5.3 Bay Delta and Central Coast Province

5.3.1 Geophysical and Ecological Description of the Province

The Bay Delta and Central Coast Province contains the important geophysical and ecological complex of estuaries, coastal valleys, and coast range mountains, comprising over 300 miles of central California coast, between the Southern California Bight and the North Coast, and extending approximately 75 miles inland from the Pacific Ocean (Figure 5.3-1). While the Bay Delta region plays many important ecological roles on its own and is affected by most of the state's ecosystems north of the Tehachapi Mountains, incorporating it with the Central Coast as one province associates it with several other critical estuarine habitat and coastal areas. Geophysically, the province is defined primarily by the Southern Coast Ranges, with many peaks in between 3,000 to over 4,000 feet elevation, up to the tallest at 5,862 feet, which is Junipero Serra Peak in the Santa Lucia Range. Between mountain ranges are broad coastal valleys, such as the Santa Clara Valley and Salinas Valley. Ecologically, the province contains extensive areas of some of the most important and sensitive salt, brackish, and fresh water habitats in the state, including the San Francisco Bay system; Sacramento-San Joaquin Delta; and the Elkhorn Slough, Carmel River, and Morro Bay estuaries. Overall, the habitats of the province are highly varied, including tidal marsh, broad areas of cultivated lands in valleys, valley and mountain riparian corridors, coastal grasslands, chaparral and other scrub plant communities, and large areas of forest and woodland habitats.

Bay Delta

Encompassing 1,600 square miles of waterways, the San Francisco Bay and Delta together form the West Coast's largest estuary and the second-largest estuary in the nation. 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, Mokelume, 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.

California Department of Water Resources (DWR)

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

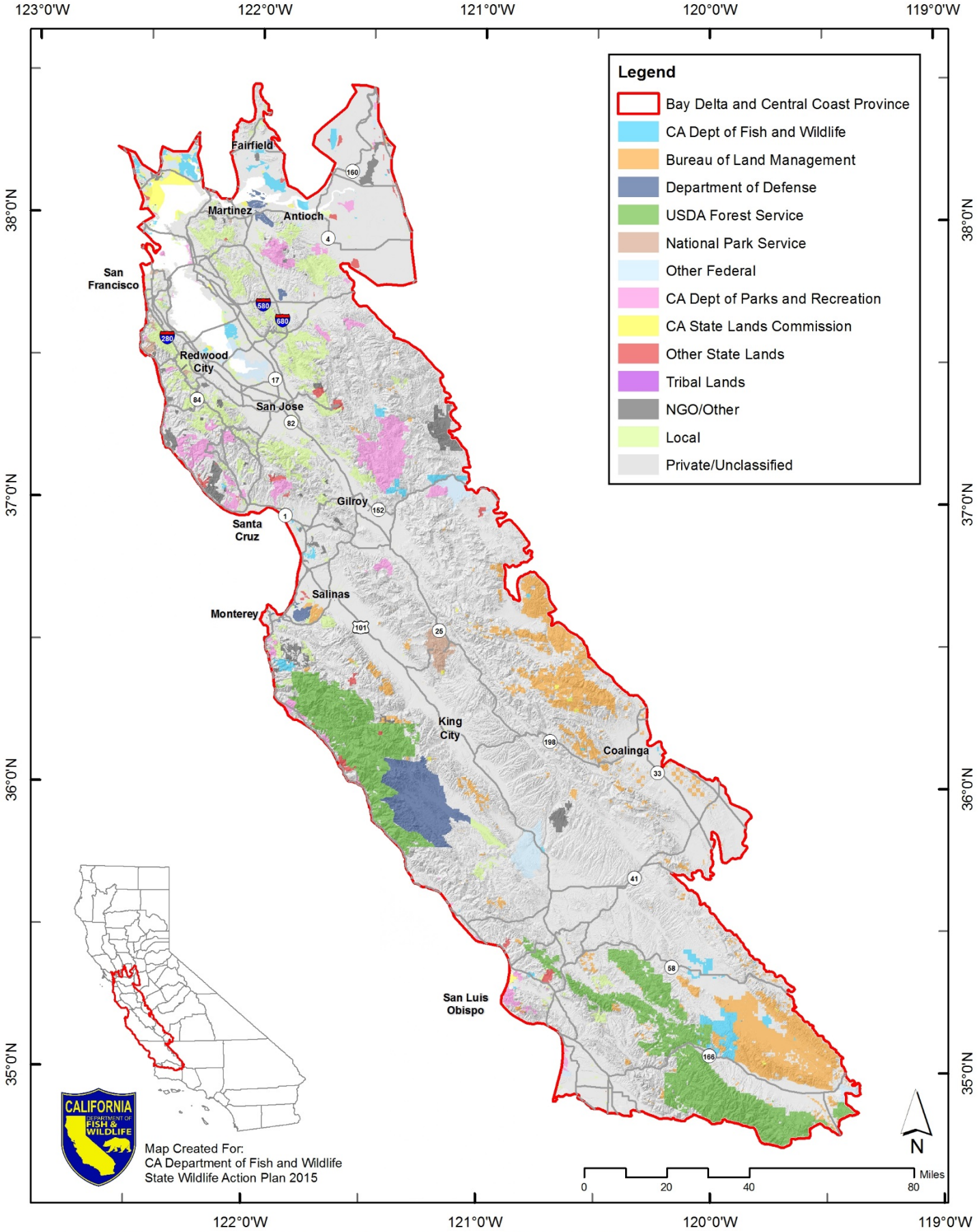
that drain into San Francisco Bay. Low coastal mountains surround San Francisco Bay, with several peaks rising above 3,000 feet. The region receives 90 percent of its surface water from the Sierra Nevada via major Central Valley creeks and rivers that feed the Delta. Other rivers draining into the Bay include the Napa, Petaluma, and Guadalupe rivers and Sonoma, Petaluma, Alameda, 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.

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 fish, invertebrates, sharks, seals, and even, on occasion, whales. Along the shoreline are coastal salt marsh, coastal scrub, tidal mudflats, 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 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



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

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. Since the Gold Rush, significant loss of wetlands has occurred as a result of diked agricultural lands, commercial salt ponds, ports, airports, transportation, and other development. 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, which has shifted the food-base and reduced the aquatic biological diversity. Invasive cordgrass (*Spartina)* has become established in coastal areas, including mud flats, salt marshes and beaches, out-competing native plants. 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. In many parts of the Bay, there have been shifts in the locations of the baylands and adjacent habitats. These shifts have resulted from a combination of urbanization of moist grasslands and vernal pool complexes, reclamation of tidal habitats, and sediment deposition in subtidal habitats. Reclamation has converted some tidal habitats into seasonal wetlands, while urbanization destroyed similar habitats in the adjacent uplands. Sedimentation has converted some subtidal areas to more shallow tidal habitats. The combined effect of these changes has been to shift seasonal wetlands and the baylands bayward. The desired landscape elements sought within tidal marsh restoration projects are open water areas within the tidal marsh of both shallow (for shorebirds) and deeper (for waterfowl) depths (Goals Project 1999).

