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About California

California covers nearly 164,000 square miles (42.4 million hectares) over 9.5 degrees of both latitude and longitude. It contains the highest (Mt Whitney; 14,505 ft/4421 m) and lowest (Badwater Basin, Death Valley; 282 ft/86 m below sea level) points in the continental United States—and these are only 85 miles/137 kilometers apart. California holds U.S. records for most rainfall in a single 12-month period (254.9 in./6.5 m), in the northwestern corner of the state, as well as greatest monthly snowfall total (390 in./9.9 m), recorded in the northern Sierra Nevada.

Bordered by the Pacific Ocean on the west and deserts on the east, California boasts remarkably diverse landforms and biotic communities. The Sierra Nevada is the dominant landscape feature, running for about 400 miles (644 km) from north to south, but other major mountain systems are present throughout the state. Three of North America's major deserts are here: the Mojave Desert,

MAP OF CALIFORNIA

SOURCE: GIS Geography. com

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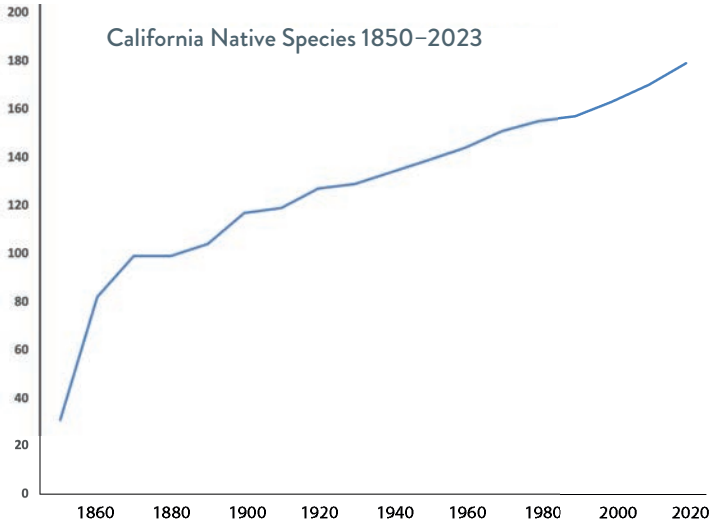
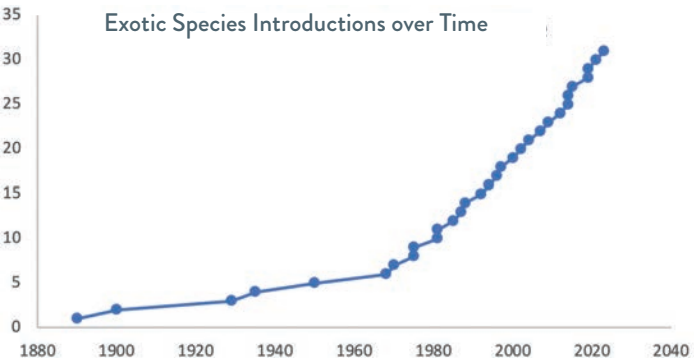
the Great Basin Desert, and the Colorado subdivision of the Sonoran Desert (we refer to this as the Colorado Desert in this book). California is home to 29 national parks and monuments, 20 national forests, and 279 state park units—the largest and most biologically diverse state park system in the United States.



The number of amphibian and reptile species recorded in California increased rapidly following a period of intense exploration of the American West in the mid-1800s. However, the species count has continued an upward trajectory to the present. This reflects a combination of field surveys in remote areas, examination of DNA sequences to identify cryptic species, and taxonomic revisions in which subspecies were elevated to full species status.



The number of exotic species with established populations in California remained very low for nearly a century after the exploration of the West began. The earliest non-natives were species such as the American Bullfrog, Pond Slider, and Spiny Softshell. Starting about 1970, perhaps coinciding with the increased popularity of amphibians and reptiles as pets, the number started to grow. As of 2024, the count stands at approximately 32 non-native species, but there are several others whose status is unclear (i.e., whether they are truly established). Considering the largely unregulated nature of the pet trade and the abundance of habitats in California, this number is expected to continue increasing.

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The climate is largely Mediterranean—with cool, wet winters and hot, dry summers—but that is more of a generalization given that northern coastal areas receive summer moisture through fog drip, and southern desert areas experience occasional monsoonal storms in summer. In recent decades, the state has experienced a warming and drying trend consistent with predictions of climate-change models. This translates to more severe droughts of longer duration interspersed with episodes of well-above-average precipitation (sometimes involving "atmospheric rivers"), episodic heat domes, and winter precipitation in mountain areas taking the form of rain instead of snow. These changes have affected California's herpetofauna (the collective term for amphibians and reptiles, often referred to as "herps") in different ways and will be even more consequential in coming decades.

California is home to 209 species of amphibians and reptiles: 51 species of salamanders, 28 species of frogs, 16 species of turtles, 64 species of lizards, and 50 species of snakes. Of this total, 32 species are exotics, meaning not native to the state; 25% of our lizard fauna consists of non-native species. Fifty-one species (29%) are endemic to California, meaning they are found nowhere else in the world; endemism is highest among our salamanders, at 73%. Four species are considered extirpated in California: Sonoran Desert Toad, Oregon Spotted Frog, Lowland Leopard Frog, and Sonora Mud Turtle. Thirty-five species (or subspecies) are listed as threatened or endangered at the state or federal level.

Why We Wrote This Field Guide

Herpetology is the slice of biological science that involves the study of amphibians and reptiles, and those of us who engage in such pursuits are *herpetologists*. Our purpose in preparing this guide has been to showcase the beauty and diversity of California's herpetofauna, as well as to highlight the conservation challenges facing many species. We have prepared concise yet informative species accounts and current distribution maps, and we have assembled nearly 1000 beautiful images of live amphibians and reptiles. Original color illustrations provide details of larval amphibians typically not seen in field guides. We believe that this guide will serve as a resource for a broad readership—amateur naturalists, teachers, students, resource managers, and professional biologists—by combining an up-to-date and scientifically accurate treatment of the California herpetofauna with high-quality illustrations.

About the Species Accounts

- Within each major group, accounts are organized by family and then alphabetically, by genus and species.
- Similar species: Within each account, we include species comparisons that are geographically relevant—that is, similar-looking species whose ranges overlap with or at least come close to the range of the species in question. That way you can narrow the range of possibilities. Still, in the field it can be hard to accurately distinguish between species. External differences may be subtle, especially among gartersnakes (*Thamnophis*) in some coastal areas, as well as among slender salamanders (*Batrachoseps*). In such uncertain cases, if you can upload a high-quality photo to an online database such as iNaturalist, that will usually result in an accurate identification.
- A VENOMOUS label is included for species whose bites are considered medical emergencies. In California, that designation is restricted to the Yellow-bellied Sea Snake, the Gila Monster, and the nine species of rattlesnakes native to our state. There are several other species of snakes that possess a mild venom used in subduing prey, but the rare human bites from those are not regarded as medically significant. Additionally, there are separate sections in this guide with information concerning snakebite (see "Venomous Snakebite" and "Rattlesnake Myths").

