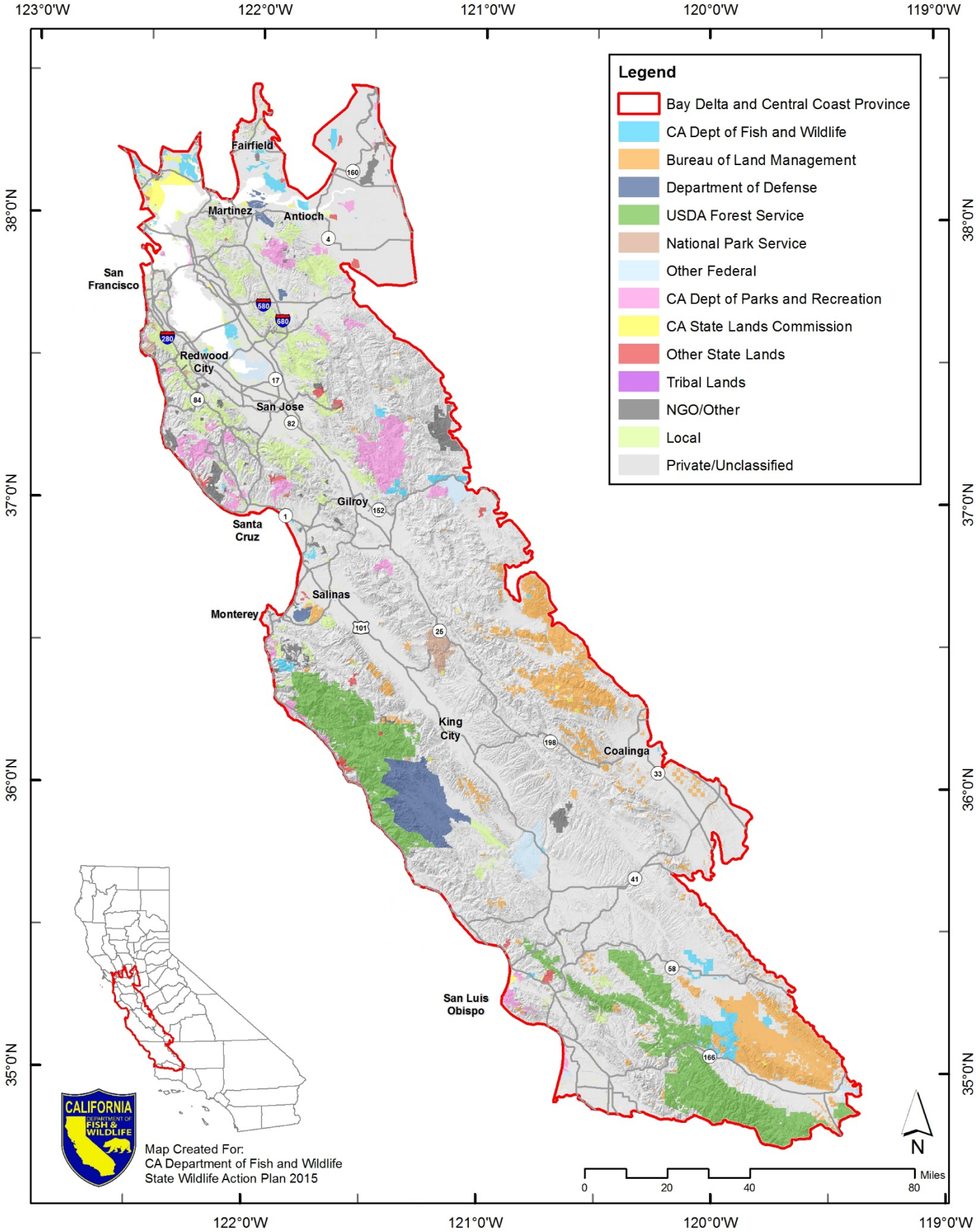
The topography allows for a variety of different habitats. The Bay itself has both deep and shallow estuarine (mixed fresh water and salt water) environments. In addition to estuarine species, the Bay also supports many marine species, including invertebrates, sharks, and even, on occasion, whales. Along the shoreline are coastal salt marsh, coastal scrub, tidal mud-flats, and salt ponds. Freshwater creeks and marshes, especially those that still have patches of riparian vegetation, are home to aquatic invertebrates and freshwater fish. Upland areas support a mixture of grasslands, chamise chaparral, and live oak and blue oak woodlands. Small stands of redwood, Douglas fir, and tanoak grow in moister areas.

The Delta is a low-lying area that contains the tidally influenced portions of the Sacramento, San Joaquin, Mokelumne, and Cosumnes rivers. The Delta was once a huge marsh formed by the confluence of the Sacramento and San Joaquin rivers. Once described as a "terraqueous labyrinth of such intricacy that unskillful navigators have been lost for days in it" (Bryant 1848), it has been extensively drained and diked for flood protection and agriculture. Exposure of the rich, organic soils behind these levees has increased oxidation rates to such an extent that the land is breaking down and much of the surface has now subsided below sea level. Because of its natural patterns of flooding, the Delta is relatively less populated than the other subregions.

The wildlife of this region is affected by a wide variety of pressures, described below. The major problem has been the loss, degradation, and fragmentation of habitats, both terrestrial and aquatic, because of the development of agriculture and urban areas. Virtually all of the streams and rivers that enter the Delta have been dammed, blocking fish migration, or have been so severely degraded that they are no longer usable by salmon and other anadromous and resident fish. Flood control structures, such as dikes, levees, and hardened embankments (riprap), have altered floodplain habitats, such as riparian forests and wetlands, throughout the region. Additionally, the biomass of the San Francisco Bay and Delta is dominated by non-native species. This region is primarily in private ownership, and the role of private landowners is very important for conservation. Additionally, water diversions for agricultural, industrial, and municipal uses, export of water to users south of the Delta (and shifts of flow patterns from west-east to north-south), and salinity control have dramatically altered water availability and ecosystem functions.

The Sacramento-San Joaquin Delta has been stressed intensively by human pressures. Its ecosystem functions have been in steep decline (e.g., pelagic organism declines), which jeopardizes the Delta's ability to support essential habitat for its fish and wildlife species and to provide water supplies to the state. The Bay Delta Conservation Plan (BDCP) has been undertaken by state and federal resources agencies to find solutions for this critically stressed estuarine ecosystem. The BDCP is a 50-year conservation plan for the Delta to pursue the co-equal goals of restoring the ecosystem and securing essential California water supplies. Information on the BDCP is available at www.baydeltaconservationplan.com. The BDCP would restore or protect approximately 142,000 acres of habitat (about 15 percent of the Delta) to address the Delta's environmental challenges. The BDCP would secure California's water supply by building new water delivery infrastructure and operating the system to improve the Delta's ecological health.

If approved the BDCP would be both a Habitat Conservation Plan (HCP) under the federal Endangered Species Act (ESA) and a Natural Community Conservation Plan (NCCP) under the California Natural Community Conservation Planning Act. The BDCP would result in long-term permits from regulatory agencies in return for meeting the Delta's ecological needs. The regulatory nature of the HCP/NCCP creates a long-term framework for fundamental and systematic improvements in the Delta. This reflects a departure from the species-by-species approach used in previous efforts to manage for Delta ecological needs. Instead, the BDCP seeks to improve the health of the ecosystem as a whole through the implementation of 22 conservation measures benefiting several covered species. Implementation of the BDCP would take place over a 50-year period by a number of agencies and organizations. A major part of BDCP implementation would be monitoring conservation measures to evaluate effectiveness, and revising actions through the adaptive management process.



Data Source: California Protected Areas Database; US Geological Survey (hillshade); CDFW Lands

Figure 5.3-1 Land Ownership of the Bay Delta and Central Coast Province

Central Coast

California's Central Coast region (Figure 5.3-1) encompasses approximately 8 million acres and extends from the southern boundary of the Los Padres National Forest north to the San Francisco Bay lowlands. Inland, the region is bounded east of the Diablo and Temblor mountain ranges. The Central Coast landscape is characterized by a rugged coastline, small mountain ranges that roughly parallel the coast, river valleys with rich alluvial soils, and arid interior valleys and hills. Across the region, differences in climate, geography, and soils result in widely varying ecological conditions, supporting diverse coastal, montane, and desert-like natural communities.

Dick Daniels

Sand dunes and wetlands occur along the coast. Rivermouth estuaries, lagoons, sloughs, tidal mudflats, and marshes make up coastal wetland communities, a unique environment where marine, freshwater, and terrestrial systems meet. Coastal habitats support numerous shorebirds, including the western snowy plover, willet, whimbrel, long-billed curlew, marbled godwit, and American avocet. Coastal estuaries provide important nursery habitats for anadromous and oceanic fish, especially in watersheds where small or seasonally dry upper tributaries provide limited rearing capacity (California Department of Fish and Game [CDFG] 1996). Elkhorn Slough and Morro Bay are the region's two largest estuaries, with other significant wetlands found at the Pajaro, Salinas, Carmel, and Santa Maria river mouths, Devereux Slough, and Goleta Slough (Page and Shuford 2000). During the last 20 year years, the salt marsh of Elkhorn Slough has been recolonized by large numbers of sea otters and it may be their preferred habitat.

Other coastal habitats include coastal scrub and maritime chaparral. Coastal scrub and grasslands also extend inland along river valleys, like the lower Salinas Valley, where the moist maritime climate reaches through gaps in the coastal ranges. Maritime chaparral, characterized by manzanita and California lilac species adapted to the foggy coastal climate, once dominated sandy hills along Monterey Bay, Nipomo Mesa, Burton Mesa, and Morro Bay. Maritime chaparral is now one of the region's most pressured community types, with its extent severely reduced by development. These scrub and chaparral communities provide important habitat for Morro Bay, Santa Cruz, and Pacific kangaroo rat species and the San Diego desert woodrat, as well as shrubland bird species, including California quail, sage sparrow, rufous-crowned sparrow, and the sensitive California thrasher and Costa's hummingbird. Additionally, several species of rare plants occur in maritime chaparral habitats.

The outer coastal ranges, including the Santa Cruz and Santa Lucia mountains, run parallel to the coastline. Well-watered by the moist ocean air, these slopes are drained by streams that run all year. The Santa Lucia Mountains provide most of the water supply to the Salinas River. These ranges support mixed coniferous forests and oak woodlands. The dominant coniferous species include ponderosa pine, Douglas fir, red alder, and, in the north, redwoods. The oak woodlands are dominated by coast live oak and valley oak. Rarer, endemic tree species include Monterey pine and Santa Lucia fir. Wildlife inhabitants of the outer coastal mountains include wide-ranging species such as mountain lion and bobcat, and sensitive species that include the California spotted owl, American badger, peregrine falcon, and golden eagle.

Moving inland across the Gabilan, Diablo, Temblor, and Sierra Madre mountain ranges, the climate becomes progressively drier, and the vegetation shifts to oak woodlands, grasslands, interior chaparral, and desert-like interior scrub. Interior streams are often intermittent, drying in the summer and fall, except at the higher elevations of the Sierra Madre ranges, where streams run year round. Additionally, many streams in San Luis Obispo and Monterey counties run year round in their upper reaches. Biologically diverse oak woodland communities support more than 200 species of plants, 300 vertebrates, and 5,000 invertebrates (Thorne et al. 2002; The Nature Conservancy 1997). Inhabitants of oak woodlands include western gray squirrel, dusky-footed woodrat, Monterey dusky-footed woodrat, pallid bat, and Townsend's big-eared bat. Large expanses of annual grasslands, now dominated by non-native grasses, are inhabited by California ground squirrel and black-tailed jackrabbit, along with sensitive species that include the giant kangaroo rat, burrowing owl, San Joaquin kit fox, American badger, tule elk, and, in the southern portion of the region, reintroduced pronghorn. Interior chaparral habitats support drought-resistant woody shrubs, including manzanita, California lilac, and chamise.

The Central Coast's largest drainages include the Salinas, Carmel, Santa Maria, Pajaro, and Santa Ynez watersheds. Riverine and riparian habitats are important to amphibian and reptile species, including the California red-legged frog, foothill yellow-legged frog, and western pond turtle, and birds such as the bank swallow, Lawrence's goldfinch, and least Bell's vireo. Steelhead and coho salmon are still present, in reduced numbers, in most of the streams where they historically occurred. Mammals that use riparian habitats include gray fox, striped skunk, mole and shrew species, and ringtail.

Higher-elevation riparian vegetation in moist coastal climates includes willow, alder, bay, maple, Douglas fir, and sometimes redwood. Valley-bottom riparian communities are dominated by sycamore, willow, alder, and cottonwood. Steep coastal streams in the forested Santa Cruz and northern Santa Lucia mountains are some of the region's most intact systems and host relatively healthy anadromous fish populations (CDFG 1996). In contrast, the majority of the region's large river-valley floodplain and riparian forests have been replaced by agriculture, and lowland fish assemblages have been severely compromised.

Seasonal vernal-pool wetland complexes are found in many parts of the region, including the Salinas River drainage and coastal dune terraces and mesas of Santa Barbara County, and seasonal sag ponds are found along the San Andreas Fault Zone, particularly in the eastern portion of San Luis Obispo County. California tiger salamanders, western spadefoot, fairy shrimp species, and many endemic plant species depend on these unique seasonal pool habitats.