The nontidal freshwater marsh natural community is composed of perennially saturated wetlands, including meadows, dominated by emergent plant species that do not tolerate perennial saline or brackish conditions. Nontidal freshwater perennial marsh communities occur in small fragments along the edges of the nontidal perennial aquatic and valley/foothill riparian natural communities. Soils are predominantly silt and clay, although coarser sediments and organic material may be intermixed. In some areas, organic soils (peat) may constitute the primary growth medium. The extent of nontidal freshwater perennial emergent wetland in California, including the Delta, has declined dramatically over the past century due to reclamation and conversion of the habitat to other uses, primarily agriculture (Gilmer et al. 1982; The Bay Institute 1998). The extent of this natural community in the Delta has been dramatically reduced in the past century, with a corresponding reduction in habitat function for associated fish and wildlife species (The Bay Institute 1998).

Bay-Delta Live

Bay-Delta Live (BDL; http://www.baydeltalive.com/) is a data hub of information needed in understanding the dynamic ecosystem known as the Sacramento-San Joaquin Rivers Delta. BDL's purpose is to expand access to data for the Delta. Members of the BDL community can view data from multiple sources with a set suite of tools such as visualizations and time series analyses to expand knowledge and reach of information to the public. BDL is supported through contributions from federal and state agencies, as well as community and agency information. Data providers include CDFW, California Department of Water Resources, U.S. Geological Survey, U.S. Fish and Wildlife Service, and U.S. Bureau of Reclamation.

Because of the conservation and management complexities and challenges facing the Bay Delta, the SWAP 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), Sacramento-San Joaquin Delta Conservancy, and 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 regional team developed targets and conservation strategies based on their discussion within the reference documents. The SWAP team also developed conservation strategies that they 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; 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).

Central Coast

California's Central Coast region 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

Dick Daniels

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.

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 marine 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), and Pescadero Marsh. 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 native coastal prairie grasslands, 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.

Patricia Bratcher, CDFW

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 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 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 California red-legged frog, foothill yellow-legged frog, and western pond turtle, and birds such as 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.

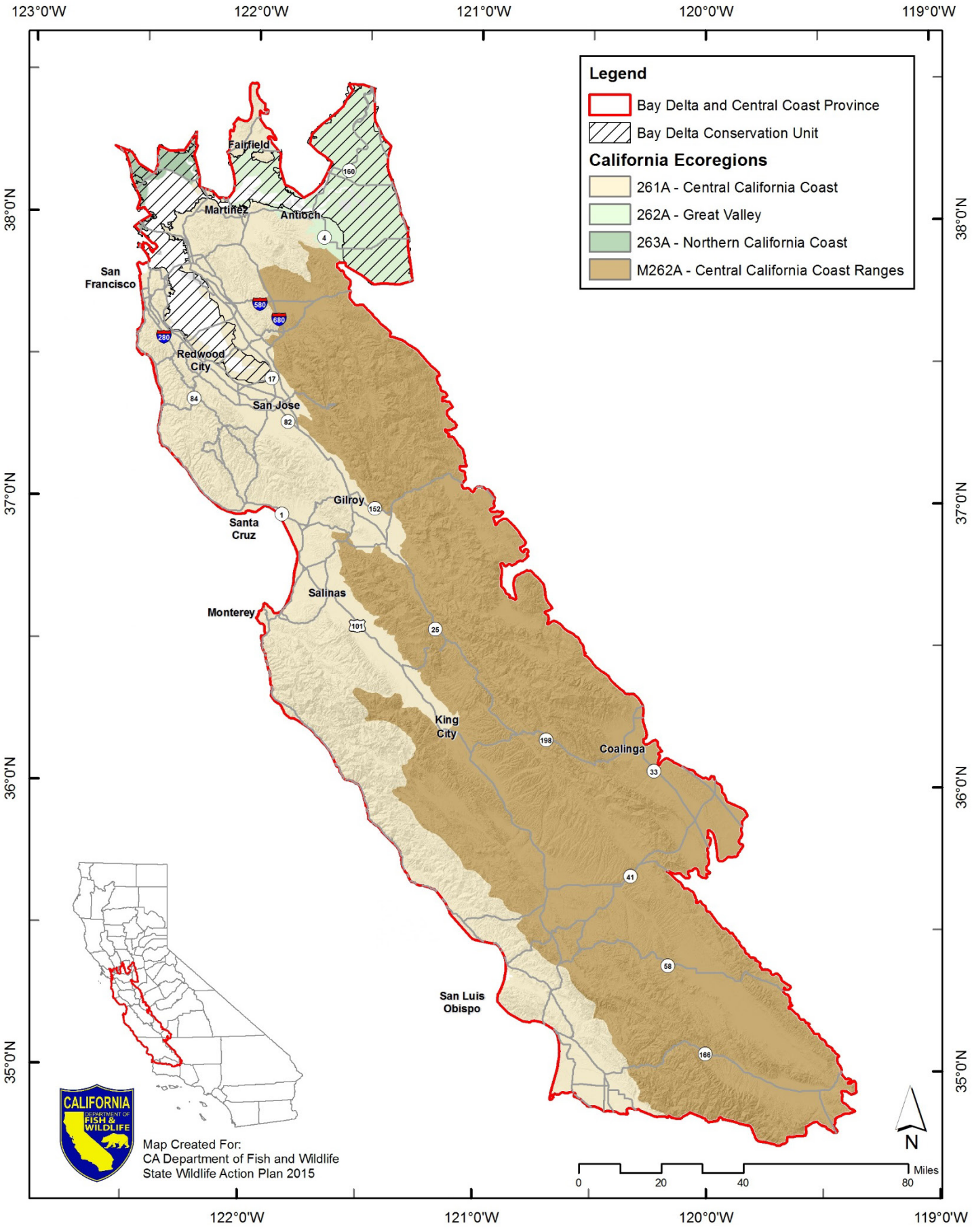
The San Andreas Fault runs the length of the region and shapes much of the region's geography. Most of the north-south running mountain ranges and valley depressions have been formed as a result of pressure between the two continental plates meeting at this fault zone. Compression, chemical interaction, 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 nonnative 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.