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How We Prepared the Range Maps

- We obtained locality data through museum collections (accessible online through VertNet or iDigBio) and observational databases (e.g., iNaturalist, HERP [Herpetological Education and Research Project]), combined with our own extensive field experience and those of many of our colleagues.
- We consulted maps published in the scientific literature.
- We used terrain, vegetation, and elevation layers to estimate range boundaries. However, we should point out that all range maps are hypotheses that, over time, will be refined by additional observations. Moreover, climate change has already modified the ranges of some species, and this trend is likely to accelerate in coming decades. Although these future changes cannot be reflected in the range maps, some of the most likely outcomes are upward elevational shifts for some species (in areas where that is possible) and shrinking ranges (or extirpation) for species occupying montane islands or isolated wetlands.
- For making distinctions between historical and current ranges—for those species where significant range reductions have occurred—we consulted a variety of sources, including satellite imagery in cases where the primary factor is habitat loss. The result is different map treatments for species that might share overall distribution patterns but have different ecological requirements or tolerances of disturbance. For example, extensive habitat loss in the Central Valley has led to near-complete extirpation of species such as the Coachwhip, Glossy Snake, and Blunt-nosed Leopard Lizard—species that require large tracts of native habitat to survive. Accordingly, our maps for those species depict their historical range as well as indicating where they no longer can be found because of habitat loss. However, other species, such as Gilbert's Skink, Western Fence Lizard, Gophersnake, and California Kingsnake, have persisted in some of these degraded habitats—and those range maps will look quite different.
- Draft maps were reviewed by species authorities and regional experts; their suggestions were critically important to the development of final maps.
- Our choice of map colors and combinations is based on a goal of "universal access"—meaning that individuals with various degrees of color-vision impairment (about 4.5% of the population) will be able to distinguish among colors used to depict ranges. Also, we have alternated between blue and rust-orange as the primary (first choice) color on maps in cases where one or the other is more visible in small range fragments, as this can be affected by the underlying relief layer.
- On some maps that depict subspecies ranges, intergrade zones are indicated by the blending of adjacent map colors. In cases where the resulting color blend is not an obvious combination of the "parent" colors, we have added a color box in the legend for clarification.

Color Plates and Illustrations

- Photographs depicting native species are labeled with only the source county and not a specific locality. We made this choice out of a desire to protect vulnerable species and habitats. The exceptions involve inclusion of island names or mountain ranges for a few species where this information is especially relevant and is unlikely to present conservation concerns.
- For a small number of species and life stages, we have used hand-painted illustrations rather than photographs. This was necessary sometimes because of the rarity of the species (as in the case of the Yellow-bellied Sea Snake) and sometimes because of the impracticality of trying to photograph aquatic subjects, such as sea turtles and amphibian larvae, in their natural surroundings (i.e., underwater). These hand-painted subjects are depicted in standardized positions, to facilitate identifying diagnostic or dissimilar traits in species that closely resemble one another. This will be especially useful for identifying amphibian larvae, a notorious challenge in the field for inexperienced and seasoned herpetologists alike. These illustrations were produced by the

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second author in traditional mixed media (gouache, acrylic, ink, and colored pencil) on hot press watercolor paper.
- Note that animals are not shown to scale. This is most obvious where juveniles are depicted at a relatively large size compared to adults of the same species and where hatchling or early-stage amphibian larvae are compared with those in more advanced stages. Rendering such subjects at an accurate scale would have been likely to obscure details of color or pattern.

Common and Scientific Names

- With some exceptions, we follow the official list adopted by the professional North American herpetological societies (the American Society of Ichthyologists and Herpetologists, The Herpetologists' League, and the Society for the Study of Amphibians and Reptiles): *Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in our Understanding*. The most recent version of the official list is available at https://ssarherps.org/publications/north-american-checklist.
- Some accounts contain an asterisk (∗) with a footnote directing the reader to the "Taxonomic Notes" section of this guide. Here we detail our reasoning for using certain scientific names in cases where the taxonomy has recently changed or where there is disagreement among experts.
- Following the scientific name at the beginning of each account, we provide the name(s) of the person(s) who first described the species, followed by the year in which the description was published. If the name appears in parentheses, such as (Myers, 1942), it means the species was originally identified as belonging to a different genus. In this example, Myers described the Black Toad in 1942 as *Bufo exsul*, but that species was later transferred to the genus *Anaxyrus* (thus, *A. exsul*).

How to Use This Book

Take this guide with you into field and forest! Mark it up to highlight useful information or to check off species you've observed. If you are trying to identify a reptile or amphibian, you can browse the color plates looking for one or more matches based just on appearance. The next step is to look through the range maps to determine a possible match based on geography. If there are two or more candidate species still in the running at this stage, consult the species account(s), looking especially at the **IDENTIFICATION** and **SIMILAR SPECIES** sections. If all else fails, you can crowdsource an ID by uploading a photo to iNaturalist.org.

How You Can Contribute

The information contained in this field guide is current through mid-2024. It reflects knowledge accumulated over many decades through the observations and field research of hundreds of people, ranging from professional scientists to amateur naturalists. And yet, there is still much to learn about California's amphibians and reptiles, and *anyone* can contribute to this knowledge base. Refer to the "Resources" section at the back of this guide for details on how to add your observations to community-science platforms such as iNaturalist.

Contacting the Authors

We'd love to hear from users of this field guide. Contact us at caherpguide@gmail.com.

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California's dynamic geological, seismological, and climatic history has produced extraordinary environmental heterogeneity. The state's diverse topography is derived from a broad plate tectonic history, having sustained transformative, divergent, and convergent plate boundaries together with extensive subduction along its coast. Currently positioned between 42 and 32 degrees north latitude, California boasts a wealth of biological diversity, with high levels of endemism represented in most taxa, including plants, insects, arachnids, fish, and mammals as well as the focus of this work, amphibians and reptiles. Such tremendous biodiversity reflects not only California's vast area but also the array of bioregions and the many habitat types they support. These bioregions—sometimes referred to as ecoregions or physiographic regions—are composed of varied soil types and diverse plant communities. The combination of spatial, geologic, and climatic factors results in such diverse landscapes as temperate rainforest, volcanic highlands, and isolated alpine fellfields at one end of the state and great expanses of xeric aeolian sand dunes, desert palm oases, and cholla cactus forests at the other.

A large area (more than 72 million acres/29 million hectares) of the state is identified as being especially species rich, most notably in plant taxa, with extreme levels of endemism. This botanical mega-region, known as the California Floristic Province, is a famous biodiversity hotspot. This province extends from southwestern Oregon southward along the coast and eastward along the Cascade-Sierran axis into cismontane southern California, running along the Transverse and Peninsular Ranges to northwestern Baja California, Mexico. The Mediterranean climate within this boundary is characterized by hot, mostly rainless summers and cool, wet winters. It is in this province that most of the state's amphibian species live. Nearly all of California's salamanders, with some exceptions, are found only within this province, with the North Coast, the Central Coast, and the Sierra Nevada being especially species rich. In fact, most of these salamanders are found nowhere else in the world. Many other amphibians and reptiles are endemic to the Central Valley, the Central Coast, the South Coast, and the Transverse Ranges within this province.

Excluded from the California Floristic Province are the more arid, eastern parts of the state, from the Modoc Plateau, the Great Basin, and the Basin Ranges to the southern California deserts. California is the only state other than Arizona to harbor four distinct desert regions: the San Joaquin, the Great Basin, the Mojave, and the Colorado Deserts. These arid regions all experience low annual rainfall and are rich in lizard and snake species. One of these deserts, the San Joaquin Desert, is geographically positioned within the California Floristic Province, but many of the indigenous flora and fauna of the San Joaquin Desert region are closely associated with the southern Sierra Nevada and the Mojave Desert, with their ranges extending to those regions.

