Descriptions of the Level IV Ecoregions of California

1. Coast Range

1a The **Coastal Lowlands** ecoregion contains beaches, dunes, and marine terraces below 400 feet in elevation. Wet forests, lakes, estuarine marshes, and tea-colored (tannic) streams are characteristic features of the landscape. Wetlands have been widely drained with many converted to dairy pastures. Residential, commercial, and recreational developments are expanding in the coastal corridor. In California, the region includes the Crescent City Plain, and Humboldt Bay Flats and Terraces. Soil moisture regimes are udic and aquic and soil temperatures are isomesic. Dune communities, grassland, coastal scrub, beach pine, bishop pine, and Sitka spruce are more typical than the redwoods in adjacent Ecoregion 1i. Riparian areas contain red alder, conifers, bigleaf maple, salmonberry, rhododendron, and willows.

1i The low mountains of the **Northern Franciscan Redwood Forest** ecoregion lie entirely in the coastal fog zone and are characteristically covered by fog-dependent coast redwoods and Douglas-fir. Historically, unbroken redwood forests occurred and moderated local climate by trapping coastal fog and producing shade. The combination of shade, root competition, young soils with a deep organic debris layer on the surface, rapid rainfall, fast rate, and silting by floods limits the number of plant species. The region extends north only about 10 miles into Oregon near Brookings. In some factors, this region has more similarities to the temperate rain forests of the Oregon and Washington Coast Ranges than to redwood forest regions to the south. Dominated by conifers, the region also includes western hemlock, western redcedar, Port Orford cedar, grand fir, and some Sitka spruce near the coast. Hardwoods such as red alder and tanoak occur. Fine and fine-loamy, isomesic, Ultisols and Alfisols are typical.

1j In contrast to the redwood forests to the north and south, the vegetation of the **King Range/Mattole Basin** ecoregion includes a mixed evergreen forest of Douglas-fir, tanoak, and madrone, as well as areas of grassland. Prairies and coastal scrub cover many of the headlands. Although this is one of the wettest spots in California, the King Range rises above the coastal fog. In summer, warm, dry, offshore winds also help keep the fog away, making the King Range too dry to support the redwood forests that surround it on three sides. The King Range thrusts 4,000 feet above the Pacific, making this area one of the more spectacular and remote stretches of coastline in the continental United States. In the northern part of the region, the Bear and Mattole Rivers drain a hilly-to-steep landscape of mixed evergreen forest, with a land cover that includes a relatively greater amount of annual grasslands than in Ecoregions 1i to the north or 1k to the south. Timber production, livestock grazing, and recreation are primary land uses.

1k The main part of the **Coastal Franciscan Redwood Forest** ecoregion extends through Mendocino County from just south of the King Range to just south of the Russian River in Sonoma County. Unlike the conifer-dominated forests of Ecoregion 1i to the north, these central redwood forests typically are more a mixture of conifers and hardwoods. Vegetation includes a multi-story canopy of redwood, Douglas-fir, tanoak, bigleaf maple, evergreen shrubs, and various grasses. In the southern parts of the region, there are more coast live oaks and grassland savannas that are intermixed with denser areas of forest. The near-coastal part of the region that is influenced more by fog has more redwoods and similarities to Ecoregion 1i to the north. Soil temperature regimes are mostly isomesic and mesic. Soil moisture regimes are predominantly udic, ustic, and xeric. Runoff is rapid and many of the smaller streams are dry by the end of the summer. Natural lakes are absent. A small outlier of this ecoregion occurs in the south in Marin County that includes the coniferous and hardwood forests of Mount Tamalpais and Bolinas Ridge. This small area of redwoods and other forest types ranges in elevation from 0 to 1,600 feet. It has more relief and coniferous forest than the Marin Hills ecoregion (6o). Various types of coniferous and hardwood forests occur, composed mostly of Douglas-fir, redwoods, tanoak, madrone, California bay, and coastal live oak. Mount Tamalpais and Bolinas Ridge force moisture out of the air as it cools and ascends the steep western mountain faces. These western parts are heavily forested with redwoods and Douglas-fir. A few areas of drier exposures or shallow soils contain grasslands, coastal scrub, or chaparral.

1l The **Fort Bragg/Fort Ross Terraces** ecoregion forms an elevated coastal plain that has less relief (200–800 feet) than the adjacent mountains of Ecoregion 1k. Quaternary and Tertiary sandstones and mudstones form the terraces, and some areas are deeply dissected, forming ravines that expose Cretaceous sedimentary rocks. Elevations range from sea level to about 1,300 feet. Soil moisture regimes are udic and some aquic, and soil temperatures are isomesic. Monthly and annual temperature variations are minimal and summer fog is common. Vegetation includes coastal grasslands and shrubs, stunted beach pine, Bishop pine, or pygmy cypress, along with areas of some grand fir and western hemlock. Terrace soils typically are unsuitable for redwoods, although they do occur in ravines and on some bluffs.

