# Klamath/North Coast Bioregion

Climate and Geography

Klamath, Shasta-Trinity, Six Rivers, and Mendocino National Forests, Jackson includes the North Coast Range and the Klamath, Siskiyou, Marble, Salmo wettest climate, with rainfall distribution varying widely from an average annual 38 inches at Fort Bragg to 80 or more inches in the King Range National Conservation Area. The coastal climate is cool, moist, and ofter mountains. Inland the climate is drier with low rainfall in winter and hot,

Major rivers include the Eel, Trinity, Klamath, Russian, Smith, Salmon, Scott, Mad, and Mattole, which flows into the Pacific Ocean near seismically active Cape Mendocino. Clear Lake, Whiskeytown Lake, Clair Engle, and the western

Plants and Wildlife

Vegetation includes mixed conifer habitat of white fir, Douglas fir, ponderosa pine, Sierra lodgepole pine, incense cedar, sugar pine, red pine, Jeffrey pine mountain hemlock, knobcone pine, western red cedar, red alder, redwood, tanoak, Pacific madrone, and chaparral. Wetlands provide places for resting, nesting, feeding and breeding for nativ

fox, black bear, mountain lion, California clapper rail, Aleutian Canada gees Roosevelt elk, osprey, fisher, bank swallow, Coho salmon, king salmon, otis blue butterfly, bald eagle, Point Arena mountain beaver, Swainson's hawle peregrine falcon, Lotis blue butterfly, Trinity bristle snail, red-legged frog, Siskiyou Mountains salamander, Pacific fisher, Del Norte salamande



Bay Area/Delta Bioregion

The temperatures in this Mediterranean climate don't vary much year-The coast experiences relatively cool, often foggy summers, mild falls, and chilly, rainy winters. Further inland, hot dry summers and warm autumi are followed by mild, wet winters. Snowfall is rare. The bioregion is mostly

grazing for wild and domestic animals, including dairy cattle. the Delta. Major rivers include the Russian, Gualala, Napa, Petaluma, and State Water Project delivery system. Lake Berryessa in Napa County is the

Plants and Wildlife

The habitats and vegetation of the Bay Area/Delta Bioregion are as varied as found among the rolling hills and mountains that descend to the ocean. Redwoods abound in Santa Cruz County. Coastal salt marsh lies around San manzanita, northern coastal scrub, California buttercups, goldfields, and Tiberon mariposa lily also are popular in the bioregion. Rare plants inclu Marin western flax, Baker's manzanita, Point Reyes checkerbloom, and Sonoma sunshine. Salt and freshwater marshes provide pickelweed, great bulrush, saltbush, and cattail.

feeding and breeding places for birds and waterfowl along the Pacific Flyway These marshes, rich in biodiversity, are popular and necessary wintering spots

Birds include canvasback, western grebe, black-crowned night heron, great woodpecker, golden eagle, western bluebird, Caspian tern, American avoca lion, leopard shark, and bat ray. Other wildlife includes grey fox, mule deer bobcat, raccoon, Pacific tree frog, and the swallowtail and painted lady

clapper rail, Smith's blue butterfly, salt marsh harvest mouse, California



Central Coast coastal scenery, blessed with a mild, seasonally moist, and sometimes foggy climate that favors rich farmland and vineyards. This highly agricultural region is famous for artichokes, garlic, and an array of fruits and vegetables. Other industries include wine-making and dairy and cattle ranching. The coast supports a brisk fishing industry, and oil production along the southern end of

The bioregion extends some 300 miles from just north of Santa Cruz to just encompasses the counties of Santa Cruz, Monterey, San Benito, Santa Barbara, and portions of Los Angeles, San Luis Obispo, Fresno, Merced, as the Monterey Bay area and Aquarium, Big Sur, the Hearst Castle, and the beaches of Santa Barbara, plus many state parks and other recreational attractions. The region also is the home of such well-known military geography offers coastal mountain ranges including the Santa Lucia and Santa Ynez, and coastal sand dunes, vegetation includes chaparral, mixed hardwood and redwood forests in the bioregion's northern coastal area, and oak woodlands. The Los Padres National Forest covers much of the southern portion of the bioregion. The Salinas and Cuyama rivers feed the bioregion's two major watersheds. Photograph: Jennifer Lotery



Malibu Creek and Point Mugu State Parks, Bolsa Chica Ecological Reserve, Department of Parks and Recreation are helping to preserve spectacular

Plants and Wildlife

species. In fact, the popular palm tree is not native to the Golden State. at lower elevations to mixed hardwood forest, southern oak, southern Jeffrey estate is especially prized, salt marshes and lagoons no longer are common to preserve and restore coastal wetlands.