In addition to the diverse regions throughout the mainland portion of the state, California has numerous islands. Amphibians and reptiles are found on 17 of these islands—most notably the Channel Islands, Año Nuevo and the Farallon Island chain off the Central Coast, and islands in San Francisco Bay. Several types of amphibians and reptiles on these islands have been isolated from their mainland counterparts for so long that they are now distinct taxa. These include the Channel Islands Slender Salamander, Island Fence Lizard, Island Night Lizard, and Santa Cruz Island Gophersnake.

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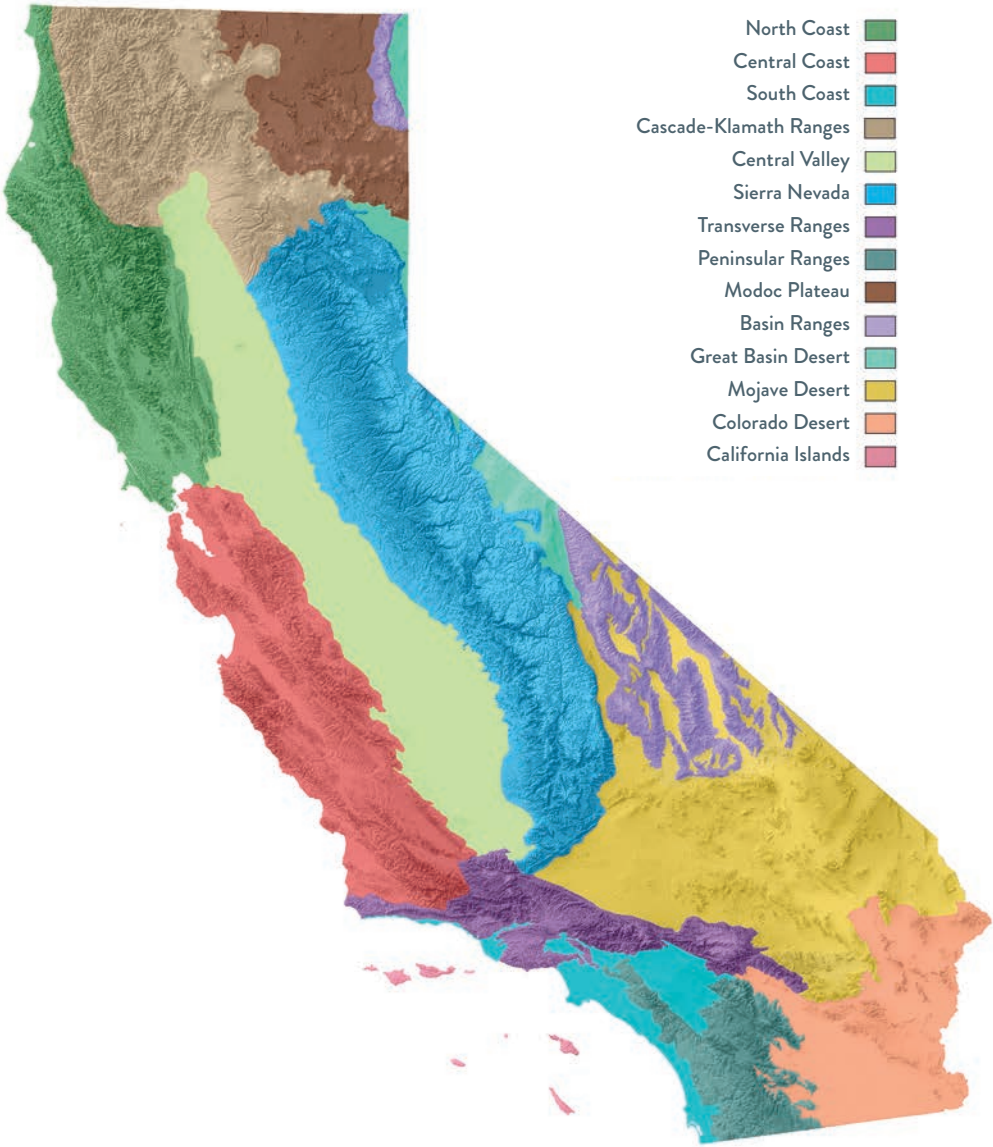
BIOREGIONS OF CALIFORNIA



Adapted from:

Bakker, E. 1971. An Island Called California: An Ecological Introduction to Its Natural Communities. 2nd ed., revised and expanded. University of California Press, Berkeley.

Interagency Natural Areas Committee (INAC). 2002. Bioregions [map]. The Resources Agency, Sacramento, California.

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There are several classification systems for California plant communities. Nearly all of them have been developed by botanists for use by other botanists. As such, they have limitations in aiding our understanding of the distribution and habitat associations of amphibians and reptiles. However, some herpetofauna have more direct associations with the microhabitat components provided by these systems (e.g., refugia such as woody debris, rodent burrows; microclimates and prey associated with vegetative shading, trans-riparian gradients, or unshaded meadows). The following list consolidates several traditionally recognized communities.*

California Prairie Is often referred to as Valley Grassland in other classification schemes, but this is misleading, as there is little evidence to suggest that this community was dominated by grasses prior to the arrival of Europeans. Occurs on the floor of the Central Valley, on the Central Coast, along bordering foothills, and in southern California lowlands. Pre-European plant species composition is unclear, but it has been extensively replaced by exotic Mediterranean annuals, with native wildflowers and forbs intermixed where spatial and moisture thresholds allow. These areas harbor what remains of vernal pool habitat, critically important for several amphibian species.

San Joaquin Desert Scrub Occurs on the Carrizo Plain, at the southern end of the San Joaquin Valley, and along its interface with the eastern edge of the Central Coast Range and foothills of the Tehachapi Mountains and the southern Sierra Nevada. Allscale Saltbush (*Atriplex polycarpa*), Spiny Saltbush (*A. spinifera*), Iodinebush (*Allenrolfea occidentalis*), Desert Tea (*Ephedra californica*), and Green Ephedra (*E. viridis*) are characteristic shrub species of this ecosystem. What remains of San Joaquin Desert Scrub is vital for the persistence of several endangered and declining amphibian and reptile species.

Lowland Riparian Is present principally along the eastern portion of the Central Valley, associated with historical floodplains of major streams draining the western Sierra Nevada. Valley Oak (*Quercus lobata*) is the most conspicuous species, but other trees, such as Fremont Cottonwood (*Populus fremontii*), California Sycamore (*Platanus racemosa*), and willows (*Salix* spp.), compose gallery forests that follow perennial streams onto the valley floor.

Upper Elevation Riparian Consists of riparian systems characterized by trees such as Black Cottonwood (*Populus trichocarpa*), White Alder (*Alnus rhombifolia*), and willows (*Salix* spp.), along creeks and rivers of foothills and mountain ranges west of the deserts. Slopes above high-water mark are often characterized by Canyon Live Oak (*Quercus chrysolepis*), California Buckeye (*Aesculus californica*), Western Redbud (*Cercis occidentalis*), and pine (*Pinus* spp.).

*Modified based on the maps developed by A. W. Küchler:
1964. Potential Natural Vegetation of the Conterminous United States. American Geographical Society, Special Publication No. 36.
1977. The map of natural vegetation of California. In M. G. Barbour and J. Major (eds.), Terrestrial Vegetation of California. California Native Plant Society, Davis, California.

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Coastal Sage Scrub Is found along the coast, from the San Francisco Bay Area to San Diego County and into northern Baja California. This endangered community is characterized by low-growing, aromatic, and drought-deciduous plant assemblages, often dominated by California Sagebrush (*Artemisia californica*), various species of sage (e.g., *Salvia apiana, S. mellifera*), and California Buckwheat (*Eriogonum fasciculatum*). Other distinctive plants include cacti, such as Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*).