1m The **Point Reyes/Farallon Islands** ecoregion includes the Point Reyes Peninsula, Bodega Head and the sand spit at the north end of Bodega Bay, and the offshore Farallon Islands. The maritime climate is temperate and humid, with frequent fog. There are granitic rocks along with Pliocene and Miocene sandstone and mudstone, and Quaternary sands. Soil temperature regimes are mostly isomesic, with some mesic. Soil moisture regimes are mostly ustic. Common vegetation includes Douglas-fir, tanoak, Bishop pine, coast live oak, Pacific ivy, and coyote brush. A few redwoods occur. Most of the streams are small, and dry by the end of the summer. The Farallon Islands, about 20 miles southwest of Point Reyes, are a group of small granitic islands providing important habitat for seabirds, seals, and sea lions.

1n The **Santa Cruz Mountains** ecoregion covers the western and southwestern parts of the range where vegetation includes redwood, Douglas-fir, tanoak, coast live oak, and California bay, along with some chaparral and coastal scrub species. The shrub layer under forest canopy generally is sparse. Species of limited range in this area include the Santa Cruz cypress and Shreve oak. Forests of this region are ecologically and genetically distinct from those of the redwood ecoregions (1i, 1k) farther north. Clear-cut logging was typical from the late 1800s to about the 1960s. Most logging now uses smaller selective cuts. Climate varies from the west to the east, as the high mountain ridges reduce the penetration of maritime air. Winters are cool and wet. On the western side, summers are cool, and fog or low overcast is typical. Soil temperature regimes are mostly mesic and isomesic, with some thermic. Soil moisture regimes are mostly ustic and xeric. Streams on the northeastern side of the mountains generally are dry during the summer, but streams on the seaward side generally are perennial.

1o The **San Mateo Coastal Hills** ecoregion has lower relief and elevations than Ecoregion 1n, with more coastal scrub vegetation and a few small areas of cropland rather than the denser forest and woodland of the Santa Cruz Mountains ecoregion (1n). Marine terraces, coastal benches, and small valleys are the primary landforms. Elevations range from sea level to about 1,000 feet. Pliocene sandstone and siltstone are the main rock types compared to the mix of geology in Ecoregion 1n that includes older sedimentary and some igneous rocks. Mollisols are typical, with mostly thermic to isomesic temperature regimes. Soil moisture regimes are mostly xeric and ustic. Summer fog is common and winters are cool and moist.

4. Cascades

4d The **Cascade Subalpine/Alpine** ecoregion contains the prominent volcanic peaks of the high Cascades. Pleistocene glaciation reshaped the mountains, leaving moraines, glacial lakes, and U-shaped glacial canyons. Glaciers and permanent snowfields still occur on the highest peaks. The vegetation is adapted to high elevations, cold temperatures, short growing season, harsh winds, and deep winter snow pack. Herbaceous subalpine meadow vegetation and scattered patches of mountain hemlock and whitebark pine occur our timberline. Oregon and Washington, some subalpine fir also occurs. Elevations of the ecoregion in California typically are above 7,600 feet.

4e The **High Southern Cascades Montane Forest** ecoregion is an undulating, volcanic plateau containing isolated buttes, cones, and peaks. Some parts of the region are glaciated. The terrain often is less dissected than that of Ecoregion 4f. Elevations of Ecoregion 4e are generally intermediate to elevations in the Low Southern Cascades Mixed Conifer Forest (4f) and the Cascade Subalpine/Alpine (4d) ecoregions. In California, elevations of the ecoregion are mostly 5,500–8,500 feet, but are lower in Oregon at 4,000–8,200 feet. Cryic soils support mixed coniferous forests dominated by mountain hemlock, lodgepole pine, and, in Oregon, some Pacific silver fir; the soils are colder than the mesic and frigid soils of the Low Southern Cascades Mixed Conifer Forest ecoregion (4f). White fir and Shasta red fir also occur in the ecoregion, with some grand fir in Oregon. This region has a longer summer drought and more intermittent streams than the Cascade Crest Montane Forest ecoregion (4c) to the north in Oregon and Washington.

4f The **Low Southern Cascades Mixed Conifer Forest** ecoregion generally is lower in elevation and less rugged than the more highly dissected Western Cascades Montane Highlands (4b) to the north in Oregon. Although still mostly a mesic mixed conifer region, the climate is drier than in the western Cascades of Oregon (Ecoregions 4a and 4b), and the vegetation reflects this. Western hemlock and western redcedar, indicator species of Ecoregions 4a and 4b, decrease in abundance southward in this ecoregion in Oregon and are replaced by Sierra Nevada species, such as incense cedar, white fir, Shasta red fir, and Jeffrey pine that tolerate prolonged summer drought. In California, shrubs such as manzanita and ceanothus are common. Curl-leaved mountain-mahogany, big sagebrush, and antelope bitterbrush occur as well. Soil and dispersion centers in the Great Basin regions farther east. River and stream discharge is significantly less than in systems to the north. Soil temperature regimes are mesic and frigid, and the soil moisture regime is xeric. Elevations in the California part of this ecoregion are about 3,000 to 7,600 feet.