foxes, black bears, raccoons, mule deer, hawks, herons, golden eagles, ospreys, peregrine falcons, desert iguanas, dolphins, whales, endangered bighorn sheep, orange-throated whiptail, California least tern, Belding's avannah sparrow, least Bell's vireo, Santa Ana sucker, arroyo southwestern toad and Tehachapi pocket mouse, Photograph: Mike Fuller



# Colorado Desert Climate and Geography

The Colorado Desert is the western extension of the Sonoran desert that lower elevation than the Mojave Desert to the north, and much of the land Common habitat includes sandy desert, scrub, palm oasis, and desert wash.

Desert bioregion on its way to Yuma, Ariz., where the two states and Mexico come together. The only other river of significant size in this bioregion is the largest body of water, on the border of Imperial and Riverside counties. The irrigation project and flooded a saline lake bed, creating an inland sea,

Anza Borrego Desert State Park, located mostly in eastern San Diego County but jutting into Imperial County, is the bioregion's largest recreation area, covering 600,000 acres. It offers more than 225 bird species and dozens of mammals, amphibians, and reptiles. Bighorn sheep can be seen there, as

white-winged doves, muskrats, southern mule deer, coyotes, bobcats, and prairie falcon, Andrew's dune scarab beetle, Coachella Valley fringe-toed



Southern California-one quarter of the state. The climate is hot and dry in rainstorms that can quickly turn a gulch or dry lake into a flash flood zone. The landscape is mostly moderately high plateau with elevations averaging 2,000 to 3,000 feet and isolated peaks that exceed 6,000 and 7,000 feet and more than 90 percent is within three miles of a paved road or off-road

prehistoric times, the bioregion contained great desert lakes, which have long elevation in North America, 282 feet below sea level in Death Valley National

# Plants and Wildlife Common habitats of the Mojave bioregion are: desert wash, Mojave creosote bush, scattered desert saltbush, Joshua tree scrub, alkali scrub, palm oasis, juniper-pinyon woodland, and some hardwood and conifer forests at higher elevations. Cottonwood willow riparian forest is rare habitat in this bioregion

as is alkali marsh and open sandy dunes.

thrasher, Nelson's bighorn sheep, gray vireo, desert tortoise, pale big-eared the cottontail marsh pupfish, found only in Death Valley National Park. Parks sandpipers, killdeer, white pelicans, teal, and thousands of migratory wading shore birds, as well as eagles, harriers, falcons, owls, coyotes, badgers, great blue herons, least Bell's vireos, red-tailed hawks, and Canada geese.

Climate and Geography The climate varies with the elevation, offering cold snowy winters and cool foothills. Summers are dry. Snowy winters in the northern Sierra are crucial c California's water supply, which depends heavily upon spring snowmelt to entral Valley Project. The projects supply about two-thirds of California's v the ski industry and a myriad of other businesses that serve and supply activities, but when high pressure areas push temperatures upward and gusty winds blow, California is vulnerable to wildfires that consume thousands of

acres of brush and timber every year. Eldorado, Stanislaus, Sequoia, Inyo, and Toiyabe. Major rivers include the Owens, Kings, Carson, Truckee, Walker, and Stanislaus. Mono Lake east of

species found in California and more than 400 of the state's terrestrial wildlife and amphibians. The variety of habitat types include annual grassland, blue red fir, riparian, alpine meadow, Jeffrey pine, sagebrush, and bitter brush.

Animals that inhabit the Sierra Bioregion include lodgepole chipmunk, mountain beaver, California mountain king snake, black bear, wolverine, California Golden Trout—the state fish—is native to the Southern Sierra.

# California spotted owl, mountain quail, willow flycatcher, bald eagle, and

Climate and Geography The year-around mild climate and varied geographical features of the South Coast contribute to its great popularity. Hot dry summers with predictable on fire-denuded slopes. Smog remains a serious problem in the South Coast bioregion, particularly the Los Angeles basin, but air quality regulations have

and mountains, including 11,500-foot San Gorgonio Peak in Riverside County. Ana, San Gabriel, San Luis Rey, San Jacinto, Santa Margarita, and San Diego. Los Padres, Cleveland, and San Bernardino; numerous parks, state beaches Torrey Pines State Reserve, and Sweetwater and Tijuana National Wildlife Refuges. In San Diego, Orange and Riverside counties, the state's Natural Community Conservation Planning (NCCP) pilot program involving local, state the threatened California gnatcatcher. In the Santa Monica Mountains, the

brown pelicans, and California sea lions. Rare animals include the Stephen's



# San Joaquin Valley

sunny days. Winters are moist and often blanketed with heavy fog. The broa Sierra Nevada foothills on the east. Habitat includes vernal pools, valley sink oak savannah. The growth of agriculture in the Central Valley has converted much of the historic native grassland, woodland, and wetland to farmland entire length of the bioregion. The southern portion of the bioregion includes