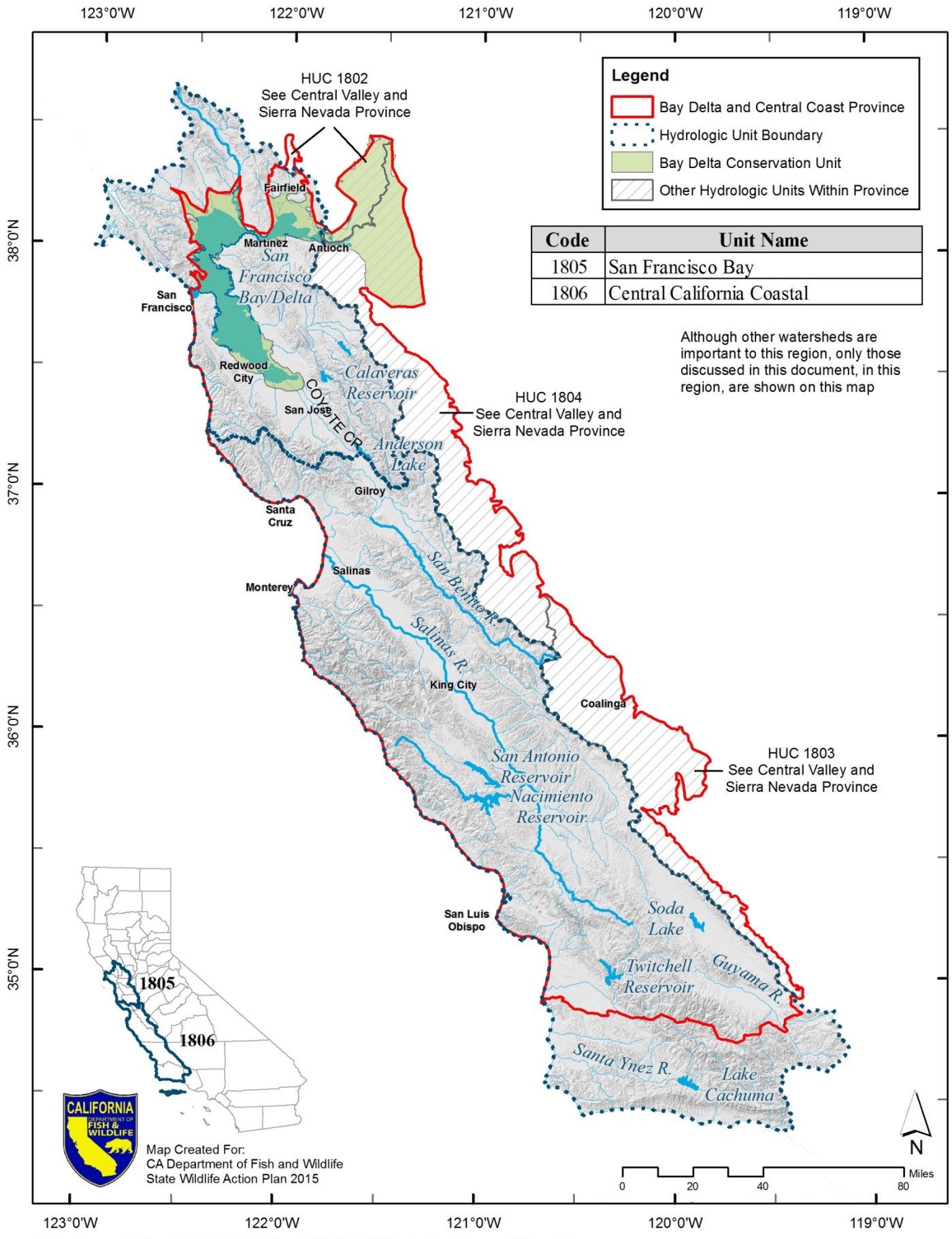
5.3.2 Conservation Units and Targets

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 1802, 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. Information about the methods used to prioritize conservation targets is presented in Appendix D. 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

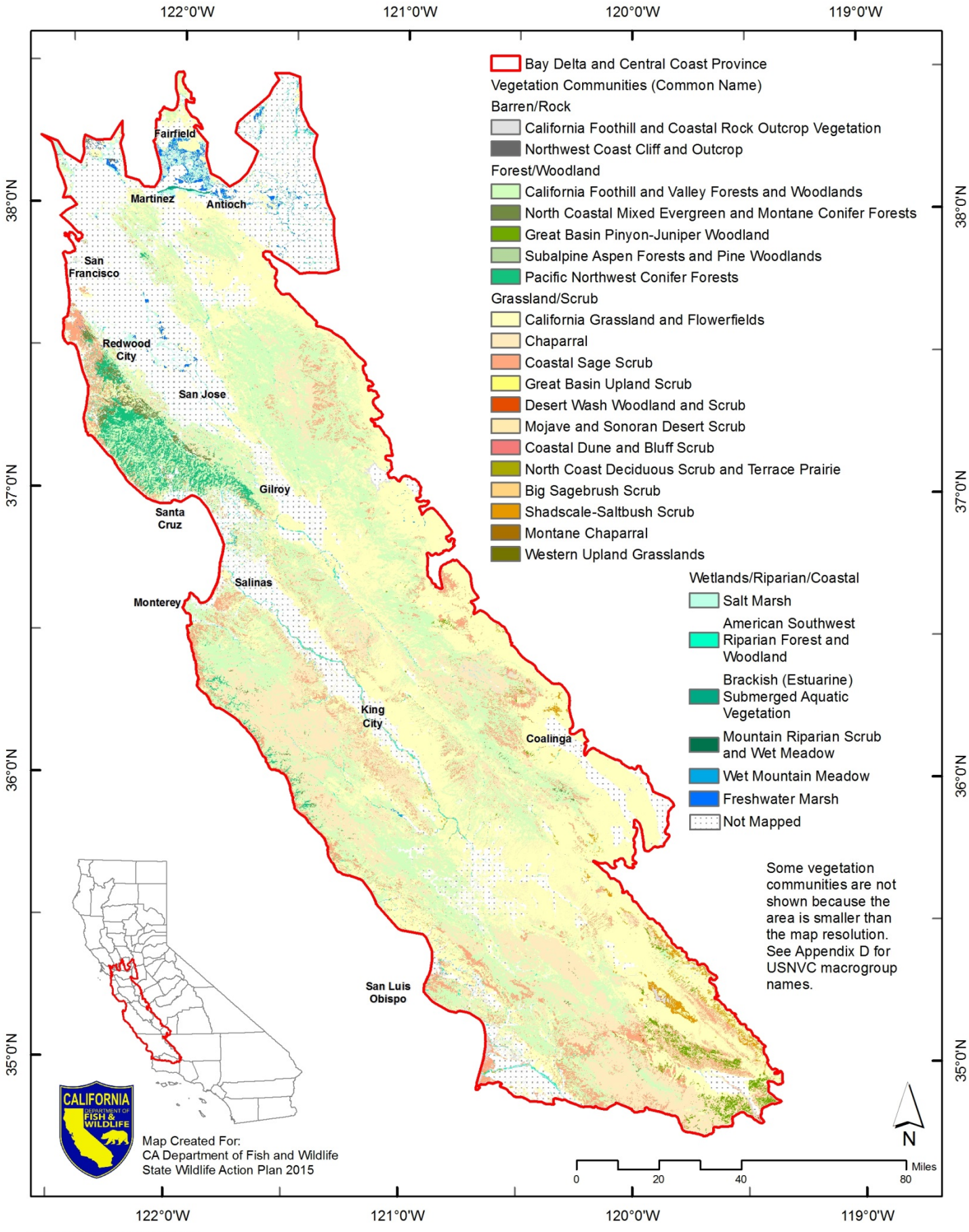
Table 5.3-1 Conservation Units and Targets – Bay Delta and Central Coast Province*