4g The **California Cascades Eastside Conifer Forest** ecoregion is drier than the other California Cascades regions. It is dominated by ponderosa pine and, in some areas, Jeffrey pine where conditions are harsher. In lower, drier areas, the region blends into the western juniper and sagebrush fields more typical of adjacent Ecoregion 9. The region wraps around to the western side (that is, the Mount Shasta foothills), as similar dry conditions exist from the rain shadow cast by the Klamath Mountains to the west. Elevations range from 3,000 to 7,100 feet.

4h The **Southern Cascades Foothills** ecoregion of volcanic hills and plateaus is mostly in the 2,000–4,000 foot elevation range, stretching from the town of Paradise in the south to the Pit River in the north. It contains dry-mesic mixed conifer forest and lower montane black oak-conifer forest and woodland. Ponderosa pine is abundant along with some Douglas-fir, and, at higher elevations, white fir. Hardwoods typically are black oak and canyon live oak. Soil temperature regimes are mostly mesic with some frigid, and soil moisture regimes are xeric.

5. Sierra Nevada

5a The **Sierran Alpine** ecoregion is above tree line and includes the highest elevations of the Sierra Nevada. Tree line generally occurs at about 10,500 feet in the southern and central areas and at about 9,600 feet in the north. On the eastern side, elevations of the alpine zone may start as high as 12,000 feet. Numerous peaks are higher than 14,000 feet. In the harsh climate of this region, growing seasons are short and cool, and winters are long, cold, and snowy. Vegetation is limited or non-existent on the exposed bedrock, boulder fields, and talus slopes. Cushion plants, uplifted grasses, alpine willows, sedges, and various shrubs and herbaceous plants occur, as well as krummholz forms of high-elevation conifers in the lower alpine zone, such as mountain hemlock and whitebark pine. Only a few animals are adapted to this area, such as the American pika, Belding's ground squirrel, and yellow-bellied marmot. Soil temperature regimes are mostly cryic.

5b Above the upper montane forests of Ecoregion 5c, the **Northern Sierra Subalpine Forests** ecoregion is typified by lodgepole pine, whitebark pine, western white pine, and mountain hemlock. It mostly lacks the foxtail pine that is found in the Southern Sierra Subalpine Forests ecoregion (5k). Elevations generally range from 8,000 to 10,000 feet, although in some eastern areas, elevations can start and range higher. With heavy snowfall, high winds, cold climates, and shallow soils, trees in this ecoregion have slow growth rates and are stunted.

5c The **Northern Sierra Upper Montane Forests** ecoregion ranges in elevation mostly from 6,000 to 8,000 feet, and its forests have a mix of conifers, including red fir, white fir, Jeffrey pine, sugar pine, incense cedar, and some lodgepole pine. Intermixed are areas of quaking aspen groves. Some montane chaparral also occurs in areas of harsh exposure, repeated fires, and clear cuts. Geology types are mostly Mesozoic granitic rocks and Tertiary volcanics, although in the north these occur along with some areas of slate, sandstone, metavolcanics, and metasedimentary rocks. Soil temperature regimes are mostly frigid, with some cryic. Soil moisture regimes are mostly xeric, but udic in areas where snowpack persists through spring.

5d In contrast to the volcanic and granitic rocks of similarly zoned Ecoregion 5g to the south, in the **Northern Sierra Mid-Montane Forests** ecoregion, metamorphic rocks are abundant, with Paleozoic metasedimentary, argillite, phyllite, and schist, and some metavolcanics, as well as Mesozoic peridotite and serpentine. Elevations range mostly from 5,000 to 6,000 feet, with some lower west-end canyon elevations. This higher elevation mixed conifer forest has more white fir and Douglas-fir and less ponderosa pine than in the lower elevation Ecoregion 5h to the south. Soil temperature regimes are predominantly mesic and frigid areas to the east. Black oak and tanoaks are common hardwoods, along with canyon live oak. Soil temperature regimes are mostly mesic and soil moisture regimes are mostly xeric.

5e Generally lower in elevation than adjacent Ecoregion 5d, the **Northern Sierra Lower Montane Forests** ecoregion has a mix of montane hardwood, montane hardwood-conifer, and mixed conifer forest. Elevations generally range from 2,000 to 4,000 feet, with a few higher areas. Ecoregion 5e has less ponderosa pine than Ecoregions 5h and 5n to the south. Douglas-fir is a more widespread conifer, and hardwoods include canyon live oak, interior live oak, black oak, and tanoak. Annual precipitation is somewhat higher than in Ecoregion 5h immediately to the south. Geology is a complex mix of Mesozoic granitic rocks, Jurassic to Triassic metavolcanics, and some Paleozoic metasedimentary and metavolcanic rocks and ultramafic rocks.