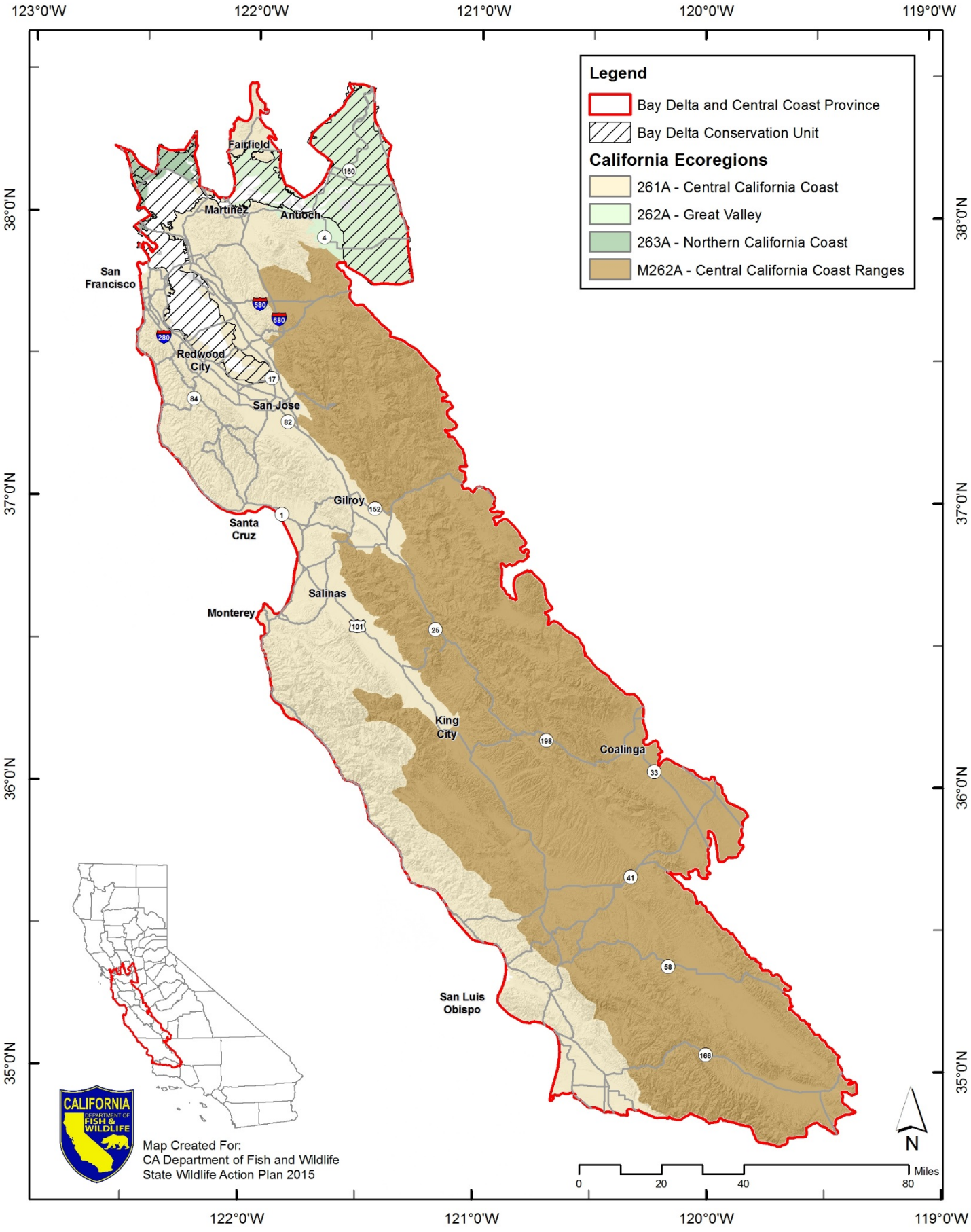
DWR

The San Andreas Fault runs the length of the region and shapes much of the region's geography. Most of the north-south running mountain ranges and valley depressions have been formed as a result of pressure between the two continental plates meeting at this fault zone. Compression, chemical interaction, and surfacing of ancient seabed sediments have produced serpentine soils that are rich in heavy metals such as chromium, nickel, and cobalt, but poor in nutrients, and have poor water-holding capacity. A number of plants have adapted to these harsh, near-toxic conditions, resulting in unique, island-like ecological communities largely restricted to serpentine areas.

Historically, urban centers have been located along the region's coastal lowlands, with crop production concentrated in valley-floor areas and grazing and natural lands occupying the surrounding foothills and mountainous areas. In recent years, however, population pressures have increased, and growth and development have expanded from urban centers to adjacent farmlands and rural areas both on the coast and in the interior portions of the region. Along with population growth, the greatest pressures to regional wildlife diversity are expansion of intensive types of agriculture, invasions by exotic species, and overuse of regional water resources. In spite of these significant regional pressures, large blocks of undeveloped natural lands remain, and the region presents many opportunities to accomplish conservation on a landscape-scale.

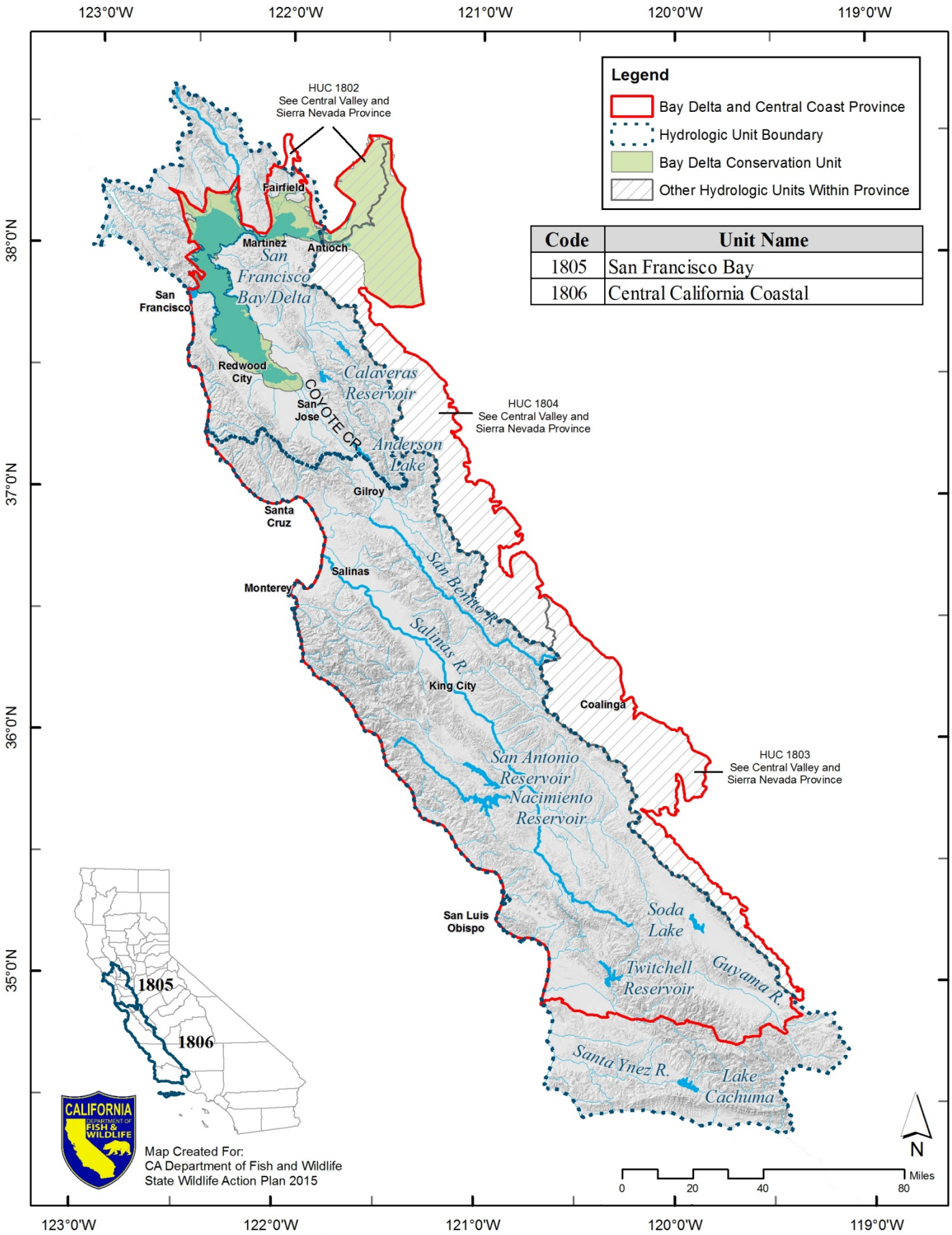
5.3.2 Conservation Units and Targets

The conservation units associated with the Bay Delta and Central Coast Province are the Central California Coast and Central California Coast Ranges ecoregions (Figure 5.3-2), Bay Delta conservation unit, which includes portions of HUC 1805, HUC 102, and HUC 1804 (see Figure 1.5-4), and Central California Coastal (HUC 1806) hydrologic unit (Figure 5.3-3). The selected targets for each of these conservation units are summarized in Table 5.3-1. Figure 5.3-4 shows the distribution of the plant communities within the province.



Data Source: USDA Forest Service (ecoregions); US Geological Survey (hillshade)

Figure 5.3-2 Ecoregions of the Bay Delta and Central Coast Province



Data Source: National Hydrologic Dataset (NHD); US Geological Survey (hillshade)

Figure 5.3-3 Hydrologic Units of the Bay Delta and Central Coast Province

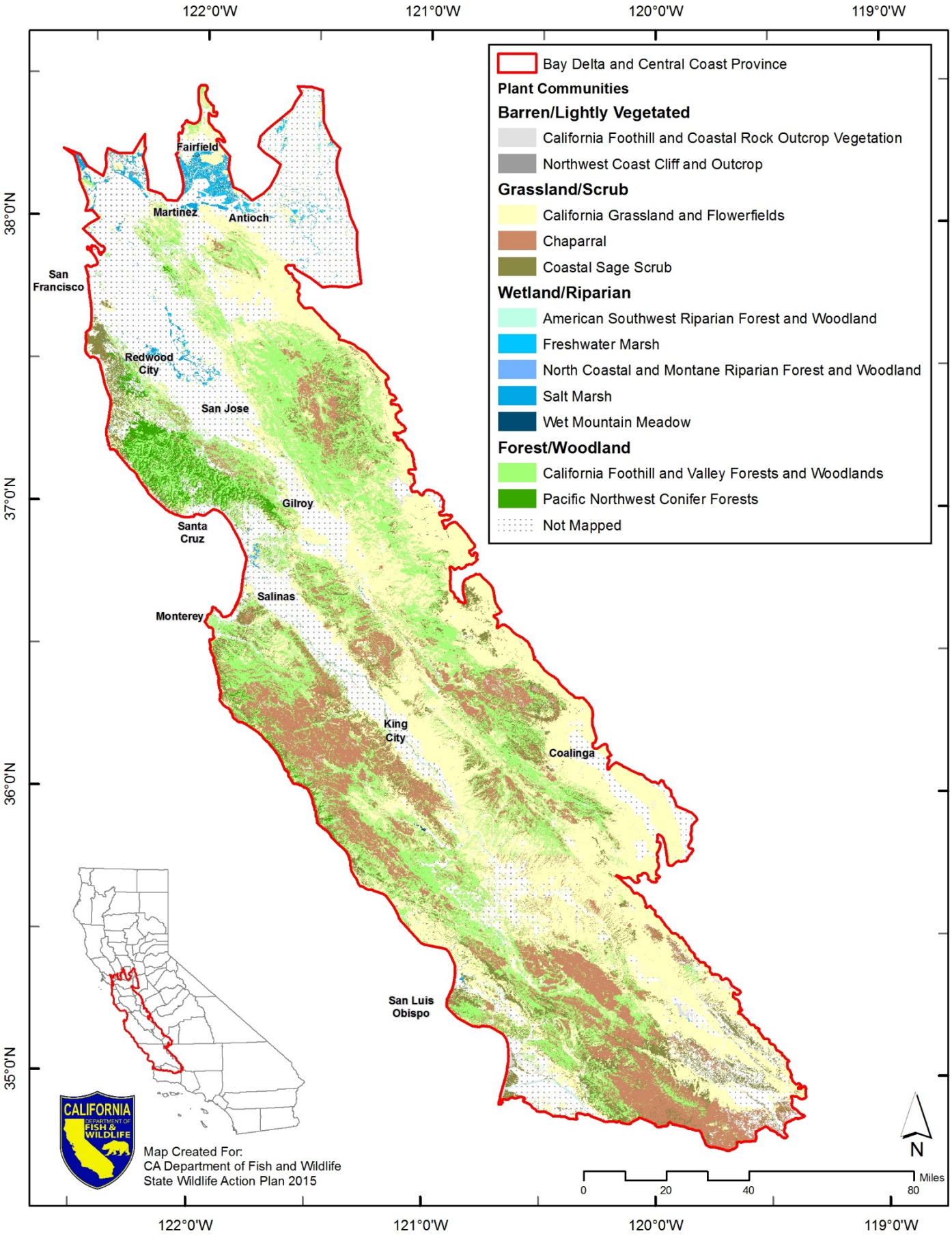
Table 5.3-1 Conservation Units and Targets – Bay Delta and Central Coast Province*