No significant rivers or creeks drain into the valley from the Coast Range. Plants and Wildlife Historically, millions of acres of wetlands flourished in the bioregion, but tream diversions for irrigation dried all but about 5 percent. Precious remnants of this vanishing habitat are protected in the San Joaquin Valle wetlands are found at the Kern National Wildlife Refuge west of Delano, owned by the U.S. Fish and Wildlife Service. It attracts a variety of duck

shorebirds, and song birds, as well as peregrine falcons.

cuckoo and valley elderberry longhorn beetle.

Department of Parks and Recreation, features the habitat of the tule elk endangered species—the San Joaquin kit fox, blunt-nosed leopard lizard Hoover's woolystar, and other rare species, such as western pond turtles, tricolored blackbird, and northern harrier. Endangered species of the bioregion also include the California tiger salamander, Swainson's hawk, and giant and Fresno kangaroo rat. Other rare species include the western vellow-billed

forests are found along the Kern River in the South Fork Wildlife Area, Great awks, and mule deer can be seen in the wildlife area. Other wildlife viewing Wildlife Area near Los Banos, and the Valley Grasslands of Merced County which attract 500,000 to 1 million birds each winter to lands owned by the Wildlife Service, and privately. The San Luis Dam and Reservoir area, jointly Reclamation, draws wintering bald eagles, abundant ducks, gopher snakes



in the coastal regions to the west. Summer hot spells that drive daytime carry moist air from San Francisco Bay eastward through the Delta and into 80s and 90s. Leaves turn gold during the brief, mild autumn that ends rathe abruptly with the coming of winter fog around Thanksgiving. The so-called tule February, keeping temperatures chilled. Except during droughts, rainfall is in the daytime, normally remain well above freezing. The Sacramento Valley is flat for the most part, but is situated within dista

ew of mountains, which are particularly visible on clear days. To the west the coastal range foothills loom on the horizon, while the snow-capped peak of the Sierra Nevada can be seen to the east. The valley's two major rivers—the Sacramento and American—carry water

San Joaquin River Delta. The importance of the Delta cannot be overstated entral Valley—the lower Feather, Bear, and Yuba Rivers.

attracting more than 1.5 million ducks and 750,000 geese to its seasonal marshes along the Pacific Flyway. Species include northern pintails, snow geese, tundra swans, sandhill cranes, mallards, grebes, peregrine falcons,

Black-tailed deer, coyotes, river otters, muskrats, beavers, ospreys, bald wildlife that abounds in this bioregion. Species on the endangered species and the western yellow-billed cuckoo. Photograph: Mike Fuller



The climate features hot dry summers and cold moist winters with snow at higher elevations. Geography is varied in the Modoc Bioregion, with volcanic areas and wetlands to the west and high desert to the east. Lassen Volcanic Lassen Peak; Tule Lake, and Clear Lake National Wildlife Refuges, Ahjumawi western side. The eastern side, which resembles its neighbor, Nevada, has

The last volcanic activity at Mount Lassen was in 1915. Bizz Johnson Trail linking Susanville and Westwood follows a railroad grade from high desert through grasslands and oak woodlands into a dense forest

The bioregion includes Modoc and Lassen National Forests and part of the Klamath National Forest. The largest lakes are Lake Almanor in Plumas County, Eagle Lake in Lassen County, Lower Klamath Lake in Siskiyou County rugged Warner Mountains in eastern Modoc and Lassen counties across the

while yellow and Jeffrey pine, white fir, mixed conifer, cedar, and aspen are

Within Last 11,000 Years

GIS Development: Mike Fuller, C.E.G., and Jim Thompson



**GEOLOGICAL AND BIOLOGICAL SETTINGS OF** 

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# Geologic Gems of California's State Parks



# **California's Geomorphic Provinces**



the province, the irregular path of the Klamath River is incised into an uplifted of benches with gold-bearing gravels on the sides of the canvons. The province metamorphosed Paleozoic and Mesozoic oceanic rocks, abundant serpenting

being interpreted as an ophiolite. Several distinct terranes have been identified. The terranes have been intruded by granitic plutons and veins, Veins, which history. Studies that dated rocks in the province show the terranes are young million years ago.) Photograph: Christopher Mizeur



reaching 6,000 feet above sea level. The Coast Ranges are predominantly present) sedimentary rocks. The northern and southern portions of the metamorphic rocks of the Salinian block lie to the west of the San Andreas the Farallon Islands.