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 description under Central California Coast Ecoregion.	Annual Grassland; Perennial Grassland
		American Southwest Riparian Forest and Woodland	See description under Central California Coast Ecoregion.	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	Freshwater Marsh	This vegetation type consists of freshwater emergent marshes and coastal/tidal marshes and meadows. It can be found surrounding streams, rivers, lakes and wet meadows. These habitats occur on virtually all exposures and slopes, provided a basin or depression is saturated or at least periodically flooded. Dominant species are generally perennial monocots including graminoids such as rushes, reeds, grasses and sedges. Dominant species include: common reeds, hardstem bulrush, small-fruited bulrush, water parsley, slough sedge, soft rush, salt rush, and pacific silverweed.	Fresh Emergent Wetland
		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; Tidal Freshwater Wetland (in the Delta)
		American Southwest Riparian Forest and Woodland	See description under Central California Coast Ecoregion.	Valley Foothill Riparian
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	Coastal lagoons are bodies of water that are permanently or seasonally separated from the ocean by sand bars, and are also known as "bar-built estuaries." Lagoons are characterized by estuarine species when open to the ocean periodically, and may be characterized by freshwater species when permanently separated from the ocean. Lagoons are surrounded by riparian vegetation providing habitat for amphibians, reptiles, birds, and mammals.	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;
- community structure and composition; and
- soil quality and sediment deposition regime.

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

Key Ecological Attributes	Conservation Units and Targets											
	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	Freshwater Marsh	Salt Marsh	American Southwest Riparian Forest and Woodland	Coastal Lagoons
Area and extent of community	X	X	X	X	X	X	X	X	X	X	X	X
Community structure and composition	X	X	X	X	X	X	X	X	X	X	X	X
Connectivity among communities and ecosystems		X	X	X	X	X		X	X		X	X
Fire regime		X		X	X	X						
Nutrient concentrations and dynamics												X
Pollutant concentrations and dynamics										X		
Soil quality and sediment deposition regime		X		X	X	X				X		
Successional dynamics	X						X		X	X		
Surface water flow regime	X						X		X			X
Water level fluctuations			X					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 (Table 5.3-3). Not all of the focal species meet the criteria to be considered Species of Greatest Conservation Need (SGCN). SGCN are indicated with an asterisk. SGCN associated with the Bay Delta and Central Coast Province are shown by ecoregion in Tables C-15 and C-16 in Appendix C.

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	Freshwater Marsh	Salt Marsh	American Southwest Riparian Forest and Woodland	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	X	
River lamprey*	*Lampetra eyresii*			X					X			X	
White sturgeon*	*Acipenser transmontanus*			X					X			X	X
North American green sturgeon Southern DPS*	*Acipenser medirostris*			X					X		X	X	
Coho salmon - central California coast ESU*	*Oncorhynchus kisutch*			X					X			X	X
Steelhead - central California coast DPS*	*Oncorhynchus mykiss irideus*			X					X			X	X
Steelhead – Central Valley DPS*	*Oncorhynchus mykiss irideus*			X					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	Freshwater Marsh	Salt Marsh	American Southwest Riparian Forest and Woodland	Coastal Lagoons
Steelhead - south/central California coast DPS*	*Oncorhynchus mykiss irideus*			X					X			X	X
Sacramento River winter-run Chinook salmon ESU*	*Oncorhynchus tshawytscha*			X					X		X	X	
Central Valley spring-run Chinook salmon*	*Oncorhynchus tshawytscha*			X					X		X	X	
Central Valley fall- and late fall-run Chinook salmon*	*Oncorhynchus tshawytscha*			X					X		X	X	
Longfin smelt*	*Spirinchus thaleichthys*										X		
Delta smelt*	*Hypomesus transpacificus*										X		
Monterey roach*	*Lavinia symmetricus subditus*			X					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			X	
Santa Cruz long-toed salamander*	*Ambystoma macrodactylum croceum*	X	X	X			X					X	X
Red-bellied newt*	*Taricha rivularis*			X								X	
California newt (Monterey County and South)*	*Taricha torosa*	X	X	X			X	X	X			X	X
California giant salamander*	*Dicamptodon ensatus*		X	X			X		X	X		X	

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Santa Cruz black salamander*	*Aneides flavipunctatus niger*	X		X								X	
San Simeon slender salamander*	*Batrachoseps incognitus*	X		X			X					X	
Santa Lucia Mountains slender salamander*	*Batrachoseps luciae*	X		X			X	X	X			X	
Lesser slender salamander*	*Batrachoseps minor*	X		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			X	
California red-legged frog*	*Rana draytonii*	X	X	X			X	X	X	X		X	X
Reptiles													
Northwestern western pond turtle*	*Actinemys marmorata*	X	X	X			X	X	X	X		X	X
Southern western pond turtle*	*Actinemys pallida*	X	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			X	
Bakersfield legless lizard*	*Anniella grinnelli*							X					
California legless lizard*	*Anniella pulchra*	X	X	X		X	X	X				X	
California glossy snake*	*Arizona elegans occidentalis*							X	X				
Forest sharp-tailed snake*	*Contia longicauda*			X								X	
San Joaquin coachwhip*	*Coluber flagellum ruddocki*							X					
Alameda whipsnake*/Alameda striped racer*	*Masticophis lateralis euryxanthus*	X	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		X	X
Giant garter snake*	*Thamnophis gigas*								X	X			
Two-striped garter snake*	*Thamnophis hammondii*	X	X	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	Freshwater Marsh	Salt Marsh	American Southwest Riparian Forest and Woodland	Coastal Lagoons
Birds													
Tule greater white-fronted goose*	*Anser albifrons elgasi*									X	X		
Brant*	*Branta bernicla*										X		X
American white pelican*	*Pelecanus erythrorhynchos*										X		
Least bittern*	*Ixobrychus exilis*									X	X		
Great egret	*Ardea alba*									X			
Great blue heron	*Ardea herodias*									X			X
California condor*	*Gymnogyps californianus*	X		X				X	X			X	
Osprey	Pandion haliaetus									X			X
Golden eagle*	*Aquila chrysaetos*	X						X		X			
Swainson's hawk*	*Buteo swainsoni*	X						X					
Northern harrier*	*Circus cyaneus*	X						X		X	X		X
White-tailed kite*	*Elanus leucurus*		X		X	X	X			X	X		
Bald eagle*	*Haliaeetus leucocephalus*			X					X			X	
California black rail*	*Laterallus jamaicensis coturniculus*									X	X		
Ridgway's rail*	*Rallus obsoletus*										X		
Sandhill crane*	Grus canadensis	X						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						X
Short-eared owl*	*Asio flammeus*	X						X		X	X		