Conservation Unit	Geographic and Ecological Summary	Conservation Target	Target Summary	Focal CWHR Types Associated with Target
Central California Coast Ecoregion	This ecoregion consists of mountains, hills, valleys, and plains in the southern Coast Ranges of California. Elevation range: 0 to 3,800 feet	California Grassland, Vernal Pools, and Flowerfields	Includes all annual forb/grass vegetation native and non-native, as well as native perennial grasslands growing within the California Mediterranean climate. This does not include the cool-moist north coastal terrace prairies, the montane meadow/upland grasslands, and non-native perennial pasture grasses. Native perennial grasslands include needle grass species, melicgrass and giant wild rye. Annual native forb and wildflower fields including species of poppy, goldfields, popcorn flowers, fiddleneck, and others. Target also includes vernal pools within grasslands. Non-native annual grasslands such as wild oat, brome, annual fescue, star-thistle, mustards, fennel, and others are also present in grassland habitats and affect the habitat function of this target.	Annual grassland, perennial grassland
		Coastal Sage Scrub	Along with chaparral, coastal sage scrub is the main community type of California shrublands. It differs from chaparral by being composed of drought-deciduous shrubs, which typically are smaller with less extensive root systems and shorter life spans. California sagebrush, true sage species, shrubby buckwheats, deer-weed, and several other shrubs are characteristic. These scrubs are typical of relatively hot and dry slopes, and occupy finer textured soils than most chaparrals. Some members of this target are disturbance specialists, colonizing burns or clearings, and giving-way to longer lived chaparral and other vegetation a few years after disturbance. Non-native invasive broom species are also present in coastal sage scrub.	Coastal scrub
		American Southwest Riparian Forest and Woodland	Diagnostic species include Fremont cottonwood, black and red willow, California sycamore, California wild grape, arroyo willow, narrow-leaf willow, button-bush, spice bush. Most stands are found in permanently moist settings or riparian settings where sub-surface water is available year-round. Suitable conditions to support native fish assemblages include presence of surface water year-round, interconnected by surface flow or pools maintained by intergravel flow.	Valley foothill riparian
		Northwest Coast Cliff and Outcrop	Includes the barren coastal cliffs on headlands and islands of the north coast. This target has not been well-described.	Barren
		Coastal Dune and Bluff Scrub	Stands of coastal dune and bluff vegetation are limited to salty, rocky or sandy settings immediately adjacent to the open coast. Adaptations to salt spray, wind and shifting sands, result in several lifeforms including succulent or hairy leaves, long underground roots and stolons (adaptation to shifting sands), and good colonization of relatively unstable and sterile substrates.	Coastal scrub
		North Coast Deciduous Scrub and Terrace Prairie	This target includes a combination of grasses and shrubs, which tend to intermix in stands. Cool foggy summers and rainy winters, coupled with salty winds tend to preclude forest development along the immediate coast, but inland these stands only persist through regular disturbance such as clearing, grazing/browsing. Stands also commonly occur adjacent to upland coastal dune and bluff scrub; however, that community is characterized by more evergreen shrubs, which occur in well-drained exposed settings (exposed bluffs and dunes), dominated by mostly winter-deciduous shrubs in association with perennial cool-season grasses. Shrub indicators include: California blackberry, thimbleberry, salmonberry, hazel, and poison-oak. Grasses include Pacific reedgrass, California oat-grass, red fescue, and tufted hair-grass. In most stands there is a combination of grasses and shrubs, but more regularly disturbed (grazed, salt-spray-blasted, etc.) tend to have grass dominance.	Perennial grassland, coastal scrub

Table 5.3-1 Conservation Units and Targets – Bay Delta and Central Coast Province*

Conservation Unit	Geographic and Ecological Summary	Conservation Target	Target Summary	Focal CWHR Types Associated with Target
Central California Coast Ranges Ecoregion	This ecoregion is the interior part of the southern Coast Ranges of California, south of the Carquinez Strait. It is inland from the coast far enough that the climate is modified only slightly by marine influence. It is bounded on the northeast by the alluvial plain of the San Joaquin Valley and on the southwest by the coastal part of the southern Coast Ranges. It extends south to the Transverse Ranges. Elevation range: 100 to 5,200	California Grassland/Vernal Pool and Flowerfields	See summary description, above.	Annual grassland, perennial grassland
		American Southwest Riparian Forest and Woodland	See summary description, above.	Valley foothill riparian
Bay Delta Conservation Unit	Includes the drainage into the Pacific Ocean from the Stemple Creek Basin boundary in Sonoma and Marin counties south to and including the Pescadero Creek Basin in San Mateo County, excluding the Sacramento and San Joaquin River Basins in California. Covers an area of 4,470 square miles. Elevation range: 0 to 3,380	Salt Marsh	Salt marshes are generally tied to coastal tidally influenced wetlands in California. They have salinities similar to ocean water and do not develop the higher concentrations of salts characteristic of the salt marsh meadow community. Many salt marsh species are widespread and species diversity is relatively low. Individual vegetation alliances within the macrogroup tend to sort out based on inundation frequencies and maximum water depths.	Saline emergent wetland
Central California Coastal HUC 1806	Includes the drainage into the Pacific Ocean from the Pescadero Creek Basin boundary in San Mateo County south to and including the Rincon Creek Basin along the border of Ventura and Santa Barbara counties in California. Covers an area of 11,400 square miles. Elevation range: 0 to 5,900	Coastal Lagoons	Species of Greatest Conservation Need (SGCN) associated with target are tidewater goby, three-spine stickleback, prickly sculpin, coastrange sculpin, and anadromous fish (steelhead and coho salmon). Target is also important for San Francisco garter snake and California red-legged frog in some locations.	Estuarine

* Description referenced from CDFG 1988, USDA 1994, USDA 2007 and Keeler-Wolf 2010.



Data Source: fveg (Calfire)

Figure 5.3-4 Plant Communities of the Bay Delta and Central Coast Province

5.3.3 Key Ecological Attributes

Key ecological attributes (KEAs) were identified for each conservation target. These attributes are considered the most important for the viability of the targets and their associated species. The KEAs for the Bay Delta and Central Coast Province are listed in Table 5.3-2. The most commonly identified attributes for the Bay Delta and Central Coast Province are:

- area and extent of community;
- connectivity among communities and ecosystems;
- structural diversity;
- native versus non-native diversity; and
- soil and sediment deposition regime.

Table 5.3-2 Key Ecological Attributes– Bay Delta and Central Coast Province

Key Ecological Attribute	Conservation Unit and Target									
	Central California Coast						Central California Coast Ranges		Bay Delta Conservation Unit	Central California Central Coastal HUC 1806
	California Grassland, Vernal Pools, and Flowerfields	Coastal Sage Scrub	American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop	Coastal Dune and Bluff Scrub	North Coast Deciduous Scrub and Terrace Prairie	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland	Salt Marsh	Coastal Lagoons
Area and extent of community	X	X	X	X	X	X	X	X	X	X
Fire regime		X		X	X	X				
Connectivity among communities and ecosystems		X	X	X	X	X		X		X
Successional dynamics	X						X		X	
Community structure and composition										
Key species population levels	X						X			
Structural diversity		X		X	X	X			X	
Diversity									X	
Native versus non-native diversity	X	X	X	X	X	X	X	X	X	X
Age class heterogeneity			X					X		
Soil and sediment deposition regime		X		X	X	X			X	
Surface water flow regime	X						X			X
Nutrient concentrations and dynamics										X
Pollutant concentrations and dynamics									X	
Water level fluctuations			X					X	X	

5.3.4 Species of Greatest Conservation Need in the Bay Delta and Central Coast Province

The SWAP regional team identified species that would benefit from the conservation strategies for each target within the province. These species are the focus of the conservation strategies and will benefit from the actions taken to implement the conservation strategies. Not all of the focal species meet the criteria to be considered Species of Greatest Conservation Need (SGCN). The criteria used to determine SGCN are described in Section 2.4 and the complete list of SGCN for California is presented in Appendix C. Table 5.3-3 lists the focal species for each conservation unit and target within the Bay Delta and Central Coast Province. SGCN are indicated with an asterisk.

Table 5.3-3 Focal Species of Conservation Strategies Developed for Conservation Targets – Bay Delta and Central Coast Province

Common Name	Scientific Name	Conservation Units and Targets[1]									
		Central California Coast						Central California Coast Ranges		Bay Delta Conservation Unit	Central California Coast HUC 1806
		California Grassland, Vernal Pools, and Flowerfields	Coastal Sage Scrub	American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop	Coastal Dune and Bluff Scrub	North Coast Deciduous Scrub and Terrace Prairie	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland	Salt Marsh	Coastal Lagoons
Invertebrates											
Zayante band-winged grasshopper*	*Trimerotropis infantilis*		X		X	X	X				
Santa Cruz rain beetle	*Pleocoma conjugens conjugens*		X		X	X	X				
Smith's blue butterfly*	*Euphilotes enoptes smithi*		X		X	X	X				
Fishes											
Pacific lamprey*	*Entosphenus tridentatus*			X					X	X	
River lamprey*	*Lampetra eyresii*			X					X		
White sturgeon*	*Acipenser transmontanus*			X					X		X
North American green sturgeon Southern DPS*	*Acipenser medirostris*			X					X	X	
Coho salmon - central California coast ESU*	*Oncorhynchus kisutch*			X					X		X
Steelhead - central California coast DPS*	*Oncorhynchus mykiss irideus*			X					X		X
Steelhead – Central Valley DPS*	*Oncorhynchus mykiss irideus*			X					X	X	

Table 5.3-3 Focal Species of Conservation Strategies Developed for Conservation Targets – Bay Delta and Central Coast Province

Common Name	Scientific Name	Conservation Units and Targets[1]									
		Central California Coast						Central California Coast Ranges		Bay Delta Conservation Unit	Central California Coast HUC 1806
		California Grassland, Vernal Pools, and Flowerfields	Coastal Sage Scrub	American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop	Coastal Dune and Bluff Scrub	North Coast Deciduous Scrub and Terrace Prairie	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland	Salt Marsh	Coastal Lagoons
Steelhead - south/central California coast DPS*	*Oncorhynchus mykiss irideus*			X					X		X
Sacramento River winter-run Chinook salmon ESU*	*Oncorhynchus tshawytscha*			X					X	X	
Central Valley spring-run Chinook salmon*	*Oncorhynchus tshawytscha*			X					X	X	
Central Valley fall- and late fall-run Chinook salmon*	*Oncorhynchus tshawytscha*			X					X	X	
Longfin smelt*	*Spirinchus thaleichthys*									X	
Delta smelt*	*Hypomesus transpacificus*									X	
Monterey roach*	*Lavinia symmetricus subditus*			X					X		
Sacramento splittail*	*Pogonichthys macrolepidotus*									X	
Unarmored threespine stickleback*	*Gasterosteus aculeatus williamsoni*								X		X
Tule perch	*Hysterocarpus traski*									X	
Tidewater goby*	*Eucyclogobius newberryi*									X	X
Coastrange sculpin	Cottus aleuticus										X
Prickly sculpin	*Cottus asper*										X
Pacific staghorn sculpin	*Leptocottus armatus*									X	X
Amphibians											
California tiger salamander*	*Ambystoma californiense*	X		X				X	X		
Santa Cruz long-toed salamander*	*Ambystoma macrodactylum croceum*	X	X	X			X				X
Red-bellied newt*	*Taricha rivularis*			X							
California newt (Monterey County and South)*	*Taricha torosa*	X	X	X			X	X	X		X
California giant salamander*	*Dicamptodon ensatus*		X	X			X		X		
Santa Cruz black salamander*	*Aneides flavipunctatus niger*	X		X							

Table 5.3-3 Focal Species of Conservation Strategies Developed for Conservation Targets – Bay Delta and Central Coast Province

Common Name	Scientific Name	Conservation Units and Targets[1]									
		Central California Coast						Central California Coast Ranges		Bay Delta Conservation Unit	Central California Coast HUC 1806
		California Grassland, Vernal Pools, and Flowerfields	Coastal Sage Scrub	American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop	Coastal Dune and Bluff Scrub	North Coast Deciduous Scrub and Terrace Prairie	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland	Salt Marsh	Coastal Lagoons
San Simeon slender salamander*	*Batrachoseps incognitus*	X		X			X				
Santa Lucia Mountains slender salamander*	*Batrachoseps luciae*	X		X			X	X	X		
Lesser slender salamander*	*Batrachoseps minor*	X		X			X	X	X		
Western spadefoot*	*Spea hammondii*	X	X			X	X	X			
Arroyo toad*	*Anaxyrus californicus*							X	X		
Foothill yellow-legged frog*	*Rana boylii*	X	X	X			X	X	X		
California red-legged frog*	*Rana draytonii*	X	X	X			X	X	X		X
Reptiles											
Northern western pond turtle*	*Actinemys marmorata*	X	X	X			X	X	X		X
Southern western pond turtle*	*Actinemys pallida*	X	X	X			X	X	X		
Blunt-nosed leopard lizard*	*Gambelia sila*							X			
Blainville's horned lizard*	*Phrynosoma blainvillii*	X	X	X		X	X	X	X		
Bakersfield legless lizard*	*Anniella grinnelli*							X			
California legless lizard*	*Anniella pulchra*	X	X	X		X	X	X			
California glossy snake*	*Arizona elegans occidentalis*							X	X		
Forest sharp-tailed snake*	*Contia longicauda*			X							
San Joaquin coachwhip*	*Coluber flagellum ruddocki*							X			
Alameda whipsnake*/Alameda striped racer*	*Masticophis lateralis euryxanthus*	X	X	X			X	X	X		
Coast patch-nosed snake*	*Salvadora hexalepis virgultea*							X	X		
San Francisco garter snake*	*Thamnophis sirtalis tetrataenia*	X		X							X
Giant garter snake*	*Thamnophis gigas*								X		
Two-striped garter snake*	*Thamnophis hammondii*	X	X	X		X	X	X	X		
Birds											
Tule greater white-fronted goose*	*Anser albifrons elgasi*									X	

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		California Grassland, Vernal Pools, and Flowerfields	Coastal Sage Scrub	American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop	Coastal Dune and Bluff Scrub	North Coast Deciduous Scrub and Terrace Prairie	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland	Salt Marsh	Coastal Lagoons
Brant*	*Branta bernicla*									X	
American white pelican*	*Pelecanus erythrorhynchos*									X	
Least bittern*	*Ixobrychus exilis*									X	
California condor*	*Gymnogyps californianus*	X		X				X	X		
Golden eagle*	*Aquila chrysaetos*	X						X			
Swainson's hawk*	*Buteo swainsoni*	X						X			
Northern harrier*	*Circus cyaneus*	X						X		X	
White-tailed kite*	*Elanus leucurus*		X		X	X	X			X	
Bald eagle*	*Haliaeetus leucocephalus*			X					X		
California black rail*	*Laterallus jamaicensis coturniculus*									X	
Ridgway's rail*	*Rallus obsoletus*									X	
Sandhill crane*	Grus canadensis	X						X			
Snowy plover (coastal population)*	*Charadrius nivosus*		X		X	X	X			X	
Mountain plover*	*Charadrius montanus*	X						X			
Long-billed curlew	*Numenius americanus*	X						X			
Black skimmer*	*Rynchops niger*									X	
California least tern*	*Sternula antillarum browni*									X	
Tufted puffin*	*Fratercula cirrhata*		X		X	X	X				
Short-eared owl*	*Asio flammeus*	X						X		X	
Long-eared owl*	*Asio otus*			X					X	X	
Burrowing owl*	*Athene cunicularia*	X						X			
Spotted owl	*Strix occidentalis*			X					X		
American peregrine falcon*	*Falco peregrinus anatum*		X		X	X	X				
Loggerhead shrike*	*Lanius ludovicianus*	X						X		X	
Least Bell's vireo	*Vireo bellii pusillus*			X					X		