The Coast Ranges record an ancient period of subduction ar Complex) formed as a massive pile of rock and sediment in an ancient

> known as the Coast Range ophiolite, are scattered throughout the province the faults has been generally strike-slip. The landscape reflects this side ences of linear valleys and ridges. Photograph: Mike Fuller



slope. The massive granites of the higher elevations are modified by glacial rivers cut deeply into the western slope. The high crest of the range culminate in Mt. Whitney with an elevation of 14,495 feet above sea level. The older metamorphic bedrock, in places still partly capped by much younger Tertiary

become the Sierran granitic rocks.

Over the last five million years, faults developed along the eastern margin of and Range province to the east. Active faults and hot springs (characteristic of the boundary zone is still evolving. The uplift of the Sierra Nevada changed the climate in California and Nevada.

that moved eastward over the land. In effect, California became wetter at the expense of Nevada. This increased precipitation allowed glaciers to cover the parks (Emerald Bay State Park and Grover Hot Springs State Park) owe some

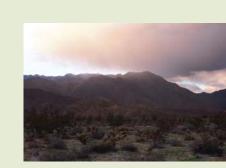


the plate boundary. The province is mostly below sea level and is the on-land Salton Sea (surface elevation about 245 feet below sea level). Surrounding the As a testament to the near-surface tectonic activity, there are several developed The province hasn't always been so dry. The Colorado River that runs from Colorado and through the Grand Canyon has long delivered its heavy sedimer load to the Gulf of California. The precise areas of sediment deposition shifte

back and forth over time. Eventually the river delta became large enough to

plug the Gulf and exclude the seawater from California. The seawater trapped

to be advancing northward into the Colorado Desert geomorphic provin confounding ways. This is one of the most seismically active places in the parched place. Photograph: Cheryl Hayhurst



the San Andreas Fault. The topographic trend is similar to the Coast Ranges, but the geology is more like the Sierra Nevada, with granitic rocks intruding th older metamorphic rocks. The Los Angeles Basin and the Channel Islands of Santa Catalina, Santa Barbara, San Clemente and San Nicolas are included in this province. Also included is the surrounding continental shelf (cut by deep submarine fault troughs). At the northern end of the province Mount San Jacinto below. The Peninsular Ranges extend south across the international border into

The Peninsular Ranges and the very similar Sierra Nevada probably formed in similar tectonic environments during the same period of time. However, they currently lie on opposite sides of the tectonic plate boundary represented by northward along the coast headed toward Alaska, Photograph; Mike Fuller

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any particular purpose.



Mount Shasta, a glacier mantled volcanic cone, rises 14,162 feet above sea end of the Cascade Range is Lassen Peak, a very large plug dome, which last centers, the Cascade Range is transected by the deep canyon of the Pit River, which eventually joins with the Sacramento River, Prehistoric eruptions within the area partially occupied by Mount Lassen.

Just 30 miles east of Mount Shasta lies Medicine Lake volcano, a large shield profile, it is believed to be the largest of the Cascade volcanoes. Medicine Lake occupies a large caldera. Its different shape relates to the less viscou (more fluid) magma that feeds it.

The Cascade volcanic rocks result from the subduction and partial melting

of the Gorda tectonic plate in the active Cascadia subduction zone. The

Many of the Cascade volcanoes are either active or potentially active.

Plateau and the Basin and Range provinces. But it also shows character

1,100 miles long, the climate and water temperatures in the south are mor

coastline is a dynamic boundary zone, of varying width, where geologic forces

Along the northern section, the coastal geomorphology is superimposed of

runs north-by-northwest from Point Conception north to Oregon. Due to the

lagoons, steep cliffs, marine terraces, and sea stacks.