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Long-eared owl*	*Asio otus*			X					X		X	X	
Burrowing owl*	*Athene cunicularia*	X						X					
Spotted owl	*Strix occidentalis*			X					X			X	
American peregrine falcon*	*Falco peregrinus anatum*		X		X	X	X			X			
Loggerhead shrike*	*Lanius ludovicianus*	X						X			X		X
Least Bell's vireo	*Vireo bellii pusillus*			X					X			X	
Purple martin*	*Progne subis*	X		X				X	X			X	
Bank swallow*	*Riparia riparia*			X					X	X		X	
Swainson's thrush	*Catharus ustulatus*			X					X			X	
Saltmarsh common yellowthroat/San Francisco common yellowthroat*	*Geothlypis trichas sinuosa*			X					X	X	X	X	
Yellow-breasted chat*	*Icteria virens*			X					X			X	
Yellow warbler*	*Setophaga petechia*			X					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	X	X	
Yellow-headed blackbird*	*Xanthocephalus xanthocephalus*									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	Freshwater Marsh	Salt Marsh	American Southwest Riparian Forest and Woodland	Coastal Lagoons
Mammals													
Monterey shrew, Salinas ornate shrew*	*Sorex ornatus salarius*			X					X			X	
Suisun shrew*	*Sorex ornatus sinuosus*										X		
Salt marsh wandering shrew*	*Sorex vagrans halicoetes*									X	X		
Pallid bat*	*Antrozous pallidus*	X	X		X	X	X	X					
Western red bat	*Lasiurus blossevillii*			X					X			X	
Long-legged myotis*	*Myotis volans*			X					X			X	
Yuma myotis	*Myotis yumanensis*		X		X	X	X						
Western mastiff bat*	*Eumops perotis californicus*	X	X		X	X	X	X		X			
Nelson's antelope squirrel*	*Ammospermophilus nelsoni*							X					
American beaver	*Castor canadensis*			X					X	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	X		
San Francisco dusky-footed woodrat*	*Neotoma fuscipes annectens*			X					X			X	
Tulare grasshopper mouse*	*Onychomys torridus tularensis*							X					

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Common Name	Scientific Name	Conservation Units and Targets[1]											
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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	Freshwater Marsh	Salt Marsh	American Southwest Riparian Forest and Woodland	Coastal Lagoons
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. For a complete list of SGCN associated with each habitat type by ecoregion, see Appendix C.

* 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 induced by negative impacts of pressures, anthropogenic (human-induced) or natural drivers that have strong influences on the health of targets. Pressures can be positive or negative depending on intensity, timing, and duration. The major pressures identified for conservation targets in the Bay Delta and Central Coast Province are summarized in Table 5.3-4. These are considered the most significant pressures to the selected conservation targets in the province but do not represent a complete list of pressures for the province. The relationship between the stresses and pressures is unique for each conservation target and is identified in Section 5.3.6. Some of the major pressures for the province are discussed in more detail below.

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

Pressure	Conservation Units and Targets											
	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	Freshwater Marsh	Salt Marsh	American Southwest Riparian Forest and Woodland	Coastal Lagoons
Agricultural and forestry effluents			X					X	X	X		X
Airborne pollutants		X		X	X	X						
Annual and perennial non-timber crops	X	X	X	X	X	X	X	X	X	X	X	X
Climate change	X	X	X	X	X	X	X	X	X	X	X	X
Commercial and industrial areas	X	X	X	X	X	X	X	X	X	X		X
Dams and water management/use			X					X	X	X	X	X
Fire and fire suppression	X	X		X	X	X	X					
Garbage and solid waste												X
Household sewage and urban waste water			X					X	X	X		X
Housing and urban areas	X	X	X	X	X	X	X	X	X	X		X
Industrial and military effluents									X	X		
Invasive plants/animals	X	X	X	X	X	X	X	X	X	X	X	
Livestock, farming, and ranching	X	X	X	X	X	X	X	X	X	X	X	X
Mining and quarrying									X	X		
Other ecosystem modifications										X		X
Recreational activities												X
Renewable energy	X						X					
Roads and railroads	X	X	X	X	X	X	X	X	X	X	X	X
Shipping lanes										X		
Tourism and recreation areas		X		X	X	X						X
Utility and service lines			X					X				
Wood and pulp plantations												X

Housing and Urban Areas; Commercial and Industrial Areas; Roads and Railroads; Dams and Water Management/Use

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. Many of the conservation actions described below address prevention, early detection, and rapid response to new invasive plants to prevent them from becoming widespread. Distribution maps and summary reports for invasive plants, as well as regional strategic plans for prioritized invasive plant species can be found on the CalWeedMapper website (http://calweedmapper.cal-ipc.org). Some of the invasive species affecting the province are discussed below.

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. Invasive spartina and perennial pepperweed is a major concern in salt marshes, and opposite leaf 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 water milfoil, 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 displacing 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, dune habitats, and salt marsh, the introduced red fox increases predation rates for sensitive coastal shorebirds such as Ridgway's rail. Populations of native avian predators, such as California gulls and corvids (i.e., raven, crows, and jays) have increased and are now having negative consequences in salt marshes in San Francisco Bay.

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, overbite 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. Domestic cats also pose a threat to species dependent on coastal, riparian, and salt marsh habitats.

Annual and Perennial Non-Timber Crops

Approximately 763,590 acres, or 8 percent of the province's land area, are planted in irrigated 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.

Although agriculture can have adverse effects on ecosystem, some types of agricultural practices provide important habitat to many wildlife species. For example, fallow grain fields with the Sacramento-San Joaquin Delta are essential wintering habitat for greater and lesser sandhill cranes, waterfowl, shorebirds, and other waterbirds. Other avian species, including tricolored blackbird and Swainson's hawk are strongly associated with agricultural fields where certain crops and management practices are implemented.

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 invasive 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 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.

Ongoing and future climate change is expected to alter the nontidal freshwater marsh natural community. Sea level rise will affect the location, extent, and composition of this community in places where it exists at or below current sea level because of increased water elevation, increased saltwater intrusion, and the tidal hydrologic regime. Nontidal freshwater perennial emergent wetland locations that exist at the water's edge will become more deeply immersed, or in the case of overtopped levees, deeply flooded. Where this community exists in flooded depressions in upland areas, which presumably already support the nontidal freshwater perennial emergent wetland natural community, it is not likely that natural processes could replace the area that will be lost.

The climatic changes presented below will likely affect all conservation targets identified in this province. Climate change has only been included as a pressure for a subset of targets that are considered more vulnerable to climate impacts, and/or in instances where it was determined that interactions between climate change and other pressures could be addressed in a meaningful way through a conservation strategy.