Table 5.3-3 Focal Species of Conservation Strategies Developed for Conservation Targets – Bay Delta and Central Coast Province

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		California Grassland, Vernal Pools, and Flowerfields	Coastal Sage Scrub	American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop	Coastal Dune and Bluff Scrub	North Coast Deciduous Scrub and Terrace Prairie	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland	Salt Marsh	Coastal Lagoons
Purple martin*	*Progne subis*	X		X				X	X		
Bank swallow*	*Riparia riparia*			X					X		
Swainson's thrush	*Catharus ustulatus*			X					X		
Saltmarsh common yellowthroat/San Francisco common yellowthroat*	*Geothlypis trichas sinuosa*			X					X	X	
Yellow-breasted chat*	*Icteria virens*			X					X		
Yellow warbler*	*Setophaga petechia*			X					X		
Rufous-crowned sparrow	*Aimophila ruficeps*		X		X	X	X				
Grasshopper sparrow*	*Ammodramus savannarum*	X						X			
Sage sparrow	*Artemisiospiza belli*		X		X	X	X				
Suisun song sparrow*	*Melospiza melodia maxillaris*									X	
Alameda song sparrow*	*Melospiza melodia pusillula*									X	
San Pablo (= Samuels) song sparrow*	*Melospiza melodia samuelis*									X	
Savannah sparrow*	*Passerculus sandwichensis*		X		X	X	X			X	
Oregon vesper sparrow*	*Pooecetes gramineus affinis*	X						X			
Tricolored blackbird*	*Agelaius tricolor*	X		X				X	X	X	
Yellow-headed blackbird*	*Xanthocephalus xanthocephalus*									X	
Mammals											
Monterey shrew, Salinas ornate shrew*	*Sorex ornatus salarius*			X					X		
Suisun shrew*	*Sorex ornatus sinuosus*									X	
Salt marsh wandering shrew*	*Sorex vagrans halicoetes*									X	
Pallid bat*	*Antrozous pallidus*	X	X		X	X	X	X			
Western red bat	*Lasiurus blossevillii*			X					X		
Long-legged myotis*	*Myotis volans*			X					X		
Yuma myotis	*Myotis yumanensis*		X		X	X	X				
Western mastiff bat*	*Eumops perotis californicus*	X	X		X	X	X	X			

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		California Grassland, Vernal Pools, and Flowerfields	Coastal Sage Scrub	American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop	Coastal Dune and Bluff Scrub	North Coast Deciduous Scrub and Terrace Prairie	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland	Salt Marsh	Coastal Lagoons
Nelson's antelope squirrel*	*Ammospermophilus nelsoni*							X			
American beaver	*Castor canadensis*			X					X		
Agile (=Pacific) kangaroo rat*	*Dipodomys agilis agilis*	X						X			
Giant kangaroo rat*	*Dipodomys ingens*	X						X			
Short-nosed kangaroo rat*	*Dipodomys nitratoides brevinasus*							X			
Narrow-faced kangaroo rat *	*Dipodomys venustus*	X						X			
Morro Bay kangaroo rat*	*Dipodomys heermanni morroensis*					X					
Santa Cruz kangaroo rat*	*Dipodomys venustus venustus*		X		X	X	X				
Salinas pocket mouse*	*Perognathus inornatus psammophilus*	X						X			
San Pablo vole*	*Microtus californicus sanpabloensis*									X	
San Francisco dusky-footed woodrat*	*Neotoma fuscipes annectens*			X					X		
Tulare grasshopper mouse*	*Onychomys torridus tularensis*							X			
Salt-marsh harvest mouse*	*Reithrodontomys raviventris*									X	
San Joaquin kit fox*	*Vulpes macrotis mutica*	X						X			
Ringtail	Bassariscus astutus		X		X	X	X		X		
American badger*	*Taxidea taxus*	X						X			
Western spotted skunk	*Spilogale gracilis*		X		X	X	X				
Pronghorn*	*Antilocapra americana*	X						X			
Tule elk	*Cervus elaphus nannodes*	X						X			

[1] A species is shown for a particular conservation unit only if it is associated with specific conservation targets identified for the unit.

* Denotes a species on the SGCN list. Non-asterisked species are not SGCN but are identified as important species by CDFW staff.

5.3.5 Pressures on Conservation Targets

If the KEAs are degraded, then the target is experiencing some type of stress. Stresses are caused by pressures, anthropogenic (human-induced) or natural drivers that could result in impacts to the target by changing the ecological conditions. Pressures can be positive or negative depending on intensity, timing, and duration. The priority pressures identified as affecting the viability of conservation targets in the Bay Delta and Central Coast Province are summarized in Table 5.3-4. The most commonly addressed pressures identified for the province (i.e., those that affect several targets) are discussed below. The relationship between the stresses and pressures are unique for each conservation target and are identified in Section 5.3.6.

Table 5.3-4 Key Pressures on Conservation Targets – Bay Delta and Central Coast Province

Conservation Unit	Central California Coast						Central California Coast Ranges		Bay Delta Conservation Unit	Central California Central Coastal HUC 1806
Target	California Grassland, Vernal Pools, and Flowerfields	Coastal Sage Scrub	American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop	Coastal Dune and Bluff Scrub	North Coast Deciduous Scrub and Terrace Prairie	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland	Salt Marsh	Coastal Lagoons
Agricultural and forestry effluents										X
Airborne pollutants		X		X	X	X				
Annual and perennial non-timber crops	X	X	X	X	X	X	X	X	X	X
Climate change		X		X	X	X				X
Commercial and industrial areas	X	X		X	X	X	X		X	X
Dams and water management/use			X					X	X	X
Fire and fire suppression	X	X		X	X	X	X			X
Garbage and solid waste										X
Household sewage and urban waste water										X
Housing and urban areas	X	X		X	X	X	X		X	X
Hunting and collecting terrestrial animals									X	
Fishing and harvesting aquatic resources									X	
Invasive plants/animals	X	X	X	X	X	X	X	X	X	X
Livestock, farming, and ranching	X		X				X	X	X	X
Other ecosystem modifications										X
Recreational activities									X	X
Renewable energy	X						X			
Roads and railroads	X	X	X	X	X	X	X	X	X	X
Shipping lanes									X	
Tourism and recreation areas		X		X	X	X				X
Wood and pulp plantations										X

Most Commonly Addressed Pressures in the Bay Delta-Central Coast Province

- Housing and Urban Areas
- Dams and Water Management/Use
- Commercial and Industrial Areas
- Roads and Railroads
- Invasive Plants/Animals
- Annual and Perennial Non-Timber Crops
- Fire and Fire Suppression
- Climate Change

Housing and Urban Areas; Commercial and Industrial Areas; Roads and Railroads

The main underlying cause of habitat loss and degradation in the Bay Delta and Central Coast Province is the increasing human population and its high demand for a limited supply of land, water, and other natural resources. Natural habitats of this region have been converted to a variety of different land uses, including weedy pastureland, dryland farming, irrigated cropland, relatively permanent orchards and vineyards, rural residential, and high-density urban. Wildlife species have different tolerances for each of these conversions, with many of them unable to adapt to the more-developed land uses. Beyond direct habitat loss, converting land to more intensive human-related uses brings additional stressors, including invasive species, human disturbance, fire suppression, and insect control, that further degrade ecosystem health and wildlife viability.

Growth and development fragment habitats into small patches, which cannot support as many species as larger patches can. These smaller fragments often become dominated by species more tolerant of habitat disturbance, while less-tolerant species decline. Populations of less-mobile species often decline in smaller habitat patches because of reductions in habitat quality, extreme weather events, or normal population fluctuations. Natural recovery following such declines is difficult for mobility-limited species. Such fragmentation also disrupts or alters important ecosystem functions, such as predator-prey relationships, competitive interactions, seed dispersal, plant pollination, and nutrient cycling (Bennett 1999; Environmental Law Institute [ELI] 2003).

Growth and development, along with associated linear structures like roads, canals, and power lines, impede or prevent movement of a variety of animals. As growth patterns include residential projects located far from existing urban centers, there is a greater need for supporting infrastructure. This is generally less significant than habitat loss but makes it more difficult for those species that need to move large distances in search of food, shelter, and breeding or rearing habitat and to escape competitors and predators. Animals restricted to the ground, like mammals, reptiles, and amphibians, face such obstacles as roads, canals, and new gaps in habitats. Attempts to cross these obstacles can be deadly, depending on the species and the nature of the gap (four-lane highways with concrete median barriers compared to narrow, rural two-lane roads, for example). Fish and other water-bound aquatic species attempting to move either upstream or downstream are blocked by lack of water resulting from diversions, physical barriers like dams, and by entrainment in diverted water. Even the movement of highly mobile species like birds and bats can be impeded by such features as transmission lines and wind energy farms, particularly in focused flight corridors like

Altamont Pass, and 50 new wind energy sites are currently proposed throughout the state on land managed by BLM (CDFG 2005). Such species either cannot see or do not avoid these structures, and many die as a result. Even outside the portions of the region undergoing rapid growth, unused oil-lease lands and large cattle ranches that are no longer profitable are being acquired by land investors and sold as 40-acre to 160-acre residential parcels. This rural residential development also requires additional road infrastructure and fragments the natural landscape.

Population numbers in the Bay Delta and Central Coast have continued to grow over the last few years. The province's population grew by approximately 4.4 percent (281,778 people) between 2010 and 2014 (California Department of Finance [CDOF] 2014). Urban acreage makes up approximately 7.3 percent of the Bay Delta and Central Coast Province. A majority of growth within the San Francisco Bay Area is expected to be in San Francisco, the East Bay (including eastern Contra Costa County), and the South Bay (in both San Mateo and Santa Clara counties) (Association of Bay Area Governments [ABAG] 2015). Growth pressure in the Central Coast region has shifted inland from the coast, with urban and rural residential development centered along the Highway 101 corridor. In the northern portion of the region, affordable housing draws commuters from San Jose to rapidly expanding towns like Morgan Hill (which grew by 8.75 percent to a population of 47,197 between 2010 and 2014), Gilroy (7.36 percent, to 52,413), Hollister (5 percent, to 36,676) and Watsonville (2.56 percent, to 52,508) (CDOF 2014). Incorporated cities in the Salinas Valley have also seen growth in recent years. In the northern portion of the valley, Salinas grew by 3.17 percent, to 155,205, between 2010 and 2014 (CDOF 2014).

Invasive Plants/Animals

Invasive plant and animal species are an important pressure on wildlife in this province, just as they are in other regions throughout the state. Invasive plants can be found in many different habitats in this region and tend to dominate brackish aquatic habitats. In grasslands, some of the more challenging plant invaders include eucalyptus, fountain grass, gorse, medusahead, tree of heaven, and yellow starthistle. In riparian and wetland areas, invading plants include edible fig, giant reed (or arundo), Himalayan blackberry, pampas grass, Russian olive, tamarisk (or saltcedar), pennyroyal, peppergrass and tree of heaven. Smooth cordgrass and perennial pepperweed is a major concern in salt marshes, and oppositeleaf Russian thistle appears to be increasing in some areas. Oak woodlands are invaded by plants such as Scotch broom and French broom. Coastal habitats face alien species such as gorse, ice plant, and pampas grass. Introduced plants also invade aquatic habitats. These aquatic invaders include Brazilian waterweed, egeria, Eurasian watermilfoil, hydrilla, water hyacinth, water pennywort, and parrot feather.

Numerous invasive plant species are also established in the region's beaches, dunes, sandy coastal soils, and lowland areas. Outcompeting and displacing native plant communities, these invasive species often provide inferior habitat for wildlife. Veldt grass, associated with sandy soils, can shift native shrub communities toward grasslands and is of particular concern in the southern part of the province. On beaches and dunes, ice plant species, European beach grass, and Veldt grass

form monocultures and dense mats of vegetation and displace native plants that provide important habitat for invertebrates like Smith's blue butterfly. Dense growth of non-native vegetation also causes unnatural stabilization of beach and dune systems. Jubata and Pampas grass are most invasive near Big Sur, Elkhorn Slough, and around the lower slopes of the Santa Cruz mountains. In timbered areas, these grasses can form dense stands that inhibit the germination of such coastal forest species as redwoods. Cape ivy chokes out native vegetation with densely growing vines. Found most commonly in shady coastal lowlands, cape ivy also invades oak woodlands, riparian forests, coastal scrub, and Monterey pine forests (CDFG 2005).

Introduced animals have invaded both terrestrial and aquatic environments. Non-native terrestrial animal species have invaded California wildlands, including brown-headed cowbirds, European starlings, domestic dogs and cats, introduced red foxes, Norway rats, and wild pigs. Cowbirds can lower the reproductive success of other native birds by laying their eggs in other birds' nests, causing the targeted host birds to raise the cowbird nestlings at the expense of their own. Native raccoons, whose populations appear to have greatly increased near housing developments and recreation facilities, pressure some native reptile species—notably western pond turtles—because of egg predation. Not all introduced vertebrates are invasive, and they have varying effects on wildlife; however, the species of most concern in the region parasitize songbird nests, dominate limited nesting habitat, prey on native species, or otherwise damage wildlife habitats. Introduced feral pigs are a major problem in many habitat types across the region. Wild pigs root in the soil, creating excessive soil disturbance and destroying native plant communities. In oak woodlands, feral pigs can inhibit the germination and growth of young oaks by eating acorns and oak seedlings and removing leaf litter, causing soils to dry out (CDFG 2005). In beach and dune habitats, the introduced red fox increases predation rates for sensitive coastal shorebirds such as Ridgway's rail.