Chaparral Occurs in fragmented expanses throughout California, mainly in foothills surrounding the Central Valley and along the Central and Southern Coasts. Also occurs at high elevations in the Sierra Nevada and on the Channel Islands. This fire-prone community is characterized by dense plant growth, typically with evergreen foliage, in nutrient-poor soil and is home to many endemic plant species. Typical large shrubs are Chamise (*Adenostoma fasciculatum*), Laurel Sumac (*Malosma laurina*), manzanitas (*Arctostaphylos* spp.), California lilac (*Ceanothus* spp.), scrub oaks (*Quercus* spp.), and chinquapin (*Chrysolepis* spp.).

Oak Woodland Occurs in the foothills of the western Sierra Nevada, on the northern slopes of the Tehachapi Mountains, and at the northern end of the Central Valley, as well as throughout foothills and lower elevations of southern California. Blue Oak (*Quercus douglasii*) is a dominant species in some foothill regions. Valley Oak (*Q. lobata*) makes up much of what remains of this community throughout most of the Central Valley, while Coast Live Oak (*Q. agrifolia*) and Engelmann Oak (*Q. engelmannii*) exemplify coastal and southern regions. Foothill Pine (*Pinus sabiniana*), California Buckeye (*Aesculus californica*), and Interior Live Oak (*Q. wislizenii*) are other conspicuous tree species occurring within these woodlands.

Montane Conifer Forest Includes pine-oak woodlands above foothill elevations grown to Ponderosa Pine (*Pinus ponderosa*), Douglas Fir (*Pseudotsuga menziesii*), Incense Cedar (*Calocedrus decurrens*), and California Black Oak (*Quercus kelloggii*), as well as pine-fir forests of Ponderosa Pine, Sugar Pine (*P. lambertiana*), Jeffrey Pine (*P. jeffreyi*), and White Fir (*Abies concolor*) at somewhat higher elevations.

Subalpine Forest Consists of pine-fir association at elevations above Montane Conifer Forest but below the Alpine zone. This community is found throughout extensive areas of the Sierra Nevada, Klamath Mountains, Cascades, Great Basin Ranges (the Warner, Sweetwater, Glass, White, Inyo, and Panamint Mountains), and southern California ranges (the San Gabriel, San Bernardino, and San Jacinto Mountains). Dominant conifers include hemlock and spruce species (*Tsuga* spp.), Red Fir (*Abies magnifica*), Whitebark Pine (*Pinus albicaulis*), Lodgepole Pine (*P. contorta*), Bristlecone Pine (*P. longaeva*), and Sierra Juniper (*Juniperus grandis*). Quaking Aspen (*Populus tremuloides*) is a notable deciduous tree in many areas. An understory shrub component is often present, which can include

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extensive stands of sagebrush (*Artemisia* spp.), manzanita (such as *Arctostaphylos nevadensis*), or more diverse assemblages composed of such species as, for example, Rose Meadowsweet (*Spiraea splendens*), Bitter Cherry (*Prunus emarginata*), Scouler's Willow (*Salix scouleriana*), Mountain Willow (*S. eastwoodiae*), Mountain Snowberry (*Symphoricarpos rotundifolius*), and gooseberry (*Ribes* spp.).

Alpine Is a mostly treeless zone at the highest elevations where vegetation grows (i.e., at tree line and below the nival zone) across the state from around 8800 to 11,500 ft (2700–3500 m), depending on latitude. Alpine communities are present in many of the state's upper montane environments, including the Sierra Nevada, Klamath Mountains, Cascades, Great Basin Ranges, and southern California ranges (the San Gabriel, San Bernardino, and San Jacinto Mountains). Plants here are often perennial wildflowers, herbs, and subshrubs adapted to high winds and low-nutrient, eroding slopes. Prominent and better-known ones include the beardtongues (*Penstemon* spp.), lupines (*Lupinus* spp.), buckwheats (*Eriogonum* spp.), pussypaws (*Calyptridium* spp.), and phlox (*Phlox* spp.), often with several species within these genera occurring at a single location.

Redwood Forest Is a densely canopied, mesic, temperate rainforest community characterized by large stands of Coast Redwood (*Sequoia sempervirens*), with an understory grown to Western Sword Fern (*Polystichum munitum*), Evergreen Huckleberry (*Vaccinium ovatum*), and Pacific Rhododendron (*Rhododendron macrophyllum*), among others. Co-occurring trees often include Big Leaf Maple (*Acer macrophyllum*), Pacific Madrone (*Arbutus menziesii*), Douglas Fir (*Pseudotsuga menziesii*), Tanoak (*Notholithocarpus densiflorus*), and Red Alder (*Alnus rubra*).

Mixed Evergreen-Deciduous Forest
Is a mid-elevation community within mountain ranges, where evergreens such as Canyon Live Oak (*Quercus chrysolepis*), Pacific Madrone (*Arbutus menziesii*), Douglas-fir (*Pseudotsuga menziesii*), and Ponderosa Pine (*Pinus ponderosa*) are interspersed with deciduous species such as California Black Oak (*Q. kelloggii*), Bigleaf Maple (*Acer macrophyllum*), and Pacific Dogwood (*Cornus nuttallii*).

Pinyon-Juniper Woodland Occurs in low-rainfall regions, mainly elevated parts of the Great Basin and eastern slopes of the Sierra Nevada. Single-leaf Pinyon (*Pinus monophylla*) and various *Juniperus* spp. are the dominant tree species. Understory of shrub stands often consists of Big Sagebrush (*Artemisia tridentata*) and rabbitbrush species (*Chrysothamnus* spp.).

Joshua Tree Woodland Is present in scattered areas from the White Mountains, in Inyo County, to the southern base of the Tehachapi Mountains and the eastern base of the southernmost Sierra Nevada, south to western Riverside County and eastern San Bernardino County. This unique woodland system is characterized by iconic stands of Joshua Tree (*Yucca brevifolia*) in slightly elevated areas of the Mojave Desert, mostly above Mojave Desert Scrub and below Pinyon-Juniper Woodland.

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Mojave Desert Scrub Dominates the Mojave Desert and is characterized by Creosote Bush (*Larrea tridentata*). Various cacti, Burro Weed (*Ambrosia dumosa*), Mojave Yucca (*Yucca schidigera*), and Ocotillo (*Fouquiera splendens*) are other conspicuous plant species.

Colorado Desert Scrub Is a regional subdivision of the Sonoran Desert. Creosote Bush (*Larrea tridentata*) and Ocotillo (*Fouquiera splendens*) are prolific, with other ubiquitous dominants such as Brittlebush (*Encelia farinosa*), Desert Agave (*Agave deserti*), Chuparosa (*Justicia californica*), and many cacti.

Desert Saltbush Shrubland Is found east of the Sierra Nevada, principally from Owens Valley north, where dominant shrub species to the south (such as Creosote) and to the north and at surrounding higher elevations (such as Big Sagebrush) are replaced by saltbush and other xeric-adapted shrubs, often in areas with alkaline soil types. Common examples of these are Budsage (*Artemisia spinescens*), Four-winged Saltbush (*Atriplex canescens*), Shadscale (*A. confertifolia*), Spiny Hopsage (*Grayia spinosa*), and Black Greasewood (*Sarcobatus vermiculatus*).