5f The **Northeastern Sierra Mixed Conifer-Pine Forests** ecoregion includes many of the drier eastside forests of the northern Sierra Nevada that occur north of Bridgeport, in the Lake Tahoe area, and to the northern extent of the Sierra near Susanville. These are mid-elevation dry forests, typically between 5,000 and 8,000 feet, with a diverse mix of conifers, such as Jeffrey, ponderosa, and sugar pines; incense cedar; and California white fir. Shrubs and herbs include sagebrush, antelope bitterbrush, and a fire-maintained chaparral component of snowbrush and manzanita. Soil temperature regimes are frigid and soil moisture regimes are mostly xeric.

5g The **Central Sierra Mid-Montane Forests** ecoregion, generally 4,000 to 6,000 feet in elevation, has a higher elevation, cooler climate, and a somewhat denser and different forest mix than Ecoregion 5h to the west. Although it is aspect-dependent, in general, a more mesic mixed conifer forest occurs in this region consisting of Douglas-fir, ponderosa pine, and canyon, live, and black oaks, compared to the abundance of pines, oaks, and chaparral more typical of Ecoregion 5h. Bedrock is volcanic (Tertiary andesite and ryholite) and granitic (Cretaceous granodiorite and quartz monzonite) in contrast to Ecoregion 5d to the north that has more metamorphic rock. Gently sloping Neogene-age lakes and lava flows can occur in some of the older plateau surfaces. Soil temperatures are mesic and some frigid and soil moisture regimes are xeric.

6. Central California Foothills and Coastal Mountains (continued)

6ak The **Paso Robles Hills and Valleys** ecoregion is a dissected plain with low, rolling to moderately steep hills. It is drier, and the vegetation is more chaparral than the adjacent regions 6ai and 6al. The rolling hills are underlain by Plio-Pleistocene nonmarine sediments, with areas of Quaternary alluvium on the flatter plains. Some small areas of Miocene and Pliocene marine sediments occur. The soil temperature regime is thermic and soil moisture regime is xeric. Common vegetation includes blue oak savannas and annual grasslands. Some valley oak occurs on deep soils and a few small areas of chaparral occur where soils are shallow or dry soils. Ranching and livestock grazing is a dominant land use, with some pasture, hay, and cropland in the valleys. Grape vineyards have become more extensive in the ecoregion.

6al In contrast to the igneous and metamorphic rocks of the Gabilan Range ecoregion (6y) to the northwest, the **Salinas-Cholame Hills** ecoregion occurs on Pliocene and Miocene marine and nonmarine sediments, as well as Plio-Pleistocene unconsolidated sedimentary materials. These hills are less steep than Ecoregion 6y, the soils tend to be more calcareous, and there is more grassland and blue oak woodland and fewer coastal oaks. The soil temperature regime is thermic and soil moisture regime is xeric. Elevations range mostly from 600 to 2,600 feet.

6am Occupying an alluvial-filled synclinal basin, the **Cuyama Valley** ecoregion consists of alluvial fans, pediments, and terraces along the Cuyama River. The semi-arid climate has hot summers and cool winters, with only about 5 inches of annual precipitation. Land cover is mostly grassland, hay and pastureland, and some cropland. Some oil field activities occurred in the past. On the transitional slopes leading to Ecoregion 8, juniper, chaparral, and blue oak woodland occur. Elevations range from about 1,600 feet in the northwest to 3,400 feet on the southern boundary.

6an The **Carrizo Plain** ecoregion is a nearly level to very gently sloping alluvial plain with low hills on the margins. Although the ecoregion is in the Coastal Ranges, the climate is arid with long dry summers, similar to a desert basin. Average annual precipitation is only 7–9 inches per year. Runoff from the surrounding coastal mountains and hills flows in ephemeral drainage channels to Soda Lake, a terminal alkali lake. The inflow is lost to evaporation, leaving behind concentrated salts and minerals. The soil temperature regime is thermic and soil moisture regimes are aridic and xeric. Vegetation includes annual grassland, needlegrass, saltgrass, and emergent aquatics. Ecoregion 6an is one of the largest areas of native grassland remaining in the State. It is home to several endangered wildlife species, including the San Joaquin kit fox, San Joaquin antelope squirrel, and the blunt-nosed leopard lizard. Tule elk and pronghorn antelope have been reintroduced to the area. Some livestock grazing occurs, but remains a controversial issue.

7. Central California Valley

7a The **Northern Terraces** ecoregion occurs on gently sloping to sloping terraces and alluvial fans at the northern end and eastern side of the Sacramento Valley. It is mostly rolling grassland and has less agricultural land than in the alluvial ecoregions (7b) to the west in the floodplain soils of Ecoregion 7e. It also generally lacks the oaks that are upslope in Ecoregion 6. Soil temperature regimes are thermic and soil moisture regimes are xeric. Common soil series include Tuscan and Anita on the east and Corning, Redding, Hillgate, and Newville on the west. Although the terraces of the Tuscan Formation on the east have geological and soil differences from the Tehama Formation terraces on the west, the landforms, climate, vegetation, and land cover generally are similar. The vegetation of annual grasses and forbs is used mostly for dryland range and pasture. A few areas of blue oak woodlands occur, primarily at high elevations near the boundary with Ecoregion 6. Vernal pools are in some areas. Streams drain mostly to the Sacramento River, with a few in the south draining to the lower San Joaquin River.