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 efforts. The probability of large fires (>200 ha) is expected to increase by the end of the 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).

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).

Marshes around San Francisco Bay are particularly vulnerable to the anticipated increase in sea-level rise and reductions in sediment availability. Ultimately, the concern is that future change will cause marshes and mudflats to drown, leaving only narrow, fragmented habitat patches along the shoreline. Such patches would be squeezed up against levees and seawalls with development behind them, exacerbating flooding and creating deleterious edge effects. These impacts would be additive or synergistic with other stressors that may also increase over time, like invasive species, contaminants, and reductions in freshwater inputs.

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.

5.3.6 Conservation Strategies

Conservation strategies were developed for conservation targets in the Bay Delta and Central Coast Province. The goals for each target are listed below. The goals are set initially as a 5 percent improvement in condition, but will be refined over time using the adaptive management process described in Chapter 8. The strategies to achieve the goals for the target are provided, along with the objectives of the strategies and the targeted pressures. When actions that are specific to the conservation unit have been identified, they are listed with the strategy. Tables 5.3-5 through 5.3-10 show the relationships between the stresses and the pressures for each target. Table 5.3-11 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.
- 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.

Targeted pressure(s): 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, draft Solano HCP, Suisun March Habitat Plan, and other relevant conservation management plans.
- 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.
- Coordinate with partners though Joint Ventures.
- 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.
- When Caltrans is currently implementing best management practices (BMPs), look for opportunities for alignment of BMPs through the implementation of SWAP strategies and existing processes such as those in place at Caltrans.

Targeted pressure(s): Roads and railroads.

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

Priority Pressures	Stresses												
	Coastal and Oceanic Characteristics	Geophysical and Disturbance Regimes	Hydrology and Water Characteristics							Ecosystem Conditions and Processes			
	Sea level rise	Change in sediment erosion-deposition regime	Change in runoff and river flow	Change in flood occurrence, frequency, intensity, and area flooded (including hydroperiod)	Change in water levels and hydroperiod	Change in water temperature	Change in groundwater tables	Change in nutrients	Change in pollutants	Change in spatial distribution of habitat types	Change in community structure or composition	Change in biotic interactions (altered community dynamics)	Change in succession processes and ecosystem development	Habitat fragmentation
Agricultural and forestry effluents					X			X	X		X			
Annual and perennial non-timber crops		X	X	X	X	X	X	X	X	X	X	X	X	X
Climate change	X	X	X	X	X	X	X			X	X	X	X	X
Commercial and industrial areas		X	X	X	X		X		X	X	X		X	X
Dams and water management/use		X	X	X	X	X	X			X	X		X	X
Household sewage and urban waste water		X			X			X	X		X			
Housing and urban areas		X	X	X	X		X		X	X	X	X	X	X
Invasive plants/animals					X						X	X	X	
Livestock, farming, and ranching		X		X		X		X		X	X	X		X
Roads and railroads		X	X								X		X	X
Utility and service lines											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.

Targeted pressure(s): 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, draft Solano HCP, and other relevant conservation management plans.
- 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):

- Reflect the research and data analysis needs of the province.
- 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.
- When Caltrans is currently implementing best management practices (BMPs), look for opportunities for alignment of BMPs through the implementation of SWAP strategies and existing processes such as those in place at Caltrans.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.
- Obtain funding for management actions.

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.

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

Conservation Strategy 7 (Partner Engagement): Coordinate with fire agencies and local landowners 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 and local landowners.

Targeted pressure(s): Fire and fire suppression.

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

Priority Pressures	Stresses									
	Geophysical and Disturbance Regime	Hydrology and Water Characteristics		Soil and Sediment Characteristics			Ecosystem Conditions and Processes			
	Change in natural fire regime	Change in runoff and river flow*	Change in water levels and hydroperiod	Change in soil chemistry	Change in soil moisture**	Change in sediment quality***	Change in spatial distribution of habitat types	Change in community structure or composition position	Change in biotic interactions (altered community dynamics)	Habitat fragmentation
Annual and perennial non-timber crops	X	X	X	X	X	X	X	X	X	X
Commercial and industrial areas	X	X	X		X		X	X	X	X
Fire and fire suppression	X							X	X	
Housing and urban areas	X	X	X		X	X	X	X	X	X
Invasive plants/animals	X	X	X		X			X	X	
Livestock, farming, and ranching	X	X	X	X	X	X	X	X	X	X
Renewable energy	X							X	X	X
Roads and railroads		X	X	X	X			X	X	X

*This addresses surface flow.
**This addresses subsurface water and flow
***This addresses soil structure.

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.

Targeted pressure(s): 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.

Targeted pressure(s): 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).

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

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

Conservation action(s):

- Coordinate with CAL FIRE.
- Coordinate with Weed Management Areas (WMAs).
- 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.

Targeted pressure(s): Invasive plants/animals.

Conservation action(s) include:

- Coordinate with WMAs.

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.
- Implement and expand existing BMPs.

Targeted pressure(s): 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).

Targeted pressure(s): 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				
	Geophysical and Disturbance Regimes	Soil and Sediment Characteristics	Ecosystem Conditions and Processes		
	Change in natural fire regime	Change in nutrients	Change in spatial distribution of habitat types	Change in community structure or composition	Habitat fragmentation
Airborne pollutants		X		X	
Annual and perennial non-timber crops	X	X	X	X	X
Climate change	X	X	X	X	X
Commercial and industrial areas	X		X	X	X
Fire and fire suppression	X		X	X	X
Housing and urban areas	X		X	X	X
Invasive plants/animals	X		X	X	
Livestock, farming, and ranching	X	X	X	X	X
Roads and railroads		X	X	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.

Targeted pressure(s): Livestock, farming, and ranching; wood and pulp plantations; dams and water management/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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): Invasive plants/animals; annual and perennial non-timber crops; livestock, farming, and ranching; wood and pulp plantations; household 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							
	Coastal and Oceanic Characteristics		Geophysical and Disturbance Regimes	Hydrology and Water Characteristics			Ecosystem Conditions and Processes	
	Sea level rise	Change in oceanic hydrodynamics	Change in sediment erosion-deposition 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	X
Climate change	X	X	X	X	X	X	X	X
Commercial and industrial areas			X	X	X	X	X	X
Dams and water management/use		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
Livestock, farming, and ranching			X	X	X	X	X	X
Other ecosystem modifications		X	X	X				
Recreational activities				X	X			
Roads and railroads			X	X			X	X
Tourism and recreation areas			X	X			X	X
Wood and pulp plantations			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; and increase connectivity among salt marsh habitats.

Objective(s):

- Restore 60,000 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.
- Support for the Coastal Conservancy and others to implement established priorities and conservation goals in San Francisco Bay.
- Increase connectivity among salt-marsh habitats in the Bay Delta.

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

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, draft Solano HCP, other relevant conservation management plans, the South San Francisco Bay Salt Pond Restoration Project, the Invasive Spartina Project, the San Francisco Baylands Ecosystem Habitat Goals Update, and the San Francisco Bay Subtidal Habitat Goals Project.