Many non-native fish species have become established in California, dominating many of the rivers and streams in this province. These include species such as striped bass, white catfish, channel catfish, American shad, black crappie, largemouth bass, bluegill, and pikeminnow (found in the Chorro Creek Watershed). Many fish were historically introduced (via stocking) by federal and state resource agencies to provide sport fishing or forage fish to feed sport fish. Many introduced non-native fish and amphibians out-compete native fish for food or space, prey on native fish (especially in early life stages), change the structure of aquatic habitats (increasing turbidity, for example, by their behaviors), and may spread diseases (Moyle 2002). However, not all non-native species are considered invasive, which typically refers to species whose introduction causes or is likely to cause economic or environmental harm.

In addition to introduced fish, native aquatic species are stressed by introduced bullfrogs, non-native tiger salamanders, red-eared sliders (a turtle), and invertebrates. Many of the province's aquatic habitats, including ephemeral streams and seasonal ponds, naturally go dry in the rainless summer months; but, water management practices that create permanent water sources, including the creation of impoundments and some agricultural practices, favor these invasive species.

Introduced invertebrates, such as Asian clam, zebra mussel, and mysid shrimp, are causing significant problems for native species in rivers, streams, sloughs, and the San Francisco estuary. Although prohibited by state and federal regulation, the introduction of species via discharge of ship ballast water in San Francisco Bay has created one of the most invaded estuaries in the world. There are at least 212 introduced species in the San Francisco Bay alone (Defenders of Wildlife 2015). Most of the clams, worms, and other bottom-dwelling invertebrates presently inhabiting the Bay-Delta have been introduced from other estuaries. This biological invasion continues, with a new species introduced roughly every 14 weeks (DWR et al. 2013). While not all of the introduced aquatic species are invasive or have significant consequences for native species, biologists are concerned about the sheer dominance of these new species and their current and potential effects on the structure and function of the estuarine ecosystem.

Annual and Perennial Non-Timber Crops

Approximately 763,590 acres, or 8 percent of the province's land area, are planted in irrigates row crops, vineyards, and orchards (California Department of Forestry and Fire Protection [CAL FIRE], Fire and Resource Assessment Program 2006). The most extensive agricultural areas are fertile river valleys and coastal terrace lands. Major crops include grapes, lettuce, artichokes, asparagus, and strawberries, with some areas also supporting orchard-grown fruits and nuts and dry-land, unirrigated winter grains, such as barley. While these agricultural lands provide important crops for California's food supply and for export, many of the intensive agricultural practices that have enabled such large-scale production also result in ecological problems. Agricultural consequences for the region's wildlife and ecosystems include runoff of agricultural chemicals and sediment, consumption of over-subscribed water resources, and conversion and fragmentation of habitat. Private landowners and local conservation districts are working on numerous projects to mitigate these consequences, to improve water quality, and to enhance conditions for wildlife on the agricultural working landscapes of the region.

Many of the region's crops receive substantial applications of fertilizers, herbicides, and pesticides. In 2012, Monterey County—which encompasses two major agricultural regions, the Salinas Valley and lower Pajaro Valley—ranked sixth in the state for the total pounds of pesticide applied (California Department of Pesticide Regulation 2012). In Monterey County, the high nitrate levels in Elkhorn Slough cause large blooms of sea lettuce (*Ulva lactuca*), which smothers mudflats and salt marsh vegetation. Exposed soils and irrigation practices make croplands susceptible to erosion. Rain and irrigation runoff carry silt and agricultural chemicals, degrading surface water quality and reaching groundwater. For example, significant amounts of nitrogen fertilizer applied through agricultural practices have contaminated groundwater supplies in agricultural communities throughout the State (Viers et al. 2012). Herbicides and pesticides can have toxic effects on aquatic plants and animals, and chemical contaminants can upset the ecological balance of aquatic systems. For example, nutrients increase aquatic plant and algal growth, resulting in lowered oxygen levels when the excessive plant matter decomposes. Elevated nutrient levels have also been implicated in amphibian deformities, because nutrient-

rich environments favor the parasitic flatworm that causes deformities in many frog species (Johnson and Chase 2004). Also, pesticide drift has been shown to favor hybrid tiger salamanders over native California tiger salamanders (Ryan et al. 2012). Silt and sediment also degrade aquatic environments, increasing turbidity and shading out aquatic vegetation, along with scouring away or smothering stream-bottom sediments that are important spawning sites and invertebrate habitats. Runoff problems are particularly severe on steeply sloping, erosion-prone soils, where strawberries, artichokes, and vineyard grapes are commonly grown. Planting practices that result in large amounts of soil disturbance, such as the establishment of vineyards and strawberry and artichoke mounds, also contribute substantially to sediment runoff.

Agricultural water consumption also pressures aquatic and riparian habitats. Irrigated agriculture accounts for about 66 percent of the Central Coast's water use and 8 percent for the Bay Area (DWR 2013). Over the last century, the increased production of water-intensive crops like strawberries, lettuce, and grapes has increased the need for water. Water is supplied to agriculture by diversion of surface water, by groundwater pumping, and through import from other regions via the State Water Project. As groundwater levels are depleted, saltwater intrusion increases and flows are also reduced in streams and rivers. Diminished flows reduce aquatic systems' capacity to discharge incoming contaminants and sediment and can inhibit migration by anadromous fish. Additionally, groundwater depletion and drought have increased salinity in inland lakes and freshwater/brackish lagoons in the province, which affects habitat conditions for pond turtles and other species.

The growth of agriculture over the last century, particularly along valley-bottom floodplains and coastal terraces, has resulted in both the loss of important habitat areas and the fragmentation of larger natural landscapes. In recent decades, intensively cultivated crops (such as vineyards) have been expanding into areas formerly used for grazing and dry-land grain production. Intensive agricultural crops almost entirely eliminate wildlife habitat values and tax water resources.

Fire and Fire Suppression

Wildfire is a natural and important ecological process in the Central Coast. Widespread fire management practices, as well as increases in human-caused wildfires, have altered fire regimes, in some cases causing dramatic changes in regional habitats. Efforts to establish fire regimes that approximate historical fire patterns and frequencies while also minimizing loss of property and life are important to maintain and restore wildlife habitats, such as chaparral shrublands, coastal sage scrub, grasslands, and woodlands.

Dry conditions and annual high summer temperatures make the region prone to fires. The causes and ecological consequences of wildfires differ among the region's ecological communities. In sage scrub, chaparral, and grassland systems, lightning-induced fires are fairly infrequent. Human-caused fires, however, have resulted in unnaturally high fire frequencies, especially along roads and near the urban-wildland interface, with some locations experiencing

multiple fires within a period of 15 to 20 years (CDFG 2005). Increased fire frequencies favor the Mediterranean grasses that were introduced to the region with the arrival of European settlers and livestock. Once established, the non-native grasses grow in a dense-thatch pattern that chokes out native vegetation and lowers habitat quality for wildlife. The dense grass also provides ample fuel for the cycle of frequent burning (Keeley 2004).

Although frequent fires can promote the spread of non-native grasses, fire's effects on grassland and shrubland ecosystems depend on the time of year the fire occurs. Prescribed burning can be an effective management tool, with spring and early summer fires being most effective to control most invasive annual plants if they occur before exotic plants set seed (DiTomaso et al. 2006); however, spring fires can also be extremely damaging to nesting birds and young mammals and must be used with caution.

Climate is also a primary determinant of fire patterns. In light of this, climate change will add a significant variable to efforts to understand historical fire regimes and to find management measures that can maintain the region's mosaic of habitats. Additionally, the expansion of residential communities into fire-dependent ecosystems creates a conflict between maintaining ecological integrity and protecting property (CDFG 2005).

Climate Change

Although climate change is already affecting wildlife throughout the state, and its effects will continue to increase, it has particular significance for this province's coastal and estuarine systems. In California winters will likely become warmer and wetter during the next century. Instead of deep winter snowpacks that nourish valley rivers through the long, dry summer, most of the precipitation will be winter rain that runs off quickly. For the Bay Delta, this means more intense winter flooding, greater erosion of riparian habitats, and increased sedimentation in wetland habitats (Field et al. 1999, Hayhoe et al. 2004).

Hotter, drier summers, combined with lower river flows, will dramatically increase the water demands of both people and wildlife. This is likely to translate into less water for wildlife, especially fish and wetland species. Lower river flows will allow saltwater intrusion into the rivers, the Bay, and the Delta, increasing salinity and disrupting the complex food web of the estuary. Water contaminants may accumulate during the summer as the natural flushing action decreases.

Temperature

In the San Francisco Bay Area, average annual temperatures are expected to increase 1.7 to 1.9°C (3.0 to 3.4°F) by 2070; and 1.5 to 4.5°C (2.7 to 8.1°F) by 2099 (Cayan et al. 2011). January average temperatures are projected to increase 2.2 to 2.8°C (4 to 5°F), while July averages temperatures are projected to increase 2.8 to 3.3°C (5 to 6°F) by 2100 (CalEMA 2012).

Inland areas within the Bay-Delta region (i.e., portions of Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties) are expected to experience similar or greater increases in average temperatures. January average temperatures are expected to increase 1.7 to 2.8°C (3 to 4°F) by 2050 and 3.3 to 3.9°C (6 to 7°F) by 2100. July increase in average temperatures: 1.7 to 2.8°C (3 to 5°F) by 2050 and 3.9 to 5°C (7 to 9°F) by 2100 (CalEMA 2012).

In the Central Coast Ranges and Central Coast regions, average annual temperatures are expected to increase 1.6 to 1.9°C (2.9 to 3.4°F) by 2070 (PRBO Conservation Science 2011). January average temperatures are expected to increase 0.6 to 1.1°C (1°F to 2°F) by 2050 and 2.2 to 2.8°C (4 to 5°F) by 2100. July average temperatures could increase 1.1 to 1.7°C (2 to 3°F) by 2050 and 2.8 to 3.9°C (4 to 7°F) by 2100, with larger increases in the eastern portions of the Coast Ranges (CalEMA 2012).

Precipitation

A moderate decline in annual rainfall is expected in the San Francisco Bay region, with a decline of 2.5 to 7.6 cm (1 to 3 inches) by 2050 and 10.2 to 12.7 cm (4 to 5 inches) by 2090. Inland areas within the Bay Delta are projected to experience similar decreases in rainfall from 7.6 to 12.7 cm (3 to 5 inches) by 2100 (CalEMA 2012).

Within the Central Coast Ranges and Central Coast regions, lower elevation areas are projected to experience declines in annual precipitation of approximately 5 cm (2 inches) by 2050 and 7.6 to 10.2 cm (3 to 4 inches) by 2100, while more elevated areas are projected to experiences losses of approximately 25 cm (10 inches) (CalEMA 2012).

Change in Freshwater Hydrologic Regimes

Sea-level rise and changes in timing and volume of flow are projected to increase salinity intrusion into freshwater aquifers and the Bay Delta region. Similarly, changes in runoff and flows could result in increases in stream temperatures throughout the province (PRBO 2011).

Estuarine inflows are projected to increase an average of about 20 percent from October through February and decrease by about 20 percent from March through September. Higher winter inflows could result in higher watershed runoff present in estuaries in winter, but reduced inflows in the spring and summer have the largest projected impact on estuarine waters reducing the amount of watershed runoff by a maximum of 8 percent by late June (PRBO 2011).

Wildfire Risk

Wildfire frequency, size, and intensity are expected to increase throughout the western portions of the province, particularly within the Coast Ranges near the San Francisco Bay Area and Central Coast Range.

In the Central Coast Ranges and Central Coast regions, particularly the eastern portion of the Central Coast Ranges, wildfire risk is projected to increase 4 to 6 times current conditions. The number of escaped fires is projected to increase by 51 percent, while total area burned by

contained fires is projected to increase 41 percent despite enhancement of fire suppression effort. The probability of large fires (>200 ha) is expected to increase by the end of 21st century, and area burned is projected to increase from 10 to 50 percent by the 2070-2099 time period (PRBO 2011).

Inland areas of the Bay Delta, including portions of western and northern Yolo County, northwestern Solano County, southern Contra Costa County, and San Joaquin and Sacramento counties are projected to experience limited increases in potential area burned by wildfire (CalEMA 2012).

Sea-Level Rise

Projected sea levels along the state's coastline south of Cape Mendocino are expected to increase from 12 to 61 cm (5 to 24 inches) by 2050 compared to 2000 levels, and 42 to 167 cm (17 to 66 inches) by 2100 compared to 2000 levels (OPC 2013:2).

The number of acres vulnerable to flooding is expected to increase 20 to 30 percent in most parts of the San Francisco Bay Area, with some areas projected for increases over 40 percent. Coastal areas in the Bay Area are estimated to experience an increase of approximately 15 percent in the acreage vulnerable to flooding (CalEMA 2012).

In the Bay Delta region, portions of the region closer to San Francisco Bay are projected to be increasingly susceptible to sea-level rise of around 1.4 m (55 inches) or higher. Solano County is anticipated to experience a 13 percent increase in estimated acreage of land vulnerable to a 100-year flood event. This indicator rises to 40 percent in Contra Costa County and 59 percent in Sacramento County. Most flooding is projected to occur in areas around Suisun City, Pittsburg, Benicia, Richmond, and Vallejo (CalEMA 2012).

This is especially significant in the San Francisco Bay Area and the Delta, where much of the land has subsided to below sea level and is currently protected from flooding by levees. Continuation of current farming practices will worsen this subsidence throughout much of the Delta. This increased subsidence, combined with higher sea level, increased winter river flooding, and more intense winter storms, will significantly increase the hydraulic forces on the levees. Given their current state, a powerful earthquake in the region could collapse levees, leading to major seawater intrusion and flooding throughout the Delta (Mount and Twiss 2005).