7b The **North Valley Alluvium** ecoregion covers the recent alluvial plain, very gently sloping recent alluvial fans, and some minor floodplains in the northern part of the Sacramento Valley. Elevations range from 100 to 300 feet. The soil temperature regime is thermic and soil moisture regime is xeric, with Tehama, Hillgate, and Arbuckle as common soil series. A mix of cropland, orchards, and pasture occurs here. Typical vegetation is annual grasslands, scattered blue oaks, and valley oaks on stream terraces and alluvial plains. Vernal pools are common.

7c The **Butte Sink/Sutter and Colusa Basins** ecoregion occurs on nearly level to very gently sloping alluvial fans, floodplains, and basin floors that are split by the alluvium of the Sacramento River (Ecoregion 7e). Elevations range from about 20 to 150 feet. The Holocene basin deposits of silt and clay are covered by mostly fine-textured soils of low permeability, such as Vertisols. Winter and spring rains historically flooded wide areas, but these areas now are confined by artificial levees. There are no lakes in the ecoregion, but winter ponding occurs. Historical flood regimes likely contributed to seasonal wetlands and flat marshes. There is extensive agriculture of rice, and some orchards and pasture; however, the region also offers wildlife habitat for waterfowl and pheasant, and drainage canals support a warm-water fishery. Many of the rice fields are flooded and leased as private waterfowl hunting clubs in winter. In the western part of Ecoregion 7c, the Colusa Basin Drain is the single largest source of agricultural return flows to the Sacramento River. The natural vegetation historically consisted of perennial grasslands, but now is mostly annual grasslands, with some willows and cottonwoods along streams.

7d The **Southern Hardpan Terraces** ecoregion is on very gently sloping terraces, floodplains, and alluvial fans along the eastern edge of the San Joaquin Valley. Elevations range from 150 to 500 feet. Ecoregion 7d is warmer and drier than the Northern Terraces ecoregion (7a) to the north. Soil temperature regimes are thermic and soil moisture regimes are xeric, nearing aridic in the south. Common vegetation includes annual grasslands, ceanothus shrublands, blue oak savannas, and scattered foothill pines in the draws and protected slopes. Vernal pools are common. Streams drain to the San Joaquin River or the San Joaquin Valley closed basins.

7e The **Sacramento/Feather Riverine Alluvium** ecoregion consists of nearly level floodplains and levees associated with the Sacramento, Feather, and lower Yuba and Bear Rivers. Much of the unweathered gravel, sand, and silt deposits are in contact with present-day river systems and have not been significantly modified by human activity. Flows of the major rivers are artificially controlled, and confined by built levees. Entisols, Mollisols, and Alfisols are more common compared to the Vertisols typical of the adjacent basins of Ecoregion 7c. The xeric soils are moderately well to somewhat poorly drained and support pasture, wheat, fruit and nut orchards, and woody wetlands. Cottonwoods and mixed willows are present, along with some grasslands. Affected in places by historical mining practices in the Sierra Nevada, the riverine region includes areas of gold field tailings on the Yuba and Feather Rivers.

7f The **Sutter Buttes** ecoregion is a small but distinctive circular area of volcanic hills that rise above the surrounding Sacramento Valley to an elevation of 2,117 feet. The region is only about 10 miles across, and the cluster of peaks, locally, is called "the world's smallest mountain range." In contrast to the surrounding regions that are mostly flat, with cropland and pasture, the Sutter Buttes are rugged and blue oak woodland, with some annual grassland and chaparral, similar to some foothill areas of Ecoregion 6. The Sutter Buttes are the remains of an extinct volcano that erupted between 1.6 and 1.3 million years ago. Rhyolite and andesite are the most common bedrock types. Soil temperatures are thermic and the soil moisture regime is xeric.

7g The **Yolo Alluvial Fans** ecoregion contains Pleistocene and recent alluvial fan material derived from the Coast Ranges and has a nearly level to very gently sloping topography. The soil temperature regime is thermic and soil moisture regime is xeric. Common vegetation includes grasslands and valley oak, with cottonwoods and willows along streams. Most of the region is in cropland, with some areas of pastureland. Alfalfa, winter wheat, sunflowers, corn, tomatoes, strawberries, and stonefruit, walnut, and almond orchards are typical crops.