Sagebrush Shrubland Occurs in the Great Basin region, east of the Cascades and Sierra Nevada, associated with low-rainfall and high-desert environments. Sometimes referred to as sagebrush steppe, which is regarded here as a sub-community of Sagebrush Shrubland found in extreme northeastern California, mainly on the Modoc Plateau. This community is dominated by shrubs, including Big Sagebrush (*Artemisia tridentata*), Black Sagebrush (*A. nova*), Bitterbrush (*Purshia tridentata*), Desert Peach (*Prunus andersonii*), and several rabbitbrush species (*Chrysothamnus* spp.). Grasses such as Blue Bunch Wheat Grass (*Elymus spictatus*), Idaho Fescue (*Festuca idahoensis*), and Great Basin Wildrye (*Leymus cinereus*) are often present.

Coastal Prairie Occurs on headlands and bluffs above shoreline. Grasses such as Blue-eyed Grass (*Sisyrinchium bellum*), California Oat Grass (*Danthonia californica*), American Dune Grass (*Elymus mollis*), and Sand Dune Blue Grass (*Poa douglasii*) are significant components of this community. However, many perennial herbs and small subshrubs may be present, including Golden Yarrow (*Eriophyllum staechadifolium*), Seaside Buckwheat (*Eriogonum latifolium*), Cliff Buckwheat (*E. parvifolium*), and Thrift Seapink (*Armeria maritima*).

Coastal Dunes Exists in a narrow expanse between the beach high-tide mark and inland terrain, which may consist of any number of habitat types but is often developed for housing. Aside from prominent exotic invasives, such as the ubiquitous iceplants (*Carpobrotus chilensis* and *Mesembryantheum crystallinum*), European Beachgrass (*Ammophila arenaria*), and Sea Rocket (*Cakile maritima*), numerous natives occur in these threatened plant assemblages. These include Beach Sagewort (*Artemisia pycnocephala*), Beach Bur (*Ambrosia chamissonis*), Coastal Buckwheat (*Eriogonum cinereum*), Dune Knotweed (*Polygonum paronychia*), lupines (e.g., *Lupinus arboreus* and *L. tidestromii*), and several dune-obligate perennial herbs such as the sand verbenas (*Abronia* spp.).

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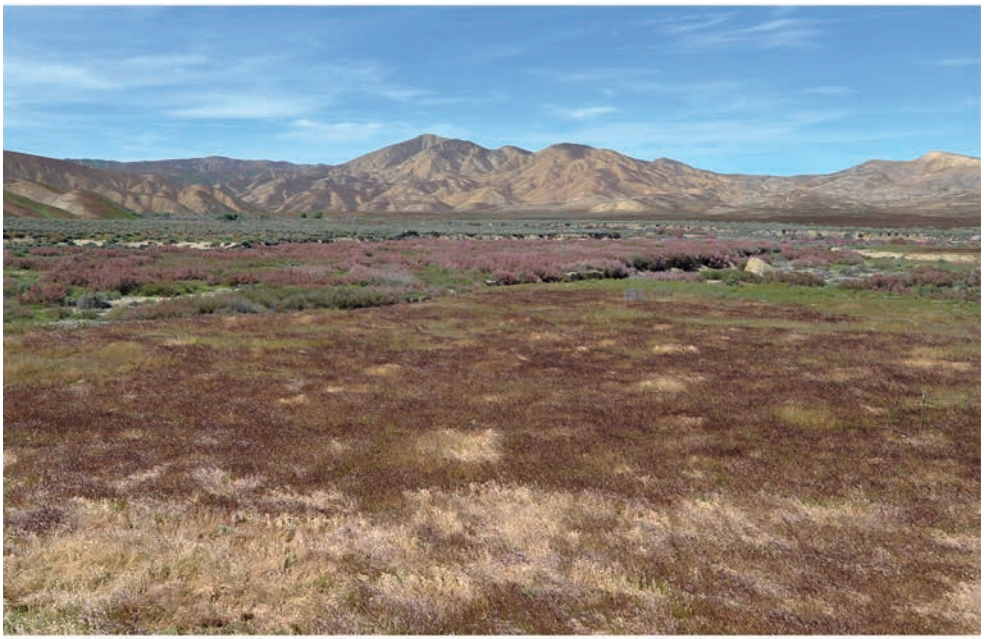
California Prairie: Vina Plains Preserve, Central Valley, Tehama Co.



San Joaquin Desert Scrub: Panoche Valley, Fresno Co.

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Lowland Riparian: Mokelumne River, Central Valley, San Joaquin Co.

Upper Elevation Riparian: Yuba River, Sierra Nevada, Nevada Co.

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Coastal Sage Scrub: Mission Trails Regional Park, San Diego Co.

Chaparral: western slope Sierra Nevada, El Dorado Co.

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Oak Woodland: Dye Creek Preserve, Tehama Co.

Montane Conifer Forest: western slope Sierra Nevada, Fresno Co.

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Subalpine Forest: Kaiser Wilderness, Sierra Nevada, Fresno Co.

Alpine: Desolation Wilderness, Sierra Nevada, El Dorado Co.

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Redwood Forest: Lost Man's Creek, Humboldt Co.

Mixed Evergreen-Deciduous Forest: Little Carson Creek drainage, Marin Co.

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Pinyon-Juniper Woodland: White Mountains, Inyo Co.

Joshua Tree Woodland: western Antelope Valley, Kern Co.

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Mojave Desert Scrub: Short Canyon, Inyo Co.

Colorado Desert Scrub: Anza-Borrego Desert State Park, San Diego Co.

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Desert Saltbush Shrubland: Alabama Hills, northern Mojave Desert, Inyo Co.

Sagebrush Shrubland: Great Basin, Mono Co.

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Coastal Prairie: Redwood Creek Beach, Humboldt Co.

Coastal Dunes: Sandspit Beach, San Luis Obispo Co.

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California's ecosystems, like many ecosystems around the world, are in peril, a consequence of an ever-growing human population. Our need for food, housing, and energy has displaced or eliminated native species from large areas of our state. Thirty-five (or 20%) of California's native species of amphibians and reptiles are currently designated as threatened or endangered. Four species no longer can be found in California. Below, we summarize major conservation threats facing California's herpetofauna. For an in-depth examination of these issues and specific discussions about impacts on individual species, please consult Thomson and colleagues' *California Amphibian and Reptile Species of Special Concern* (see the "Resources" section at the back of this guide).

Habitat Loss

Loss or degradation of natural habitat is far and away the leading threat to California's amphibians and reptiles. The most extensive losses correspond to major human population centers—the San Francisco Bay Area and the Los Angeles to San Diego region—and the Central Valley, where industrial-scale agriculture has fundamentally reshaped the landscape. Chemical runoff from farming operations has polluted streams and groundwater. Nearly all of California's rivers have been dammed for flood control, water storage, or hydroelectric power generation. Not surprisingly, amphibians and reptiles associated with wetlands (rivers, streams, lakes, vernal pools, and marshes) make up 65% of the roster of species that are endangered, threatened, or of special concern.

Climate Change

Data from the last several decades have confirmed predictions of long-range climate models. These models predict the following: (1) an increase in average daily temperatures, including higher daily maxima as well as reduced overnight cooling in summer; (2) increased volatility of annual precipitation levels, with growing frequency of longer and more severe droughts, interspersed with periods of well-above-normal levels of rain and snow ("climate whiplash"); (3) winter precipitation changing from snow to rain; (4) increased frequency of catastrophic wildfires; (5) increased frequency and intensity of regional heat dome events—atmospheric high-pressure systems that trap heat over a large area. All these phenomena are likely to have profound impacts on our herpetofauna.