- Update conservation targets based on upcoming bay-wide strategies addressing ecosystem needs, challenges and restoration opportunities such as the Baylands Ecosystem Habitat Goals Update due for completion in late 2015.
- Conduct or acquire existing assessments of parcels to determine restoration potential and biological value, as well as gain information on transition zones and connectivity with upland habitats.
- Write Land Acquisition Evaluation (LAE) or CAPP for high priority parcels. Acquire lands or easements to allow for future marsh migration.
- Identify groups/organizations, such as the San Francisco Bay Joint Venture, 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.
- Restore CDFW lands.
- Develop or support conservation strategies that focus on subtidal and open water habitats.

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

Objective(s):

- Coordinate with the Delta-Science Program, Delta Conservancy, and the Coastal Conservancy in the coordination of research efforts and data sharing.
- Continue ongoing long-term studies (baseline and monitoring).
- Identify and prioritize data gaps for future investigation/research.

Targeted pressure(s): 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.

Targeted pressure(s): 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.

Targeted pressure(s): 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 a 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; develop programmatic permits; and prepare for climate change.

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.

Targeted pressure(s): Recreational activities.

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.
- 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.

Targeted pressure(s): 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, such as the Invasive Spartina Project.
- Implement top priority controls plans, i.e. spartina.
- 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.
- Participate and contribute to working committees, management boards, and projects of each of the California Joint Ventures, such as the San Francisco Bay Joint Venture.

Targeted pressure(s): Dams and water management/use; shipping lanes; roads and railroads; recreational activities.

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 Habitat Plan, and USFWS Tidal Marsh Recovery Plan.
- When Caltrans is currently implementing BMPs, look for opportunities for alignment of BMPs through the implementation of SWAP strategies and existing processes such as those in place at Caltrans.
- Coordinate with state, federal, local agencies, and private landowners, including the California Water Fix 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.

Targeted pressure(s): Dams and water management/use; shipping lanes; roads and railroads; recreational activities.

Conservation action(s):

- Coordinate with local agencies and NGOs with large-area draft and completed conservation plans.
- Coordinate with entities involved in Bay-Delta conservation.
- 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 Salt Marsh

Priority Pressures	Stresses												
	Coastal and Oceanic Characteristics	Geophysical and Disturbance Regimes		Hydrology and Water Characteristics					Soil and Sediment Characteristics	Ecosystem Conditions and Processes			
	Sea level rise	Change in oceanic hydrodynamics	Change in sediment erosion-deposition regime	Change in runoff and river flow	Change in water levels and hydroperiod	Change in flood occurrence, frequency, intensity, and area flooded (including hydroperiod)	Change in pollutants	Change in nutrients	Change in sediment quality	Change in spatial distribution of habitat types	Change in community structure and composition	Change in succession processes and ecosystem development	Habitat fragmentation
Agricultural and forestry effluents					X		X	X			X		
Annual and perennial non-timber crops			X	X	X	X	X	X	X	X	X	X	X
Climate change	X	X	X	X	X	X			X	X	X	X	
Commercial and industrial areas			X	X	X	X	X		X	X	X	X	X
Dams and water management/ use		X	X	X	X	X			X	X	X	X	X
Household sewage and urban waste water			X		X		X	X			X		
Housing and urban areas			X	X	X	X	X		X	X	X	X	X
Industrial and military effluents			X				X	X			X	X	
Invasive plants/animals			X		X	X			X		X	X	
Livestock, farming, and ranching			X	X		X		X		X	X	X	X
Mining and quarrying			X			X	X						
Other ecosystem modifications		X	X		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

Target: Freshwater Marsh

Goals:

- By 2025, acres of freshwater emergent wetland habitat are increased by at least 5 percent from 2015 acres.
- By 2025, miles of freshwater emergent wetland where native species are dominant are increased by at least 5 percent from 2015 miles.
- By 2025, population abundance of key species (SGCN) is increased by at least 5 percent from 2015 population.
- By 2025, acres/miles of freshwater emergent wetland with desired inches of groundwater are increased by at least 5 percent from 2015.
- By 2025, acres of freshwater emergent wetland with suitable soil characteristics are increased by 5 percent from 2015 acres.
- By 2025, populations of key species (beaver, tricolored blackbird, giant garter snake, and western pond turtle) are increased by at least 5 percent from 2015 population.
- By 2025, acres of freshwater emergent wetland with desired stages of succession are increased by at least 5 percent from 2015 acres.
- By 2025, acres/miles with desired channel pattern (connected floodplains) are increased by at least 5 percent from 2015 acres/miles.
- By 2025, miles with desired level of discharge (mimicking natural flood frequency, seasonality, and magnitude) are increased by at least 5 percent from 2015 miles.

Conservation Strategy 1 (Outreach and Education): Provide outreach and education.

Objective(s):

- Influence public awareness of proper land management for freshwater marshes by providing information to landowners regarding BMPs and proper wetland management. Coordinate with local landowners to determine what conservation efforts they are engaged with and determine how CDFW may assist in their efforts.

Targeted pressure(s): Livestock, farming, and ranching.

Conservation action(s):

- Target Buckeye Conservancy and RCDs.
- Design and produce brochures with wetland conservation message.
- Employ web-based media for providing information to public.

Conservation Strategy 2 (Land Acquisition/Easement/Lease): Purchase land and conservation easements.

Objective(s):
- Improve land management by removing invasive species and creating better grazing practices.

Targeted pressure(s): Livestock, farming, and ranching; annual and perennial non-timber crops.

Conservation action(s):
- Prioritize with Conceptual Area Protection Plan (CAPP) and Environmental Site Assessment.

Conservation Strategy 3 (Law and Policy): Advocate for laws and policies.

Objective(s):
- Strengthen regulatory authority over wetlands and integrate beaver ecology into wetland restoration activities.

Targeted pressure(s): Livestock, farming, and ranching; annual and perennial non-timber crops.

Conservation action(s):
- Evaluate and update Wetlands Policy.
- Implement wetland and riparian technical memorandum.
- Review and modify CDFW policy on beaver depredation.
- Update wetlands implementation policy.

Conservation Strategy 4 (Management Planning): Develop management plans.

Objective(s):
- Develop BMPs for ecosystem management on CDFW lands.
- BMPs would provide guidance on managing CDFW lands for multi-species use and benefit both recreation and conservation of native species.

Targeted pressure(s): Invasive plants/animals; livestock, farming, and ranching; annual and perennial non-timber crops; climate change.

Conservation action(s):
- Revise Land Management Plan (LMP) guidelines to include ecosystem management.
- Update LMPs to be consistent with new guidelines for managing at an ecosystem level.
- Develop policy on ecosystem management on public lands.

Conservation Strategy 5 (Economic Incentives): Provide economic incentives for improved resource management.