The ecological functioning of upland habitats is likely to be disrupted as individual species respond differently to climatic changes. Some species will likely adapt in place, others will probably move to better climates, and the rest will experience different rates of population or health declines. Movement to other habitats will be more challenging as the few remaining habitat patches shrink and the gaps between habitats grow.

5.3.6 Conservation Strategies

Conservation strategies were developed for five conservation targets in the Bay Delta and Central Coast Province. The goals for each target are listed below. The strategies to achieve the goals for the target are provided, along with the objectives of the strategies and the pressures intended to be reduced by implementing the strategies. When specific actions have been identified for the strategies, they are also listed. Tables 5.3-5 through 5.3-9 show the relationships between the stresses and the pressures for each target. Table 5.3-10 summarizes conservation strategies for the province.

Target: American Southwest Riparian Forest and Woodland

Goals:

- By 2025, acres of habitat are increased by at least 5 percent from 2015 acres of riparian habitat in the Central Coast Ecoregion.
- By 2025, acres where native species are dominant are increased by at least 5 percent from 2015 acres.
- By 2025, miles connected are increased by at least 5 percent from 2015 miles of riparian habitat.
- By 2025, miles with desired level of discharge are increased by at least 5 percent from 2015 miles.
- By 2025, acres with desired age class heterogeneity are increased by at least 5 percent from 2015 acres of riparian habitat.

Conservation Strategy 1 (Land Acquisition/Easement/Lease): Acquire, conserve and manage habitat for SGCN that inhabit riparian forest and woodland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities.

Objective(s):

- By 2020, establish conservation and management plans for SGCN that inhabit riparian forest and woodland habitats.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas.

Conservation action(s):

- Develop, fund and implement conservation actions, land acquisition and management plans as part of the East Contra Costa NCCP, Santa Clara Valley NCCP, East Alameda County Conservation Strategy, and draft Solano HCP.
- Obtain funding for conservation actions, land acquisition and management plans implementation and staff.
- Survey the interests from willing sellers of title fee or conservation easements.
- Identify partners for funding and management.
- Identify willing landowners to participate in habitat enhancement programs.

Conservation Strategy 2 (Outreach and Education): Implement education and outreach to the public and local agencies regarding the value of riparian habitat, development of riparian buffers along major rivers and streams, and reducing encroachment of crops into riparian buffers.

Objective(s):

- Increase the knowledge of all local agencies on the value of riparian habitat.
- Gain support by all local agencies for the development of riparian buffers along major rivers and streams.
- Reduce encroachment of annual and perennial non-timber crops into riparian buffers.

Intended pressure(s) reduced: Annual and perennial non-timber crops.

Conservation action(s):

- Fund and implement riparian habitat education and conservation actions in draft and final NCCPs, HCPs, Conservation Strategies, and Recovery Plans.

Conservation Strategy 3 (Direct Management): Develop grazing best management practices (BMPs).

Objective(s):

- Co-develop BMPs with land management agencies.
- Implement state and local policies that benefit wildlife and sustain habitats.
- Reduce inappropriate livestock farming and ranching.

Intended pressure(s) reduced: Livestock, farming, and ranching.

Conservation action(s):

- Fund and implement vegetation management actions, including grazing management practices, in draft and final NCCPs, HCPs, Conservation Strategies, and Recovery Plans.

Conservation Strategy 4 (Direct Management): Manage invasive species.

Objective(s):

- Eradicate or control invasive species on 1,000 acres of public lands by watershed.

Intended pressure(s) reduced: Invasive plants/animals.

Conservation action(s):

- Fund and implement invasive species management actions in draft and final NCCPs, HCPs, Conservation Strategies, and Recovery Plans.
- Conduct assessment and map invasive species occurrence by watershed.
- Develop partnerships with agencies and non-governmental organizations (NGOs).
- Identify and apply for funding grant to fund control of invasive species.
- Develop plan to prioritize and control invasive species.
- Implement management plan to control invasive species.

Conservation Strategy 5 (Direct Management): Manage dams and other barriers to allow for fish passage.

Objective(s):

- Remove barriers to allow for fish passage.
- Increase bypass flows through water conservation.
- Achieve agreement among water management agencies on dam management and barrier removal. This objective additionally includes the following:
  - improve in-stream flows;
  - gather baseline data to identify the current conditions of amount of water use and water use efficiency, fish passage conditions, and the major barriers to fish passage;
  - establish a baseline of candidate barriers that can be removed;
  - develop restoration/management plans;
  - investigate the impact from water diversion including stream flow modification and fish passage barriers; and
  - investigate the potential to develop water conservation and fish passage barrier modification measures, and evaluate the effectiveness of the measures.

Intended pressure(s) reduced: Dams and water management/use.

Conservation Strategy 6 (Direct Management): Develop riparian buffers along major rivers and streams.

Objective(s):

- Establish riparian buffers along major rivers and streams.
- Reduce encroachment of annual and perennial non-timber crops into buffer areas.

Intended pressure(s) reduced: Annual and perennial non-timber crops.

Conservation action(s):

- Fund and implement riparian buffer management actions in draft and final NCCPs, HCPs, Conservation Strategies, and Recovery Plans.
- Identify existing land use policies on riparian buffers in agricultural landscapes.
- Link to Outreach and Education strategy.
- Seek to redesignate buffers as natural resource zones in county general plans.
- Identify incentives for landowners.
- Coordinate and provide input to cities and counties regarding buffer zones.
- Review local agencies ordinances to determine whether buffers zones are adequate.

Conservation Strategy 7 (Direct Management): Improve road maintenance on county and state roads to reduce sediment impacts to stream habitats.

Objective(s):

- Improve maintenance of county and state roads to reduce sediment impacts to stream habitat (particularly fish spawning and invertebrate production habitat within gravels, and pool habitat).
- Reduce road maintenance impacts.

Intended pressure(s) reduced: Roads and railroads.

Table 5.3-5 Stresses and Pressures for American Southwest Riparian Forest and Woodland

Priority pressures	Stresses								
	Changes in geophysical and disturbance regime		Changes in hydrology and water characteristics				Ecosystem changes		
	Change in sediment erosion-deposition regime	Change in natural fire regime	Change in groundwater tables	Change in pollutants	Change in runoff and river flow	Change in water levels and hydroperiod	Change in spatial distribution of habitat types	Habitat fragmentation	Change in community structure or composition
Annual and perennial non-timber crops	X	X	X	X	X	X	X	X	X
Dams and water management/use	X	X	X	X	X	X	X	X	X
Invasive plants/animals		X				X	X	X	X
Livestock, farming, and ranching	X	X	X	X	X	X	X	X	X
Roads and railroads	X	X	X	X	X	X			

Target: California Grassland, Vernal Pools, and Flowerfields

Goals:

- By 2025, acres of grassland habitat restored are increased by at least 5 percent from 2015 acres.
- By 2025, acres of vernal pool habitat restored are increased by at least 5 percent from 2015 acres.
- By 2025, acres where native species are dominant are increased by at least 5 percent from 2015 acres, by treatment with managed grazing.
- By 2025, population of key species (spadefoot toad) is increased by at least 5 percent from 2015 population levels.
- By 2025, acres with desired stages of succession are increased by at least 5 percent from 2015 acres by reducing encroachment of coyote bush/coastal scrub into grassland.
- By 2025, miles with desired stream stage are increased by at least 5 percent from 2015 miles through length of hydroperiod.
- By 2025, miles with desired level water quality are increased by at least 5 percent from 2015 miles by meeting standards of Basin Plan.

Conservation Strategy 1 (Land Acquisition/Easement/Lease): Acquire, conserve, and manage habitat for SGCN that inhabit grassland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities.

Objective(s):

- Establish conservation and management plans for SGCN that inhabit grassland habitats.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas.

Conservation action(s):

- Develop, fund and implement conservation actions, land acquisition and management plans as part of the East Contra Costa NCCP, Santa Clara Valley NCCP, East Alameda County Conservation Strategy, and draft Solano HCP.
- Obtain funding for conservation actions, land acquisition and management plans implementation and staff.
- Survey the interests from willing sellers.
- Identify partners for funding and management.
- Identify willing landowners.

Conservation Strategy 2 (Data Collection and Analysis): Identify and conduct research on high-priority study questions for grassland habitat/conservation areas; conduct research to inform coordination with Caltrans and county transportation agencies on wildlife-friendly transportation corridors; implement and fund monitoring and research components of completed and draft NCCPs, HCPs, and Conservation Strategies.

Objective(s):

- Identify high priority research/study questions regarding grassland habitat/conservation areas.
- Use research to inform coordination with Caltrans and County Transportation Agency on wildlife-friendly transportation corridors.

Intended pressure(s) reduced: Livestock, farming, and ranching; annual and perennial non-timber crops; roads and railroads.

Conservation action(s):

- Conduct surveys and monitoring as part of the East Contra Costa NCCP, Santa Clara Valley NCCP, East Alameda County Conservation Strategy, and draft Solano HCP.
- Obtain funding for research, surveys and monitoring for developing and existing conservation plans and recovery plans.
- Gather and/or review existing information.
- Utilize existing conservation plans and recovery plans to establish prioritization
- Identify inventory protocol.
- Coordinate with landowners.

- Utilize existing conservation plan partnerships and identify new partners.
- Obtain funding for program implementation.
- Analyze spatial distribution using Geographic Information Systems (GIS).
- Coordinate with Caltrans on siting of roads, and design and siting of wildlife crossings.

Conservation Strategy 3 (Land Use Planning): Develop statewide strategies on renewable energy development location siting; identify renewable energy development zones and obtain their approval by the Renewable Energy Action Team (REAT).

Objective(s):

- Identify and approve renewable energy development zones by REAT.

*Intended pressure(s) reduced***:** Renewable energy.

Conservation Strategy 4 (Land Use Planning): Provide input on project planning and decision-making processes; ensure that city and county planning departments consider the conservation of grassland and vernal pool habitat.

Objective(s):

- City and county planning departments take into account the conservation of grassland and vernal pool habitat.

Intended pressure(s) reduced: Renewable energy; housing and urban areas.

Conservation Strategy 5 (Direct Management): Manage invasive species, with focus on controlling or eradicating them in grassland habitats in the Central California Coast Ecoregion.

Objective(s):

- Eradicate or control invasive species in grassland habitats in the Central California Coast Ecoregion.

Intended pressure(s) reduced: Invasive plants/animals.

Conservation action(s):

- Fund and implement invasive species management actions in draft and final NCCPs, HCPs, conservation Strategies, and Recovery Plans.
- Coordinate with the California Invasive Plant Council.
- Identify sites for eradication of non-native tiger salamanders and bullfrogs.

Conservation Strategy 6 (Partner Engagement): Coordinate with Caltrans and county transportation agencies to use information on high-priority wildlife corridors in the design of wildlife-friendly transportation corridors.

Objective(s):

- Transportation agencies use information on high priority wildlife corridors to design wildlife-friendly transportation corridors.

Intended pressure(s) reduced: Roads and railroads; invasive plants/animals.

Conservation Strategy 7 (Partner Engagement): Coordinate with fire agencies to develop and implement fire management BMPs in grassland habitats.

Objective(s):

- Fire management BMPs to improve grassland habitat are co-developed with fire agencies.

Intended pressure(s) reduced: Fire and fire suppression.

Table 5.3-6 Stresses and Pressures for California Grassland, Vernal Pools, and Flowerfields

Priority Pressures	Stresses									
	Changes in geophysical and disturbance regime	Changes in soil characteristics		Changes in hydrology and water characteristics			Ecosystem changes			
	Change in natural fire regime	Change in soil chemistry	Soil compaction (not standard)	Change in runoff and river flow	Change in water levels and hydroperiod	Change in groundwater tables	Changes succession processes and ecosystem development	Change in spatial distribution of habitat types	Change in community structure or composition	Habitat fragmentation
Annual and perennial non-timber crops	X	X			X	X	X	X	X	
Commercial and industrial areas	X				X	X	X	X	X	X
Fire and fire suppression	X				X	X	X	X	X	X
Housing and urban areas	X				X	X	X	X	X	X
Invasive plants/animals	X			X	X	X	X	X	X	X
Livestock, farming, and ranching	X		X	X	X	X	X	X	X	X
Renewable energy	X				X	X				
Roads and railroads	X				X	X	X	X	X	X

Target: Coastal Sage Scrub, Northwest Coast Cliff and Outcrop, Coastal Dune and Bluff Scrub, and North Coast Deciduous Scrub and Terrace Prairie

Goals:

- By 2025, acres with desired structural diversity are increased by at least 5 percent from 2015 acres.
- By 2025, acres connected are increased by at least 5 percent from 2015 acres.
- By 2025, acres with desired fire regime are increased by at least 5 percent from 2015 acres.
- By 2025, acres with suitable soil characteristics are increased by 5 percent from 2015 acres.
- By 2025, acres of habitat are increased by at least 5 percent from 2015 acres.
- By 2025, acres where native species are dominant are increased by at least 5 percent from 2015 acres.

Conservation Strategy 1 (Land Acquisition/Easement/Lease): Protect priority habitats through fee title acquisition, permanent conservation easement, or other means; purchase land in a corridor connecting two protected areas to provide connectivity of habitat.

Objective(s):

- Ensure that funds are in place and priority sites are placed in easements; and, at each annual review, ensure that easements or leases are in compliance.

Intended pressure(s) reduced: Tourism and recreation areas; annual and perennial non-timber crops; housing and urban areas; commercial and industrial areas.

Conservation Strategy 2 (Land Acquisition/Easement/Lease): Designate conservation areas with emphasis on sites or landscapes that have unique and important value to wildlife.

Objective(s):

- Designate 5,000 acres for conservation area status.

Intended pressure(s) reduced: Roads and railroads; housing and urban areas; commercial and industrial areas.

Conservation Strategy 3 (Data Collection and Analysis): Collect biological and ecological data to address key information gaps on SGCN, habitats, and pressures.