Exotic Species

Thirty-two species in this field guide (1 salamander, 5 frogs, 7 turtles, 16 lizards, and 3 snakes) are not native to California. One of these, the American Bullfrog, introduced in the late 1800s, is now abundant throughout the state. The number of non-native species is likely to grow through the illegal release of pets, some of which will be able to establish populations. A handful of the 32 non-natives are considered "invasive"—a term biologists reserve for species that display certain life history traits, such as high reproductive output, broad ecological tolerances, and an ability to displace native species (through either resource competition or predation). Exotic species can also introduce novel pathogens into settings where native species have little to no resistance to them. And consider the effect of the introduction of the Western Tiger Salamander, which breeds with the endangered California Tiger Salamander to produce hybrids that outcompete their native counterparts. The "exotic species problem" is not confined to introductions of amphibians and reptiles, either. In fact, non-native predators—mainly fishes and crayfish—have fundamentally altered the species composition of numerous waterways in California. In many areas, all native fishes, frogs, and turtles have been replaced by exotics.

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Current and Emerging Disease Threats

Recognition of ecologically significant diseases in wild populations of California amphibians and reptiles is a relatively recent development and a dynamic field of study. The information below likely has a short shelf life, and readers are encouraged to consult the PARC National Disease Task Team website (https://parcplace.org/species/parc-disease-task-team) for the most current information.

- **Chytridiomycosis (*Bd*)**: Caused by the fungal pathogen *Batrachochytrium dendrobatidis*, or *Bd*, this form of chytrid has been implicated in declines of frogs throughout the world. Ranid frogs in California seem particularly susceptible to it. The introduced American Bullfrog is not affected but likely is an asymptomatic carrier. *Bd* has been detected in species of slender salamanders (*Batrachoseps*) and is suspected to have played a role in the decline of the Desert Slender Salamander and Relictual Slender Salamander.
- **Chytridiomycosis (*Bsal*)**: This second form of chytrid is caused by *Batrachochytrium salamandrivorans*, or *Bsal*, a necrotizing pathogen that has caused population-level impacts in Europe. It was brought to Europe from Asia, where it originated, likely via amphibians imported for the pet trade. *Bsal* has not been detected in North America, but because the international pet trade is not heavily regulated, it presents a grave risk to native U.S. species. Based on observations in Europe and results from lab testing, the following genera of California amphibians are considered vulnerable: *Aneides*, *Ensatina*, *Hydromantes*, *Taricha*, and *Scaphiopus*.
- **Pond Turtle Shell Disease**: Thought to be caused by a fungus, *Emydomyces testavorans* (*Emte*), this affliction was first noted in Northwestern Pond Turtles in Oregon and Washington. Symptoms ranged from minor discoloration and small pitting lesions on the carapace to severe, deep lesions with extensive shell damage. Initial detections in California were in non-native Pond Sliders; infected individuals appeared asymptomatic but presumably serve as reservoirs capable of

Sea Turtle Declines and Conservation

The conservation challenges facing sea turtles are different from those discussed above for California's terrestrial herpetofauna, and for that reason we highlight them here. The world's seven sea turtle species collectively suffer from the same multitude of harms that have led to substantial and ongoing global declines. Five of these species live in the eastern Pacific Ocean and visit or reside in California waters. In general, sea turtles take a long time to reach sexual maturity—and individual turtles thus face much longer exposure to threats. In addition to natural predation, significant negative impacts on sea turtles' survival include the following:

- Invasive species predation
- Boat strikes
- Marine pollution, including oil spills
- Nest poaching
- Poaching for the illegal shell trade
- Traditional hunting, no longer a sustainable practice for most populations
- Climate change, with possible impacts on sex ratios and reduced shorelines for nesting
- Trash, resulting in ingestion of plastic, possible choking hazards
- Commercial fishing bycatch from use of nets/longline or gillnets
- Disease, especially fibropapillomatosis, which produces large tumors

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spreading the fungus. Recently, the fungus has been detected in Northwestern and Southwestern Pond Turtles at multiple locations in California, but prevalence and loads are relatively low. Potential impacts are unknown.

- **Upper Respiratory Tract Disease (URTD)**: Caused by the bacteria *Mycoplasma agassizii* or *M. testudineum* (or both), this chronic infectious disease has been responsible for major die-offs in Mojave Desert Tortoises. It was likely introduced through the release of infected captive tortoises. Symptoms include nasal discharge and nasal occlusion.
- **Snake Fungal Disease or Ophidiomycosis (SFD)**: Caused by a fungal pathogen, *Ophidiomyces ophidiicola*, SFD likely originated in southeast Asia and was transmitted to North America via the pet trade. It was first detected in the eastern United States in 2008 and only recently detected, at low levels, in California, where individual snakes of the following species have tested positive for SFD: Northern Pacific Rattlesnake, North American Racer, Gophersnake, Common Gartersnake (including the endangered San Francisco Gartersnake), Giant Gartersnake, California Kingsnake, Ring-necked Snake, and Southern Watersnake. Signs of infection include scabs, flaking scales, open wounds, and severe facial swelling. However, some snakes that have tested positive for SFD lack any external signs of infection. Although SFD may be fatal in snakes, it is unclear whether there are population-level impacts in California. Observations of possibly infected snakes should be reported on the California Department of Fish and Wildlife's "Wildlife Mortality Reporting" page (https://wildlife.ca.gov/Conservation/Laboratories/Wildlife-Health/Monitoring/Mortality-Report).
- **Ranavirus (Rv)**: Ranaviruses have a global distribution. They pose the greatest threat to salamanders (*Ambystoma*), ranid frogs (*Rana* spp.), anuran larvae, and freshwater turtles, with mortality reaching 100% in some species. Symptoms in turtles include lethargy, buoyancy problems, erratic swimming, and gasping for air. Infected amphibians may exhibit abnormal swimming; swelling of the neck, limbs, and body; and ventral hemorrhaging.

Everyone who appreciates California's native herps should be aware of basic steps they can take to reduce the chances of spreading disease. Follow established disinfection protocols to clean your boots, nets, and other equipment before and after visiting wetlands. Know that releasing captive herps or relocating wild animals is a bad idea and may be in violation of wildlife regulations. Read the guidelines on the Partners in Amphibian and Reptile Conservation website at https://parcplace.org/species/herpetofaunal-disease-resources.

Sources of Information about Diseases and Biosecurity

Bletz, M. C., J. Palmisano, J. T. Julian, L. Shender, and D. H. Olson. 2023. Amping up biosecurity for herps. The Wildlife Professional Nov/Dec:46–49.

Gray, M. J., and Colleagues. 2023. Broad host susceptibility of North American amphibian species to *Batrachochytrium salamandrivorans* suggests high invasion potential and biodiversity risk. Nature Communications 14:3270. https://www.nature.com/articles/s41467-023-38979-4.pdf.

Ladner, J. T., and Colleagues. 2022. The population genetics of the causative agent of snake fungal disease indicate recent introductions to the USA. PLoS Biology 20(6): e3001676. https://doi.org/10.1371/journal.pbio.3001676.