7h The **Yolo/American Basin** ecoregion includes nearly level to very gently sloping stream terraces, overbank deposits, levees, and basin rims. The climate is hot and dry, and is warmer than the lower Sacramento River. The American Basin, just east of the river, is the northern unit, and the Yolo Basin, just west of the river, is the southern unit. Elevations range from about 10 to 40 feet. Some flooding and high water tables occur during wet winters, although much of the region is protected by artificial levees, and flood control reservoirs upstream. The soil temperature regime is thermic and soil moisture regime is xeric. Common vegetation includes annual grassland, valley oak, and riparian willows and other shrubs. Some central marsh occurs, carrying Sacramento River water at overflow toward the Delta ecoregion (7j). Cropland, hay and pasture land, and barebacked wetlands cover most of the region, with rice being the most extensive crop. The soil temperature regime is thermic and soil moisture regimes are aquic and xeric. Common vegetation includes annual grassland, needlegrass, saltgrass, and emergent aquatics. Ecoregion 6an is one of the largest areas of native grassland remaining in the State. It is home to several endangered wildlife species, including the San Joaquin kit fox, San Joaquin antelope squirrel, and the blunt-nosed leopard lizard. Tule elk and pronghorn antelope have been reintroduced to the area. Some livestock grazing occurs, but remains a controversial issue.

7i The **Delta** ecoregion is a low elevation area, near sea level, at the confluence of major rivers. It is characterized by numerous sloughs and channels formed where the Sacramento, Mokelumne, Cosumnes, Mokelumne, and San Joaquin Rivers enter the ecoregion. Water from these rivers commingles in the Delta and is influenced by tidal action, streamflow, and water diversion as it flows toward San Francisco Bay. Brackish tidal water enters the area when river flow is low during the summer and autumn. In the main part of the region, former wetland islands have been reclaimed for intensive agriculture. Land cover is mostly pasture, hay, and cropland. Soil temperature regimes are mesic and soil moisture regimes are aridic, xeric, and aquic. Typical vegetation includes big sagebrush and sedge meadow communities. The Pit River is a tributary of the Sacramento River.

7j The **Warner Mountains** ecoregion comprises the low to mid-elevations of the Warner Mountains. In contrast to the mesic soils of the surrounding lower ecoregions, soil temperature regimes here are frigid. Soil moisture regimes are xeric. Vegetation includes big sagebrush, low sagebrush, perennial bunchgrasses, and western juniper at low elevations. At higher elevations, ponderosa pine, Jeffrey pine, Washoe pine, aspen, and white fir are common. Streams on the western side of this fault-block mountain drain to Goose Lake or the Pit River, and streams on the eastern side, which are much shorter, drain to Surprise Valley in Ecoregion 80.

7k The small **Lodi Alluvium** ecoregion is on nearly level to very gently sloping floodplains and alluvial fans of the Mokelumne and Calaveras Rivers and smaller streams between the Delta (7j) and the Northern Terraces (7a) of the Central Valley. Elevations range from about 20 to 100 feet. Nearly the entire ecoregion is in cropland, with some urban land around Lodi. Grapes are dominant in the northern part, whereas walnuts are typical in the south. The soil temperature regime is thermic and soil moisture regimes are xeric and aquic. The natural vegetation historically included perennial and annual grasslands, valley oak savannas, cottonwoods, and willows. Streams drain to the west to the Delta area or to the Stockton Basin (7l).

7l The **Stockton Basin** ecoregion is a nearly level basin floor on the eastern edge of the Delta (7j). Nearly one-half of the ecoregion is urban and residential land of Stockton that covers most of the western part. To the east is cropland of corn, wheat, alfalfa, grapes, and walnuts. The soil temperature regime is thermic and soil moisture regimes are aquic and xeric. Vertisols are more common than in adjacent Ecoregion 7k. Winter ponding occurs. Natural vegetation historically included perennial and annual grasslands, valley oak savannas, cottonwoods, and willows.

7m The **San Joaquin Basin** ecoregion, including the downstream Caswell Basin, is on nearly level floodplains and basin floors in the middle of the San Joaquin Valley. It is upstream of the Delta ecoregion (7j) and between alluvial fans from the Coast Ranges on the west and alluvial fans from the Sierra Nevada on the east. Elevations range from near sea level in the north to 130 feet in the south. The predominant soils are poorly drained, and much of the region is flooded periodically. The soil temperature regime is thermic and soil moisture regimes are aquic and xeric. Although cropland and hay/pasture land cover most of the region, large areas, particularly in the central part, are herbaceous wetlands. Alfalfa and corn are typical crops in the north, whereas cotton, alfalfa, corn, and tomatoes are grown in the south. Common vegetation includes emergent aquatics, cottonwood, willow, valley oak, saltgrass, alkali sacaton, creeping wildrye, and allscale.

7n The **Manteca/Merced Alluvium** ecoregion is on very gently to gently sloping floodplains and alluvial fans that slope from the higher terraces and foothills in regions to the east toward the San Joaquin River to the west. The soil temperature regime is thermic and soil moisture regimes are xeric and aquic. Natural vegetation historically included perennial and annual grasslands, valley oak savannas, cottonwoods, and willow. Cropland, pasture, and urban uses now dominate.