Objective(s):

- Ensure that: the proposal includes clear management needs and outcomes that have been identified with input from relevant data users.
- Research provides answers to relevant questions.
- Appropriate audiences are accessing data.
- Research provides recommendations for conservation actions.
- Data are being used to inform conservation actions.
- Ensure that conservation strategies are implemented, based on research, to reduce any pressures to conservation targets that may be cumulative to climate change (e.g., recreation, grazing).

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; tourism and recreation areas; annual and perennial non-timber crops; fire and fire suppression; invasive plants/animals; airborne pollutants; climate change.

Conservation Strategy 4 (Law and Policy): Develop or influence law and policy that addresses vehicle emissions, timber harvest cumulative impacts, critical habitat, and marine species with ranges that overlap jurisdictional boundaries.

Objective(s):

- Adopt policies that address vehicle emissions, no net loss of critical habitat, timber harvest cumulative impact standards, and interstate enforcement for marine species with ranges that cross jurisdictional boundaries.

Intended pressure(s) reduced: Airborne pollutants; climate change.

Conservation Strategy 5 (Land Use Planning): Provide input to land use planning decisions.

Objective(s):

- Ensure that: local land use planners receive input on land use plans; a land use plan is approved that is consistent with input provided; the plan is implemented in a manner consistent with the input; and, at each annual review, the behavior of local entities is consistent with input.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; annual and perennial non-timber crops; roads and railroads; airborne pollutants.

Conservation action(s):

- Provide comments on documents such as City and County general plans, California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) documents, timber harvest plans, Integrated Natural Resource Management Plans (INRMPs) on military lands, etc.

Conservation Strategy 6 (Direct Management): Conduct direct resource management.

Objective(s):

- Management actions are implemented. Examples of applicable actions include: restore or enhance degraded habitats, monitor populations, and remove barriers to species movement; conduct controlled burns, wet burns, fire hazard abatement, and periodic burning in wildland areas; conduct managed thinning; enhance partnerships in private lands to increase direct management of natural resources; conduct managed grazing; manage invasive species; remove non-native species; conduct resource assessments to inform management decisions; and establish BMPs to implement across partnerships.

Intended pressure(s) reduced: Fire and fire suppression; invasive plants/animals.

Conservation action(s):

- Coordinate with CAL FIRE.
- Coordinate with Weed Management groups.
- Apply for funding.

Conservation Strategy 7 (Management Planning): Develop and implement management plans.

Objective(s):

- Develop management plans for target areas. Examples of applicable management planning actions include: work with partners on the development of large landscape conservation planning; develop or update management plans to integrate the effects of climate change; development of management plans for species, habitats and natural processes; develop a management plan for habitat of SGCN; reintroduction, relocation or stocking of native animals or plants or animals to an area where they can better adapt; translocate/breed in captivity SGCN to establish new populations in suitable habitat; and restore SGCN to historically occupied habitats.

Intended pressure(s) reduced: Invasive plants/animals.

Conservation action(s) include:

- Coordinate with weed management groups.

Conservation Strategy 8 (Partner Engagement): Establish and engage in partner relationships.

Objective(s):

- Engage state and federal agencies, tribal entities, the NGO community and other partners to achieve shared objectives and broader coordination across overlapping areas.
- Establish partnership to co-monitoring species/habitats on federally managed lands.
- Establish decision-making processes with other public and private entities to determine or implement strategies.
- Convene an advisory committee to assist with implementation of strategies.
- Establish BMPs to implement across partnerships.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; annual and perennial non-timber crops; tourism and recreation areas; fire and fire suppression; invasive plants/animals; climate change.

Conservation Strategy 9 (Environmental Review): Implement environmental review, with focus on the following: non-conservation oriented policies; projects and plans to help ensure impacts to wildlife are minimized and benefits maximized; infrastructure development projects to ensure they are designed and sited to avoid impacts on species and habitat; state highway plans; forest management plans; and plans for transmission corridor siting.

Objective(s):

- Review appropriate plans (i.e., EIRs, EISs, Negative Declarations, Biological Opinions, Land use changes, General Plans).

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; roads and railroads; dams and water management/use; renewable energy.

Table 5.3-7 Stresses and Pressures for Coastal Sage Scrub, Northwest Coast Cliff and Outcrop, Coastal Dune and Bluff Scrub, North Coast Deciduous Scrub and Terrace Prairie

Priority Pressures	Stresses							
	Climate factors			Changes in geophysical and disturbance regime	Changes in soil characteristics	Ecosystem changes		
	Change in summer average precipitation	Change in annual average precipitation	Change in temperature extremes	Change in natural fire regime	Change in nutrients	Habitat fragmentation	Change in spatial distribution of habitat types	Change in community structure or composition
Airborne pollutants					X			
Annual and perennial non-timber crops						X	X	
Climate change	X	X	X	X	X	X	X	X
Commercial and industrial areas						X	X	
Fire and fire suppression				X		X		X
Housing and urban areas						X	X	
Invasive plants/animals				X		X		X
Roads and railroads					X	X		
Tourism and recreation areas						X	X	

Target: Coastal Lagoons

Goals:

- By 2025, area (miles/acres) with desired nutrient load (TMDL) are increased by at least 5 percent from 2015 area (miles/acres).
- By 2025, acres of lagoon habitat are increased by at least 5 percent from 2015 acres.
- By 2025, acres of connected lagoon habitat are increased by at least 5 percent from 2015 acres.
- By 2025, miles with desired level of discharge (water level) are increased by at least 5 percent from 2015 miles.

Conservation Strategy 1 (Land Acquisition/Easement/Lease): Protect riparian areas by acquiring land adjacent to lagoons, and reduce water diversion from the critical lagoons and tributary streams during late spring to summer.

Objective(s):

- Protect riparian areas by acquiring land adjacent to lagoons, and reduce water diversion from the critical lagoons and tributary streams during late spring to summer.

Intended pressure(s) reduced: Livestock, farming, and ranching; wood and pulp plantations; dams, water management and use; commercial and industrial areas; housing and urban areas; tourism and recreation areas.

Conservation action(s):

- Develop Conceptual Area Protection Plan (CAPP).
- Obtain funding for implementation and staff.
- Survey the interests from willing sellers.
- Identify partners for funding and management.
- Identify willing landowners.

Conservation Strategy 2 (Data Collection and Analysis): Conduct baseline surveys for SCGN/habitat and pressures in at least 50 percent of coastal lagoons within the ecoregion.

Objective(s):

- Conduct baseline surveys for SCGN/habitat and pressures in coastal lagoons within the ecoregion.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; tourism and recreation areas; annual and perennial non-timber crops; livestock, farming, and ranching; wood and pulp plantations.

Conservation Strategy 3 (Law and Policy): Influence the drafting of laws and policies that promote conservation of lagoon habitat.

Objective(s):

- Influence the drafting of laws and policies that promote conservation of lagoon habitat.
- Ensure that riparian function and processes are maintained to provide desired conditions, and manage riparian buffers.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; tourism and recreation areas; annual and perennial non-timber crops; livestock, farming, and ranching; wood and pulp plantations.

Conservation action(s):

- Develop CDFW policy for protecting riparian and watercourse zones tributary to lagoons.
- Participate in interagency working group to advocate for lower order stream protection.
- Advocate for compliance monitoring.

Conservation Strategy 4 (Direct Management): Manage dams and other barriers to improve fish passage and stream ecosystem function.

Objective(s):

- Using the Passage Assessment Database, Fish Passage Forum Barrier Optimization Model, and CDFW's internal prioritization team, establish a candidate list of small diversion dams that can be modified or removed to improve fish passage.
- Quantify needed bypass flows to support biological requirements and geomorphology.

Intended pressure(s) reduced: Dams and water management/use; other ecosystem modifications.

Conservation action(s):

- Coordinate with private landowners.
- Inventory barriers and assess flow and water condition.
- Develop plan for prioritization and construction or retrofits.
- Identify funding sources-apply.
- Permits, environmental review.
- Perform conservation-oriented construction or retrofits.
- Implement water conservation strategies.
- Identify location of barriers.

Conservation Strategy 5 (Direct Management): Develop an interagency direct management plan for coastal lagoons.

Objective(s):

- Develop an interagency direct management plan for coastal lagoons.

Intended pressure(s) reduced: Annual and perennial non-timber crops; livestock, farming, and ranching; wood and pulp plantations.

Conservation action(s):

- Coordinate with private and public landowners.
- Inventory lagoons to assess flow and water condition and other important parameters for SGCN.
- Identify groups/organizations to participate in interagency working group to establish priorities for restoration.
- Develop plan for management prioritization, including restoration needs.
- Identify funding sources.
- Secure permits and complete environmental review.
- Perform conservation-oriented management and restoration actions.
- Implement strategies to enhance functions for SGCN critical life history needs.
- Conduct or acquire existing assessments of parcels to determine restoration potential and biological value.

Conservation Strategy 6 (Training and Technical Assistance): Provide training and technical assistance, including training interagency staff in fish identification and invasive species management/control techniques.

Objective(s):

- Train interagency staff on fish identification (native and non-native) and invasive species management/control techniques.

Intended pressure(s) reduced: Invasive plants/animals; annual and perennial non-timber crops; livestock, farming, and ranching; wood and pulp plantations; housing sewage and urban waste water; agricultural and forestry effluents; garbage and solid waste; climate change.

Table 5.3-8 Stresses and Pressures for Coastal Lagoons

Priority pressures	Stresses						
	Changes in geophysical and disturbance regimes		Changes in hydrology and water characteristics			Ecosystem changes	
	Change in sediment erosion-deposition regime	Change in natural fire regime	Change in runoff and river flow	Change in water chemistry	Change in groundwater tables	Change in spatial distribution of habitat types	Habitat fragmentation
Agricultural and forestry effluents				X			
Annual and perennial non-timber crops	X		X	X	X		X
Climate change	X		X	X	X	X	X
Commercial and industrial areas	X	X	X	X	X	X	X
Dams and water management/use	X		X				
Fire and fire suppression		X					
Garbage and solid waste				X			
Housing and urban areas	X	X	X	X	X	X	X
Housing sewage and urban waste water				X			
Livestock, farming, and ranching	X		X	X	X		X
Other ecosystem modifications	X		X				
Recreational activities			X	X			
Roads and railroads							X
Tourism and recreation areas	X	X	X	X	X	X	X
Wood and pulp plantations	X		X	X	X		X

Target: Salt Marsh

Goals:

- By 2025, miles with desired level water quality are increased by at least 5 percent from 2015 miles.
- By 2025, acres of habitat (salt-marsh habitat) are increased by at least 5 percent from 2015 acres.
- By 2025, acres with desired genetic connectivity are increased by at least 5 percent from 2015 acres.
- By 2025, acres with desired structural diversity are increased by at least 5 percent from 2015 acres.
- By 2025, acres connected are increased by at least 5 percent from 2015 acres.
- By 2025, acres of habitat (salt-marsh habitat by providing high-tide refugia for native species) are increased by at least 5 percent from 2015 acres.
- By 2025, miles with desired level of water yield (consistent with the Bay-Delta Water Quality Control Plan requirements) are increased by at least 5 percent from 2015 miles.
- By 2025, improve water quality in the San Francisco Bay Delta by meeting Total Maximum Daily Load (TMDL) requirements for organic and inorganic pollutants.
- By 2025, miles with desired level water quality are increased by at least 5 percent from 2015 miles.

Conservation Strategy 1 (Land Acquisition/Easement/Lease): Protect and restore land acquired through fee title or conservation easement, with focus on the following: acquire, protect, enhance, or restore salt marsh habitat; support the Delta Conservancy to establish restoration priorities; increase connectivity among salt marsh habitats; and enhance working landscapes to benefit fish and wildlife.

Objective(s):

- Restore 10,000 acres of salt-marsh habitat; acquire, protect, enhance, or restore salt-marsh habitat in the Bay Delta.
- Support the Delta Conservancy to establish priorities for restoration in the Bay Delta.
- Increase connectivity among salt-marsh habitats in the Bay Delta.
- Enhance working landscapes to benefit fish and wildlife.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; annual and perennial non-timber crops; livestock, farming, and ranching; climate change.

Conservation action(s):

- Fund and implement salt marsh habitat acquisition and restoration actions as described in draft and final NCCPs, HCPs, Conservation Strategies, and Recovery Plans, including the Suisun Marsh Plan and USFWS Tidal Marsh Recovery Plan.
- Conduct or acquire existing assessments of parcels to determine restoration potential and biological value.
- Write Land Acquisition Evaluation (LAE) or CAPP for high priority parcels.
- Identify groups/organizations to participate in interagency working group to establish priorities for restoration of salt-marsh habitat.
- Establish priorities for restoration of salt-marsh habitat in San Francisco Bay Delta.
- Link to strategy that advocates for legislation that supports acquisition and restoration of degraded habitat.
- Identify and summarize available grant funding for acquisition and restoration.
- Coordinate with private landowners.

Conservation Strategy 2 (Data Collection and Analysis): Conduct research regarding effective salt marsh management.

Objective(s):

- Coordinate research efforts and data sharing (Delta-Science Program; Delta Conservancy).
- Continue ongoing long-term studies (baseline and monitoring).
- Identify and prioritize data gaps for future investigation/research.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; annual and perennial non-timber crops; livestock, farming, and ranching.

Conservation action(s):

- Obtain funding and implement research and monitoring described in the UFWS Tidal Marsh Recovery Plan and Suisun Marsh Plan.
- Obtain funding for plan implementation.
- Coordinate with state, federal, and local agencies, universities, and NGOs.
- Identify existing/ongoing research/data-gathering efforts.
- Create central repository for data, research tracking, and coordination.
- Participate in science tracking database.
- Develop data needs database/conceptual model.
- Evaluate and prioritize existing long-term baseline data gathering efforts.

Conservation Strategy 3 (Outreach and Education): Implement education and outreach focused on educating local agencies and the public on the biological values of Bay Delta habitats and existing pressures that affect fish and wildlife, and promote effective and coordinated conservation strategies for the Bay Delta.