Objective(s):
- Provide economic incentives through restoration grants.

Targeted pressure(s): Livestock, farming, and ranching; annual and perennial non-timber crops.

Table 5.3-10 Stresses and Pressures for Freshwater Marsh

Priority Pressures	Stresses												
	Coastal and Oceanic Characteristics	Geophysical and Disturbance Regimes	Hydrology and Water Characteristics						Soil and Sediment Characteristics	Ecosystem Conditions and Processes			
	Sea level rise	Change in sediment erosion-deposition regime	Change in runoff and river flow	Change in water levels and hydroperiod	Change in flood occurrence, frequency, intensity, and area flooded (including hydroperiod)	Change in groundwater tables	Change in pollutants	Change in nutrients	Change in soil moisture	Change in spatial distribution of habitat types	Change in community structure and composition	Change in succession processes and ecosystem development	Habitat fragmentation
Agricultural and forestry effluents		X					X	X			X		
Annual and perennial non-timber crops		X	X	X	X	X	X	X	X	X	X	X	X
Climate change	X	X	X	X	X				X	X	X	X	
Commercial and industrial areas		X	X	X	X	X	X		X	X	X	X	X
Dams and water management/ use		X	X	X	X	X			X	X	X	X	X
Household sewage and urban waste water		X					X	X			X		
Housing and urban areas		X	X	X	X	X	X		X	X	X	X	X
Industrial and military effluents		X					X	X			X	X	
Invasive plants/animals		X		X	X				X		X	X	
Livestock, farming, and ranching		X	X		X			X		X	X	X	X
Mining and quarrying		X					X						
Roads and railroads		X	X		X					X	X	X	X

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Table 5.3-11 Conservation Targets and Strategies for the Bay Delta and Central Coast Province

Target	Goals[1]	Key Ecological Attributes (KEAs)	Pressures[2]	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 ▪ Community structure and composition ▪ Connectivity among communities and ecosystems ▪ Water level fluctuations	▪ Agricultural and forestry effluents ▪ Annual and perennial non-timber crops ▪ Climate change ▪ Commercial and industrial areas ▪ Dams and water management/use ▪ Household sewage and urban waste water ▪ Housing and urban areas ▪ Invasive plants/animals ▪ Livestock, farming, and ranching ▪ Roads and railroads ▪ Utility and service lines	▪ 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 ▪ Community structure and composition ▪ Successional dynamics ▪ Surface water flow regime	▪ Annual and perennial non-timber crops ▪ Climate change ▪ 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 ▪ Direct Management ▪ Land Acquisition/Easement/ Lease ▪ Land Use Planning ▪ Partner Engagement
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 ▪ Community structure and composition ▪ Connectivity among communities and ecosystems ▪ Fire regime ▪ Soil quality and sediment deposition regime	▪ Airborne pollutants ▪ Annual and perennial non-timber crops ▪ Climate change ▪ Commercial and industrial areas ▪ Fire and fire suppression ▪ Housing and urban areas ▪ Invasive plants/animals ▪ Livestock, farming, and ranching ▪ Roads and railroads ▪ Tourism and recreation areas	▪ Data Collection and Analysis ▪ Direct Management ▪ Environmental Review ▪ Land Acquisition/Easement/ Lease ▪ Land Use Planning ▪ Law and Policy ▪ Management Planning ▪ Partner Engagement
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 ▪ Community structure and composition ▪ Connectivity among communities and ecosystems ▪ Nutrient concentrations and dynamics ▪ Surface water flow regime	▪ Agricultural and forestry effluents ▪ Annual and perennial non-timber crops ▪ Climate change ▪ Commercial and industrial areas ▪ Dams and water management/use ▪ Garbage and solid waste ▪ Housing sewage and urban waste water ▪ Housing and urban areas ▪ 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

Table 5.3-11 Conservation Targets and Strategies for the Bay Delta and Central Coast Province (continued)

Target	Goals[1]	Key Ecological Attributes (KEAs)	Pressures[2]	Strategy Categories
Freshwater Marsh	▪ By 2025, acres of freshwater emergent wetland habitat acre increased by at least 5% from 2015 acres. ▪ By 2025, miles of freshwater emergent wetland where native species are dominant are increased by at least 5% from 2015 miles. ▪ By 2025, population abundance of key species (SGCN) is increased by at least 5% from 2015 population levels. ▪ By 2025, acres/miles of freshwater emergent wetland with desired inches of groundwater are increased by at least 5% from 2015. ▪ By 2025, acres of freshwater emergent wetland with suitable soil characteristics are increased by 5% from 2015 acres. ▪ By 2025, populations of key species (beaver, tricolored blackbird, giant garter snake, and western pond turtle) are increased by at least 5% from 2015 population levels. ▪ By 2025, acres of freshwater emergent wetland with desired stages of succession are increased by at least 5% from 2015 acres. ▪ By 2025, acres/miles with desired channel pattern (connected floodplains) are increased by at least 5% from 2015 acres/miles. ▪ By 2025, miles with desired level of discharge (mimicking natural flood frequency, seasonality, and magnitude) are increased by at least 5% from 2015 miles.	▪ Area and extent of community ▪ Community structure and composition ▪ Connectivity among communities and ecosystems ▪ Successional dynamics ▪ Surface water flow regime	▪ Agricultural and forestry effluents ▪ Annual and perennial non-timber crops ▪ Climate change ▪ Commercial and industrial areas ▪ Dams and water management/use ▪ Household sewage and urban waste water ▪ Housing and urban areas ▪ Industrial and military effluents ▪ Invasive plants/animals ▪ Livestock, farming, and ranching ▪ Mining and quarrying ▪ Roads and railroads	▪ Economic Incentives ▪ Land Acquisition/Easement/ Lease ▪ Law and Policy ▪ Management Planning ▪ Outreach and Education
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 native 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 (TMDL) 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 ▪ Community structure and composition ▪ Pollutant concentrations and dynamics ▪ Soil quality and sediment deposition regime ▪ Successional dynamics ▪ Water level fluctuations	▪ Agricultural and forestry effluents ▪ Annual and perennial non-timber crops ▪ Climate change ▪ Commercial and industrial areas ▪ Dams and water management/use ▪ Household sewage and urban waste water ▪ Housing and urban areas ▪ Industrial and military effluents ▪ Invasive plants/animals ▪ Livestock, farming, and ranching ▪ Mining and quarrying ▪ Other ecosystem modifications ▪ Roads and railroads ▪ Shipping lanes	▪ Data Collection and Analysis ▪ Direct Management ▪ Economic Incentives ▪ Land Acquisition/Easement/ Lease ▪ Law and Policy ▪ Management Planning ▪ Outreach and Education ▪ Partner Engagement

[1] The goals are set initially at 5 percent, but will be refined over time using the adaptive management process described in Chapter 8.
[2] Pressures can be positive or negative depending on the intensity, timing, and duration of the action on the target habitat.