7o The **Westside Alluvial Fans and Terraces** ecoregion is on very gently to gently sloping terraces and alluvial fans along the western edge of the San Joaquin Valley, adjacent to the Coast Ranges. Elevations range mostly from 5 to 300 feet, reaching 900 feet in the west. The soil temperature regime is thermic; soil moisture regimes are xeric, but aridic in the south. Vegetation includes annual and perennial grasslands and bladdered and ephedra shrublands. Vernal pools and winter ponding occur. Agricultural land use is dominant, with grassland at the western margin.

7p The **Granitic Alluvial Fans and Terraces** ecoregion is on nearly level to very gently sloping alluvial fans and basins that are below older fans or terraces on the eastern side of the San Joaquin Valley. Elevations range from 100 to 500 feet. The soil temperature regime is thermic and soil moisture regimes are xeric and aquic. Vegetation includes grasslands and valley oak on the fans, cottonwood and willow along streams, and emergent wetland species in basins. Almost the entire region now is in cropland, hay and pastureland, and some urban and suburban uses.

7q The **Panoche and Cantua Fans and Basins** ecoregion is on nearly level to gently sloping alluvial fans of streams that drain from the Coast Ranges toward the San Joaquin Valley and partly on basin floors in the west-central part of the valley. Elevations range from 140 to 800 feet. The soil temperature regime is thermic and soil moisture regime is aridic. Annual precipitation is only 6–8 inches and streams often are dry. The grassland and shrubland vegetation has been replaced by cropland and orchards. Soil salinity is a concern in several areas.

7r The **Tulare Basin/Fresno Slough** ecoregion contained historical Tulare Lake, which was once the largest freshwater lake west of the Mississippi River. The Tulare Basin was formed by the merging of alluvial fans from the Kings River to the east and Los Gatos Creek from the Coast Ranges to the west. Water flows through the sloughs to the lowest basins, such as Lakes (Tulare, Buena Vista, Kern, and Goose Lakes) filled beyond capacity from winter and spring runoff, the overflow was sent down the Fresno Slough. In the dry season, subsurface flow from the Tulare Basin still helped to sustain flows in the San Joaquin River. Both areas once supported extensive freshwater marshes, but disconnecting regulated sloughs. Although the hydrology now is greatly modified by drainage canals, dams, and agricultural land uses, during major flood events, some water still collects in the lake basins and sloughs. Soils are mostly fine-textured and poorly drained, with a thermic temperature regime and aquic soil moisture regime. Ponding occurs.

7s The **Kern Terraces** ecoregion consists of gently sloping terraces, dissected alluvial fans, and mostly small floodplains at the southeastern edge of the San Joaquin Valley. Elevations range from a low of 100 feet on the west side of the valley to 1,000 feet on the east. Ecoregion 7s is warmer and more arid than the terraces of Ecoregion 7d to the north, with slightly more relief, and fewer hardpan soils or vernal pools. The soil temperature regime is thermic and soil moisture regime is aridic. Common vegetation includes perennial and annual grasslands, with scattered stands of blue oak woodland and savanna, and a few small areas of chaparral. Agriculture is the transition to the Tehachapi Foothills ecoregion (6ae). Beavertail cactus is one indicator of the desert influences here. Streams drain westward to the canals and closed basins of the southern San Joaquin Valley. Streams are low gradient and intermittent, although the dam-controlled Kern River also cuts across the region. Some cropland occurs on the western margins, which are flatter and lower in elevation. Oil production occurs especially near Bakersfield.

7t The **South Valley Alluvium** ecoregion occurs on a level basin and on nearly level to gently sloping alluvial fans in the southern San Joaquin Valley. The soil temperature regime is thermic and soil moisture is aridic. Vegetation includes perennial bunchgrasses and annual grasslands, alkali sacaton, mesquite dunelands, and some iodinebush. Basin ponding occurs. Cropland, pasture, and urban land cover most of the ecoregion, with oil field deposits in some areas. Few wetlands remain.

7u The dry, hot **Antelope Plain** ecoregion occurs on nearly level to gently sloping alluvial fans along the southwestern edge of the San Joaquin Valley. Elevations range from 250 to 1,200 feet. Relief is slightly greater than in the flat Ecoregion 7v to the east. The soil temperature regime is thermic and soil moisture regime is aridic. Precipitation averages 6 inches annually. Alkali sacaton, bush seepweed scrub, and annual and alkali sacaton grasslands are typical cover. About one-third of the ecoregion now is in cropland, and the western margin is mostly grazed. Some oil fields occur.

7v The **Southern Clayey Basins** ecoregion consists of the low basin areas around the Buena Vista, Kern, and Goose Lake beds, and the area of fine-textured soils that extends into the Tulare Basin ecoregion (7r) to the north. The flat basins have elevations of about 200–300 feet. Cropland is the dominant land use, with some grasslands and herbaceous wetlands in the north around the Kern National Wildlife Refuge and numerous private wetlands operated as hunting clubs. This area provides wintering habitat for migrating birds, shorebirds, and waterfowl in the southern San Joaquin Valley. The endangered Buena Vista Lake shrew, San Joaquin kit fox, and blunt-nosed leopard lizard also find remaining habitat here. Wildlands are maintained by a complex of canals, pipelines, deep wells, pump stations, and water control structures.