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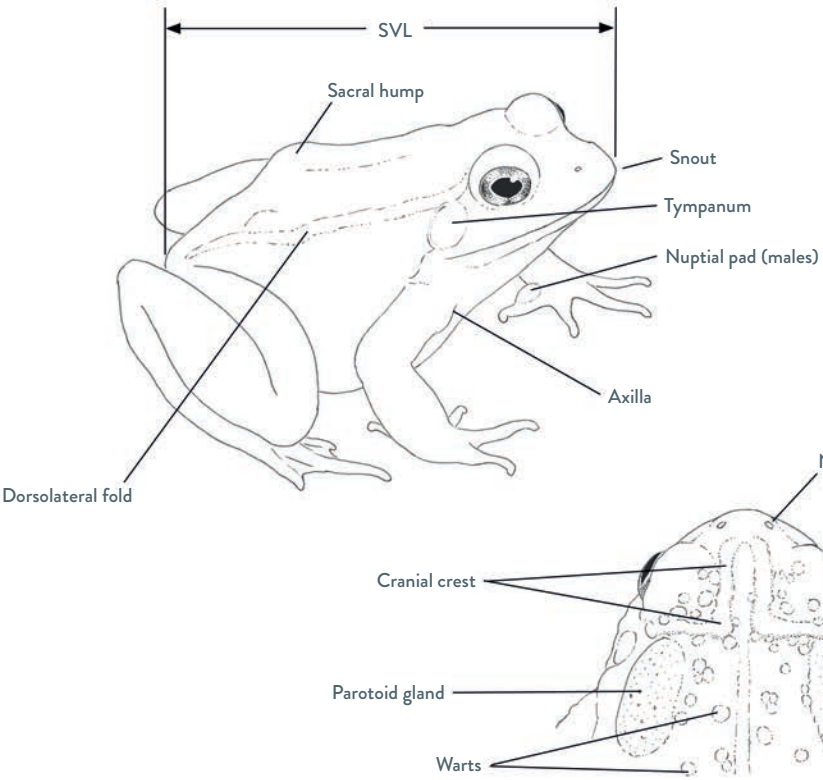
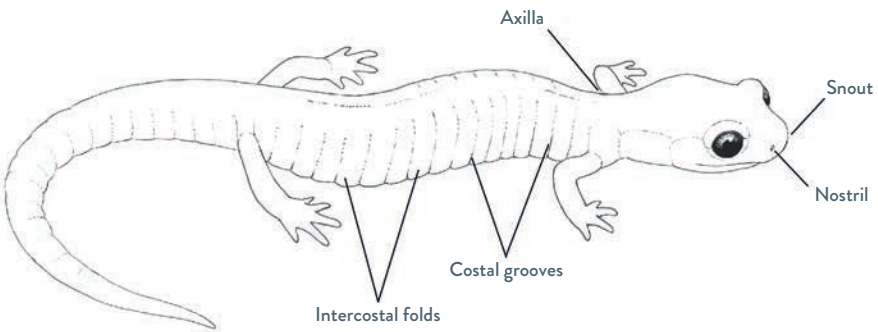
AMPHIBIAN MORPHOLOGY





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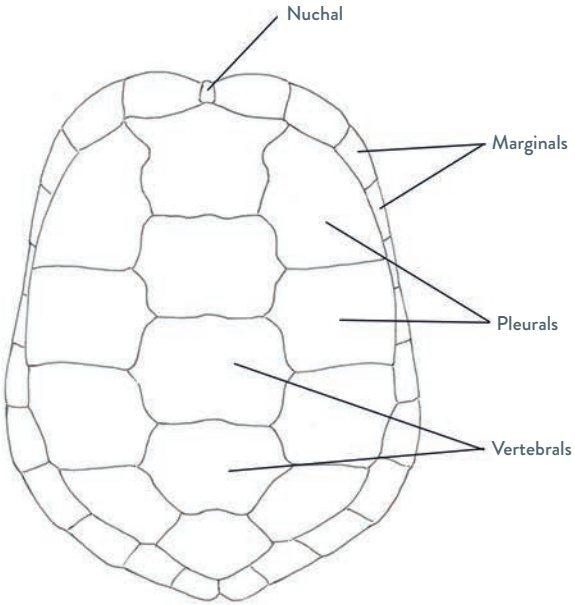
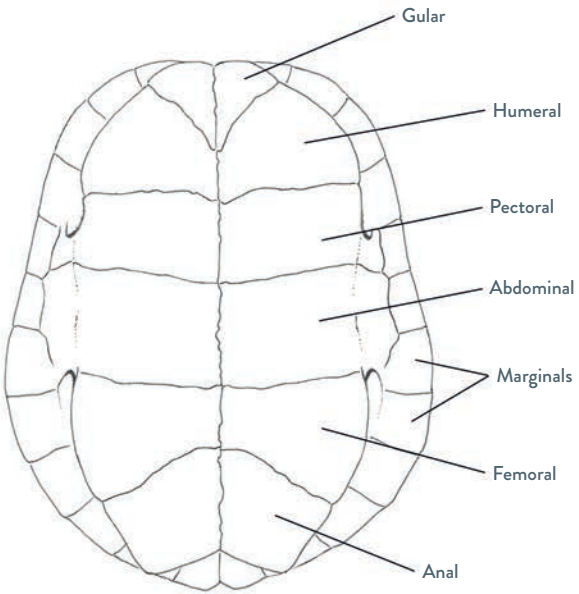
TURTLE SHELL SCUTE TERMINOLOGY



Carapace



Plastron

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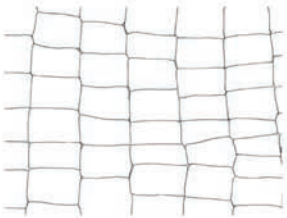
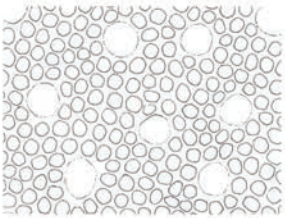
SCALATION IN LIZARDS

Pointed and keeled
(Western Fence Lizard)

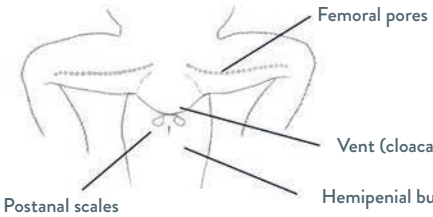
Cycloid
(Western Skink)



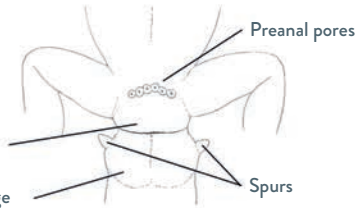
Square
(Island Night Lizard)



Granular with enlarged tubercles
(Switak's Banded Gecko)

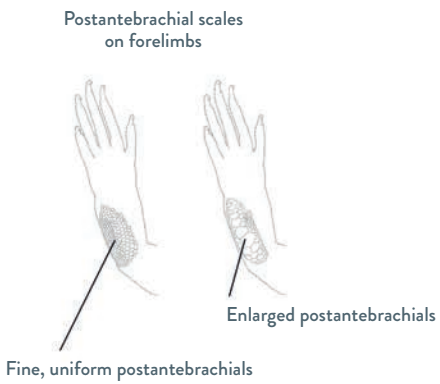


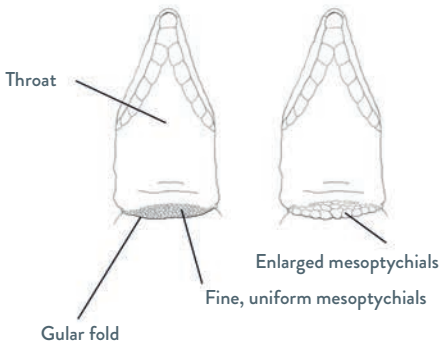
Colorado Desert Fringe-toed Lizard



Western Banded Gecko

Scales in Whiptails (*Aspidoscelis*)