Objective(s):

- Educate local agencies and the public on the biological values of the Bay Delta habitats and the existing pressures affecting fish and wildlife.
- Promote effective and coordinated conservation strategies for the Bay Delta.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; annual and perennial non-timber crops; livestock, farming, and ranching; invasive plants/animals.

Conservation action(s):

- Identify existing outreach and education strategies for the Bay Delta.
- Participate in existing partnerships for developing an outreach and education strategy for the Bay Delta.
- Coordinate with stakeholders.
- Develop outreach messages.
- Identify target audience.
- Obtain funding for strategy implementation and staffing.
- Develop and implement outreach plan.

Conservation Strategy 4 (Economic Incentives): Provide economic incentives for improved resource management.

Objective(s):

- Support Resource Conservation Districts on existing incentive programs (e.g., incentivize landowners to conserve and restore habitat).
- Collaborate with state, federal, and local agencies to identify opportunities to implement joint conservation actions.
- Provide landowner assistance with cost share requirements to receive incentives.
- Work with agencies providing incentives to lengthen enrollment limits.

Intended pressure(s) reduced: Housing and urban areas; commercial and industrial areas; annual and perennial non-timber crops; livestock, farming, and ranching.

Conservation action(s):

- Identify willing landowners to participate in incentive programs.
- Identify priorities based on conservation potential.
- Obtain funding for strategy implementation.
- Identify partnership opportunities.
- Make recommendations based on program criteria.
- Coordinate with federal agencies.
- Develop pilot projects and case studies to demonstrate success.
- Promote good-neighbor policies.

Conservation Strategy 5 (Law and Policy): Advocate for laws and policies, with focus on the following: influence land use policies to reduce impacts on salt marsh habitat; streamline permitting process for restoration; enhance law enforcement capacity for protection of restoration sites; and develop programmatic permits.

Objective(s):

- Influence land use policies to reduce impacts on salt-marsh habitat.
- Improve the effectiveness of the local, state, and federal permitting processes for restoration.
- Enhance law enforcement capacity for protection of restoration sites
- Reduce vandalism (e.g., pumps) and dumping.
- Develop programmatic permits.

Intended pressure(s) reduced: Recreational activities; hunting and collecting terrestrial animals; fishing and harvesting aquatic resources.

Conservation action(s):

- Identify conservation partners.
- Coordinate with state, federal, and local agencies.
- Evaluate the efficacy of creating new policies and regulations protecting salt-marsh habitat.
- Make recommendations to enhance enforcement of existing laws and regulations.
- Advocate for changes in regulations to allow streamlining.
- Develop legislative and regulatory proposals for streamlining permitting process.
- Develop advocacy message for habitat restoration.
- Link to outreach and education strategy to inform decision makers.
- Restore CDFW lands.
- Obtain funding for strategy implementation.

Conservation Strategy 6 (Direct Management): Control invasive species.

Objective(s):

- Comprehensively assess and map plant and animal invasive species distributions.
- Develop an integrated control plan for each.
- Coordinate update and implementation of landscape level invasive species monitor and control plan.

Intended pressure(s) reduced: Invasive plants/animals.

Conservation action(s):

- Collaborate with existing agencies or groups involved with invasive species monitoring and treatment.
- Identify and compile existing invasive species strategies.
- Conduct additional mapping as necessary to fill gaps.
- Develop control plans for priority species.
- Implement priority species control plans
- Implement top priority controls plans.
- Monitor invasive species and continue removal efforts as needed to keep populations in check.
- Link to outreach and education plan.

Conservation Strategy 7 (Management Planning): Implement integrated resource management.

Objective(s):

- Coordinate and integrate ongoing management activities (e.g., grazing BMPs, invasive species, water management, land use).
- Enhance working landscapes to benefit fish and wildlife.

Intended pressure(s) reduced: Dams and water management/use; shipping lanes; roads and railroads; recreational activities; hunting and collecting terrestrial animals; fishing and harvesting aquatic resources.

Conservation action(s):

- Fund and implement water and habitat management strategies on existing large-area habitat lands to enhance fish and wildlife population and increase water conservation for multi-benefits and uses.
- Fund and implement salt marsh resource management actions as described in draft and final NCCPs, HCPs, Conservation Strategies, and Recovery Plans, including the Suisun Marsh Plan, and USFWS Tidal Marsh Recovery Plan.
- Coordinate with state, federal, local agencies, private landowners, including BCDP process
- Participate in California Biodiversity Council integration process.
- Participate in Dredged Material Management Office, incorporate Delta.
- Implement invasive species strategy.
- Create common set of biological/ecological indicators.
- Develop common methods/priorities for habitat restoration and management.
- Coordinate cross-jurisdictional activities.

Conservation Strategy 8 (Partner Engagement): Partner for joint advocacy.

Objective(s):

- Create high-level multi-agency/NGO partnerships to coordinate conservation actions.
- Through partnerships, leverage political awareness of need to conserve salt marsh habitat in the Bay Delta.
- Solicit additional funding through grants or political advocacy.

Intended pressure(s) reduced: Dams and water management/use; shipping lanes; roads and railroads; recreational activities; hunting and collecting terrestrial animals; fishing and harvesting aquatic resources.

Conservation action(s):

- Coordinate with local agencies and NGOs with large-area draft and completed conservation plans
- Coordinate with entities involved in the BDCP.
- Develop MOU/Charter for partnership.
- Review and synthesize existing conservation strategies.
- Establish process for prioritizing conservation actions.
- Advocate science based decisions and process.
- Develop coordinated/unified conservation plan.
- Pool or leverage funding for conservation.

Table 5.3-9 Stresses and Pressures for North American Pacific Coastal Salt-Marsh

Priority pressures	Stresses							
	Changes in geophysical and disturbance regimes		Changes in hydrology and water characteristics			Ecosystem changes		
	Change in sediment erosion-deposition regime	Change in extreme events	Change in flood occurrence, frequency, intensity, and area flooded (including hydroperiod)	Change in water levels and hydroperiod	Change in pollutants	Change in spatial distribution of habitat types	Change in community structure and composition	Changes succession processes and ecosystem development
Annual and perennial non-timber crops	X	X	X	X	X	X	X	X
Commercial and industrial areas	X	X	X	X	X	X	X	X
Dams and water management/use	X	X	X	X	X	X	X	X
Fishing and harvesting aquatic resources	X	X	X	X	X	X	X	X
Housing and urban areas	X	X	X	X	X	X	X	X
Hunting and collecting terrestrial animals	X	X	X	X	X	X	X	X
Invasive plants/animals	X	X	X	X	X	X	X	X
Livestock, farming, and ranching	X	X	X	X	X	X	X	X
Recreational activities	X	X	X	X	X	X	X	X
Roads and railroads	X	X	X	X	X	X	X	X
Shipping lanes	X	X	X	X	X	X	X	X

Table 5.3-10 Conservation Targets and Strategies for the Bay Delta and Central Coast Province

Target	Goals	Key Ecological Attributes (KEAs)	Pressures[1]	Strategy Categories
American Southwest Riparian Forest and Woodland	▪ By 2025, acres of habitat are increased by at least 5% from 2015 acres of riparian habitat in the Central Coast Ecoregion. ▪ By 2025, acres where native species are dominant are increased by at least 5% from 2015 acres. ▪ By 2025, miles connected are increased by at least 5% from 2015 miles of riparian habitat. ▪ By 2025, miles with desired level of discharge are increased by at least 5% from 2015 miles. ▪ By 2025, acres with desired age class heterogeneity are increased by at least 5% from 2015 acres of riparian habitat.	▪ Area and extent of community ▪ Connectivity among communities and ecosystems ▪ Native versus non-native diversity ▪ Age class heterogeneity ▪ Water level fluctuations	▪ Annual and perennial non-timber crops ▪ Dams and water management/use ▪ Invasive plants/animals ▪ Livestock farming and ranching ▪ Roads and railroads	▪ Direct Management ▪ Land Acquisition/ Easement/ Lease ▪ Outreach and Education
California Grassland, Vernal Pools, and Flowerfields	▪ By 2025, acres of grassland habitat restored are increased by at least 5% from 2015 acres. ▪ By 2025, acres of vernal pool habitat restored are increased by at least 5% from 2015 acres. ▪ By 2025, acres where native species are dominant are increased by at least 5% from 2015 acres by treatment with managed grazing. ▪ By 2025, population of key species (spadefoot toad) is increased by at least 5% from 2015 population levels. ▪ By 2025, acres with desired stages of succession are increased by at least 5% from 2015 acres by reducing encroachment of coyote bush/coastal scrub into grassland. ▪ By 2025, miles with desired stream stage are increased by at least 5% from 2015 miles through length of hydroperiod. ▪ By 2025, miles with desired level water quality are increased by at least 5% from 2015 miles by meeting standards of Basin Plan.	▪ Area and extent of community ▪ Successional dynamics ▪ Key species population levels ▪ Native versus non-native diversity ▪ Surface water flow regime	▪ Annual and perennial non-timber crops ▪ Commercial and industrial areas ▪ Fire and fire suppression ▪ Housing and urban areas ▪ Invasive plants/animals ▪ Livestock farming and ranching ▪ Renewable energy ▪ Roads and railroads	▪ Data Collection and Analysis ▪ Partner Engagement ▪ Direct Management ▪ Land Acquisition/ Easement/ Lease ▪ Land Use Planning
Coastal Sage Scrub Northwest Coast Cliff and Outcrop Coastal Dune and Bluff Scrub North Coast Deciduous Scrub and Terrace Prairie	▪ By 2025, acres with desired structural diversity are increased at least 5% from 2015 acres. ▪ By 2025, acres connected are increased by at least 5% from 2015 acres. ▪ By 2025, acres with desired fire regime are increased by at least 5% from 2015 acres. ▪ By 2025, acres with suitable soil characteristics are increased by 5% from 2015 acres. ▪ By 2025, acres of habitat are increased by at least 5% from 2015 acres. ▪ By 2025, acres where native species are dominant are increased by at least 5% from 2015 acres.	▪ Area and extent of community ▪ Fire regime ▪ Connectivity among communities and ecosystems ▪ Structural diversity ▪ Native versus non-native diversity ▪ Soil and sediment deposition regime	▪ Air-borne pollutants ▪ Annual and perennial non-timber crops ▪ Climate change ▪ Commercial and industrial areas ▪ Fire and fire suppression ▪ Housing and urban areas ▪ Invasive plants/animals ▪ Roads and railroads ▪ Tourism and recreation areas	▪ Data Collection and Analysis ▪ Partner Engagement ▪ Management Planning ▪ Direct Management ▪ Environmental Review ▪ Land Acquisition/ Easement/ Lease ▪ Land Use Planning ▪ Law and Policy
Coastal Lagoons	▪ By 2025, area (miles/acres) with desired nutrient load (TMDL) are increased by at least 5% from 2015 area (miles/acres). ▪ By 2025, acres of lagoon habitat are increased by at least 5% from 2015 acres. ▪ By 2025, acres of connected lagoon habitat are increased by at least 5% from 2015 acres. ▪ By 2025, miles with desired level of discharge (water level) are increased by at least 5% from 2015 miles.	▪ Area and extent of community ▪ Connectivity among communities and ecosystems ▪ Native versus non-native diversity ▪ Surface water flow regime ▪ Nutrient concentrations and dynamics	▪ Agricultural and forestry effluents ▪ Annual and perennial non-timber crops ▪ Climate change ▪ Commercial and industrial areas ▪ Dams and water management/use ▪ Fire and fire suppression ▪ Garbage and solid waste ▪ Housing and urban areas ▪ Housing sewage and urban waste water ▪ Livestock farming and ranching ▪ Other ecosystem modifications ▪ Recreational activities ▪ Roads and railroads ▪ Tourism and recreation areas ▪ Wood and pulp plantations	▪ Data Collection and Analysis ▪ Direct Management ▪ Land Acquisition/ Easement/ Lease ▪ Law and Policy ▪ Training and Technical Assistance
Salt Marsh	▪ By 2025, miles with desired level of water quality are increased by at least 5% from 2015 miles. ▪ By 2025, acres of habitat (salt-marsh habitat) are increased by at least 5% from 2015 acres. ▪ By 2025, acres with desired genetic connectivity are increased by at least 5% from 2015 acres. ▪ By 2025, acres with desired structural diversity are increased at least 5% from 2015 acres. ▪ By 2025, acres connected are increased by at least 5% from 2015 acres. ▪ By 2025, acres of habitat (salt-marsh habitat by providing high-tide refugia for sensitive species) are increased by at least 5% from 2015 acres. ▪ By 2025, miles with desired level of water yield (consistent with the Bay-Delta Water Quality Control Plan requirements) are increased by at least 5% from 2015 miles. ▪ By 2025, improve water quality in the San Francisco Bay Delta by meeting Total Maximum Daily Load requirements for organic and inorganic pollutants. ▪ By 2025, miles with desired level water quality are increased by at least 5% from 2015 miles.	▪ Area and extent of community ▪ Successional dynamics ▪ Structural diversity ▪ Diversity ▪ Native versus non-native diversity ▪ Soil and sediment deposition regime ▪ Pollutant concentrations and dynamics ▪ Water level fluctuations	▪ Annual and perennial non-timber crops ▪ Commercial and industrial areas ▪ Dams and water management/use ▪ Fishing and harvesting aquatic resources ▪ Housing and urban areas ▪ Hunting and collecting terrestrial animals ▪ Invasive plants/animals ▪ Livestock farming and ranching ▪ Recreational activities ▪ Roads and railroads ▪ Shipping lanes	▪ Data Collection and Analysis ▪ Partner Engagement ▪ Management Planning ▪ Direct Management ▪ Economic Incentives ▪ Land Acquisition/ Easement/ Lease ▪ Law and Policy ▪ Outreach and Education

[1] Pressures can be positive or negative depending on the intensity, timing, and duration of the action on the target habitat.