8. Southern California Mountains

8a The **Western Transverse Range Lower Montane Shrub and Woodland** ecoregion provides a transition from the Coast Ranges to the west to the rest of the Transverse Range. The ecoregion has similarities to Ecoregion 8e, although the geology here primarily is Tertiary and Cretaceous marine sedimentary rock. The climate has more marine influence than Southern California Mountain regions farther inland. Elevations range from about 1,000 to more than 6,000 feet. Some coastal sage scrub occurs at low elevations. Scattered patches of coast live oak, canyon oak, Coulter pine, California bay, or bigcone Douglas-fir occur in a mostly chaparral-dominated landscape of coastal sage scrub and grassland. Some populations of other species such as cherry and birchleaf mountain-mahogany. The region provides habitat to the California condor and many other rare or endangered plant and animal species.

8b The **Western Transverse Range Montane Forest** ecoregion has two separate areas of high-elevation montane forest, with elevations ranging from 5,000 to more than 7,500 feet. The steep slopes are underlain mostly by Eocene and Cretaceous-age sandstone. Soil temperature regimes are mesic and soil moisture regimes are aquic and xeric. Annual precipitation is about 24–28 inches, with less snow in the winter than in Ecoregion 8f to the east. Along with some of the conifers at lower elevations, this high-elevation ecoregion contains a more continuous mixed coniferous forest with Jeffrey pine, sugar pine, white fir, incense cedar, hardwoods such as canyon live oak, and areas of montane chaparral. There is less ponderosa pine in this ecoregion than Ecoregion 8f to the east. In addition to the California condor, the ecoregion supports bird species such as the mountain chickadee, white-headed woodpecker, Cooper's hawk, and golden eagle.

8c The **Arid Montane Slopes** ecoregion is diverse, has Mojave Desert influences, and has vegetation communities ranging from desert scrub to semi-desert montane chaparral to singleleaf pinyon-California juniper woodlands. It stretches along the northern side of the San Gabriel and San Bernardino Mountains, with elevations about 3,000 to 7,000 feet. The geology is mostly granitic and gneissic rocks. There also are areas of carbonate geology (limestone and dolomite) in the San Bernardino Mountains that provide unique habitat for several endangered endemic plants.

8d The **Southern California Subalpine/Alpine** ecoregion includes the highest elevation areas, generally 8,500 to greater than 11,000 feet, including peaks such as Mounts San Antonio (Mount Baldy), San Gorgonio, and San Jacinto in the San Bernardino and San Gabriel Mountains at 11,502 feet is the southernmost point in California with evidence of glaciation. The large distances between these "islands" of high elevation habitat contribute to distinctive floras on each major peak. A few endemic alpine plant species occur. Scattered krummholz trees grow in some areas. The subalpine areas contain lodgepole pine, limber pine, and white fir. Some Sierra juniper occurs along with montane chaparral scrub. Gneiss, schist, and granitic rocks are dominant. Annual precipitation is about 40 inches, most of it as snow, and winter snowfall is typical. Soil temperature regimes are mesic and frigid and soil moisture regimes are udic and xeric. Annual precipitation is about 28–35 inches, falling mostly as snow. Soil temperatures are mesic with xeric, aquic, and aridic soil moisture regimes. The valley floor has a grassland and sagebrush ecosystem and contains extensive freshwater marshes filled with cattails, bulrushes, and alkaline flats that drain into the Middle Fork Feather River. Many species of wildlife use the valley, including migratory birds, wintering waterfowl, and raptors. More than 260 bird species have been observed in the valley, and 160 are known to breed here. Sandhill cranes nest in the valley. Pasture for cattle is extensive along with some hay and alfalfa fields.

8e The **Southern California Lower Montane Shrub and Woodland** ecoregion occurs on the igneous-dominated mountains of the eastern Transverse Range and the Peninsular Ranges at elevations ranging from about 3,000 to 5,000 feet. The chaparral-dominated landscape also contains patches of mixed evergreen woodland consisting mostly of bigcone Douglas-fir and canyon live oak. These fragmented, compact groves typically occur in deep canyons and on steep north-facing slopes. Some montane areas of coastal sage scrub occur near the lower margins, although most of that scrub occurs at lower elevations in Ecoregions 85c and 85f. The mosaic of land cover and vegetation communities is complex in the Peninsular Ranges. Certain chaparral shrubs in the Peninsular Ranges, such as mission manzanita and red shank, have limited ranges in southern California and Baja California, and they are not found in other chaparral types. Annual precipitation is about 24–28 inches, with less snow in the winter than in Ecoregion 8f to the east. Along with some of the conifers at lower elevations, this high-elevation ecoregion contains a more continuous mixed coniferous forest with Jeffrey pine, sugar p