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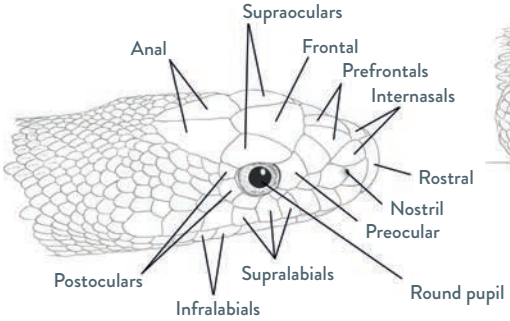
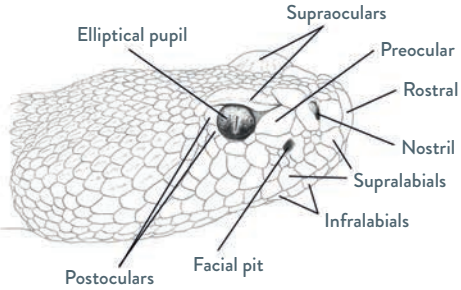
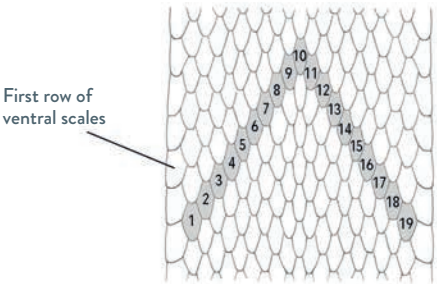
SCALATION IN SNAKES



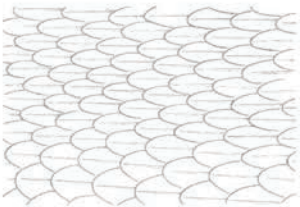
Gophersnake



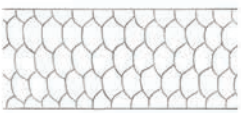
Northern Pacific Rattlesnake



Dorsal scale row count

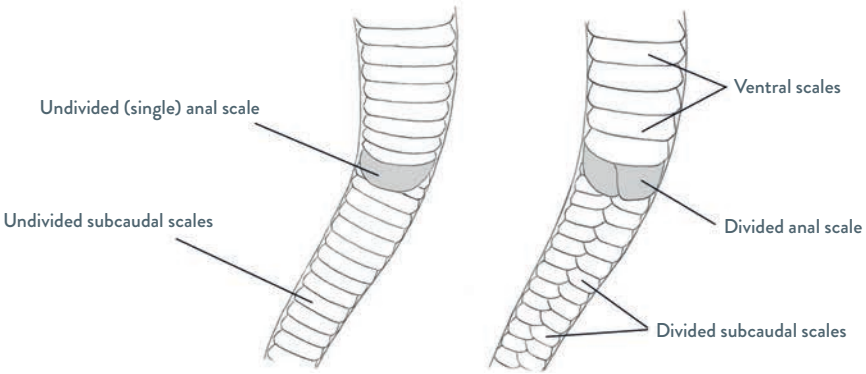


Keeled dorsal scales
(Southern Pacific Rattlesnake)



Cycloid ventral scales
(Western Threadsnake)

Smooth dorsal scales
(California Kingsnake)



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SPECIES ACCOUNTS

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ORDER **CAUDATA—*SALAMANDERS***

FAMILY **Ambystomatidae—*Mole Salamanders***

CALIFORNIA TIGER SALAMANDER—*Ambystoma californiense* Gray, 1853 ENDEMIC

Map p. 430, Plate p. 234

IDENTIFICATION A medium-sized, stocky terrestrial salamander, with rounded snout, protuberant eyes, and variable pattern of white, cream, or yellow ovals or bars on a black background. Venter uniformly pale, gray, or a mosaic of dark gray and white or yellow. Ground color of some adults in isolated Sonoma Co. population is chocolate brown. Tubercles on underside of feet. Maximum size 9.4 in./240 mm TL; males attain larger average size than females and have longer tail. In breeding season, males develop swollen cloaca as well as fins on dorsal and ventral aspects of tail. **SIMILAR SPECIES** Unlikely to be confused with other species over most of its range. Co-occurs with Long-toed Salamander (*Ambystoma macrodactylum*) in a small area along Central Coast, in Monterey and Santa Cruz counties. but has a much larger adult size and different dorsal pattern. Non-native Western Tiger Salamander (*Ambystoma mavortium*), notably in northern Salinas Valley (Monterey Co.), hybridizes with *A. californiense.* Hybrids have also been detected at many other locations in central Coast Ranges, as well as on east side of San Joaquin Valley (Merced Co.). Although *A. mavortium* is readily distinguished from our native form by its size and markings, hybrids can resemble either parent species. **HABITAT** Grasslands (historical California Prairie), often gently rolling terrain underlain by clay soils that support formation of vernal pools in the rainy season. Also foothills of Sierra Nevada and Coast Ranges, where scattered oaks dot the landscape. At coastal sites in Monterey and Santa Cruz counties, it occupies grasslands and bordering forests dominated by Coast Live Oak. Local distribution is centered on complexes of vernal pools, with nearby uplands containing numerous active ground squirrel or pocket gopher burrows, critical refugia in the dry season. **RANGE/ELEVATION** Central Valley, from Sacramento and Yolo counties through Coast Range foothills and valleys to San Luis Obispo and Kern counties (Temblor Range); along east side of San Joaquin Valley and Sierra Nevada foothills to northwestern Tulare Co. Isolated range segments in Sonoma and Santa Barbara counties. Old and questionable northernmost record for Gray Lodge Wildlife Area, southwestern Butte Co., now apparently extirpated. Elevational range from just above sea level to 1680 ft/512 m, in Sierra Nevada (near Yokuts Valley, Fresno Co.), and to 3618 ft/1103 m, at Ohlone Regional Wilderness, Alameda Co. **ACTIVITY/BEHAVIOR** Emerges from underground retreats following first significant rain in fall or winter. Adults may be seen crossing roads on rainy nights from September to April, occasionally turning up in residential garages or swimming pools. Movement to breeding ponds often is confined to a few nights, with males arriving first, where they remain for 6–8 weeks; females arrive later and remain for 1–2 weeks. Aestivates during dry months, in small mammal burrows. On summer nights, juveniles may be seen moving across dry terrain in search of rodent burrow shelters. Dorsal pattern of scattered spots on a dark background is cryptic during periods of nocturnal movement. Defensive responses consist of body coiling, elevating tail to cover head, and noxious skin secretions from tail glands. **DIET** Aquatic larvae are suction feeders, capturing small invertebrates; late-stage larvae feed on aquatic crustaceans (tadpole shrimp) and tadpoles of Pacific Chorus Frog, Western Spadefoot, and Western Toad. Adult and post-metamorphic salamanders capture both aquatic and terrestrial prey, including insects (water boatmen, beetles, moth larvae, camel crickets, craneflies), tadpole shrimp, spiders, centipedes, and earthworms. **REPRODUCTION** Breeds from November to April (depending on local rainfall patterns) in temporary pools and stock ponds that are inundated in rainy season, less often in permanent fishless ponds or quiet side pools of seasonal creeks. There may be no reproduction in drought years when ponds fail to fill. During underwater courtship, male deposits a spermatophore on pond bottom, which is then picked up by female's cloaca. Females produce 400–1340 eggs per season, deposited singly (less often in groups of 2–5) on submerged vegetation (grass, twigs, or stiff leaves) or directly on substrate, usually

(continued...)

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Page numbers in **bold** indicate first page of species account; those in *italics* refer to larval account; those in red refer to color plate(s).

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