At Medicine Lake, the magma and style of volcanism is more c

boundary zones. Photograph: Shannon Utley



associated valleys that trend northwest, subparallel to the active San Andrea the Sonoma and Clear Lake regions Pliocene and younger volcanic flows, ash

subduction zone. The bulk of the formation is a sheared matrix with large bl of various rock types (mélange). Adjacent enclosed blocks exhibit distinctively

> the entire length of the Coast Ranges. To some degree, the San Andreas Fault Mendocino triple junction. For the past 20 million years, the movement along deformation with local areas of uplift or subsidence often reflected as parallel



ago. The former Farallon oceanic tectonic plate was driven beneath the presen plutons. The terranes and sediments that accumulated in the subduction zone of this former plate boundary have been metamorphosed by the heat and fluids that radiated off the molten batholiths and plutons that eventually cooled to

the trend of the San Andreas is north by northwest but in this section it bends counterclockwise, that is more northwest. In simple terms, the lands the Peninsular Ranges geomorphic provinces, occupies a major boundary zone, northwest heading. The lands southwest of the boundary are riding on the plate. Photograph: Pam Irvine

shifted course and sent water and sediment north of the plug instead of south. rift zone between oceanic plates. Based on seismic activity, the rift appears





The region consists of 1) Tertiary and Pleistocene basalt lava flows with more ecent flows at the edge of the Cascade Range geomorphic province and 2) closely spaced, northerly-trending faults characteristic of the Basin and as a broad boundary zone between the Cascade and Basin and Range ovinces. Photograph: Michael Wopat



The Great Valley is an alluvial plain, about 50 miles wide and 400 mile drained by the Sacramento and San Joaquin Rivers, which join and enter San the Sutter (Marysville) Buttes, an isolated Plio-Pleistocene volcanic plug about 2,000 feet high. The valley is filled with nearly flat-lying sediments as much as 20,000 to 40,000 feet thick. Beneath the valley, Cretaceous and Cenozoic strata form a broad U-shaped cross-sectional profile (trough) that is Valley sedimentary rock can be seen along the western margin of the trough San Joaquin Valley oil fields follow uplifts and fault warps that formed "traps'

world due to a mild climate and extensive, fertile soils. These soils formed in Mountains on the east and the accretionary wedge of the Coast Ranges on the

washed into the trough, at that time occupied by the sea. The shoreline ran

abundant outwash of the glacial erosion (as exemplified at Emerald Bay State

Park) into the trough. The trough eventually filled with sediment and the seas

along the eastern edge of the modern Great Valley where sediments wer

retreated. Photograph: Mike Fuller

are often cobbly or gravelly with scattered sandy beaches. From San Diego to Point Conception, the coastline trends northwestwardly storms that arrive from the west and northwest. A broad continental shell lies along the southern section. The shallow offshore shelf helps absorb wave energy by causing waves to break further from shore. Sand depositi in the form of beaches started roughly 10,000 years ago and is relatively

both of which are variable through time. Sea level was as much as 400 feet the glaciers that covered northern and southern latitudes. During this time Islands) of its current location. During the Ice Ages, major rivers cut deep During the last interglacial, sea level was approximately 15-20 feet high



of the adjacent Coast Ranges and Peninsular Ranges. The section of Cenozoic

deep marine basins and the peaks are expressed as the ranges. The thick sediments were at first rapidly deposited into the deep marine basins; then with continued compression were pressed up into the ranges. Tectonic models suggest that the Ranges rotated nearly 100 degrees clockwise due to plate complex section of the tectonic plate boundary. This compression is thought to result from what is called the "Big Bend" in the San Andreas Fault. Overall,



of lava flows and tuff/ash beds that have built the plateau. Many northerly



wetlands as floodplain deposits replenished by sediment carried in the Sierra development of the Great Valley. To a large extent the floods and the sediment

orientation, the winter storms and waves tend to attack the northern si

widespread along the southern coast.



Basin and Range has been stretching from east to west, resulting in tilt is actually growing in area as a result of these extensional processes.

regional structural trends are significant in the formation of important oil Rosa, and Santa Cruz. The eastern limit, extends into the Mojave Desert, and includes the San Bernardino Mountains to the east of the San Andreas Fault. Within the Transverse Ranges, the San Bernardino and San Gabriel Mountain contain some of the highest peaks in southern California, ranging from

squeezing them for the past 20 million years, from south to north producing high amplitude compressed folds and faults. The troughs of the folds becar

6,000 feet. Because of the enclosed interior drainage, rainwater either seeps there are two important fault trends that control topography, a prominent

The rocks in the Mojave Desert are progressively older from the west toward

the east. Some of the oldest rocks (about 1.7 billion years old) in California

are exposed in the eastern Mojave Desert. Here also are remnants of what

was the western continental shelf during the formation of the Appalachian

to the Garlock Fault along its northern boundary (the southern boundary of the Sierra Nevada) and the San Andreas Fault along the southern boundary

Like the Basin and Range geomorphic province, this region has been growing

Tectonic Setting

from east to west. It is also being sliced north to south along a set of faults (the eastern California shear zone) that operate similar to and parallel with the San Andreas Fault. Photograph: California State Parks

