

CALIFORNIA PLANT COMMUNITIES

A plant community is a repeatable grouping of plants which are obvious and easily identifiable: they include dominants such as grasses, shrubs, or trees depending upon climate, soils, and biotic factors. In nature, these three kinds of factors--climate, soil, and biotic factors--usually determine which plant community we see.

CLIMATIC FACTORS

Climatic factors include the mixture of precipitation, temperature, wind, and fire. Our major climate type in California's foothills is Mediterranean: winters mild and wet; summers hot and dry. The interaction of this unusual combination of moisture and temperature results in the many special adaptations we see in California's chaparral, oak woodlands, grasslands, and more.

The immediate coast experiences a modified Mediterranean climate in which we have cool, damp summers

mitigated by heavy fogs. Such a climatic mix allows development of coastal plant communities, including closed-cone pine forest, redwood forest, and coastal scrub.

The higher mountains show a montane climate, in which cold, snowy winters predominate. The growing season shifts to later in the year and is much shorter than for Mediterranean climates; late spring, summer, and early fall are usually snow-free and warm enough to allow plant growth. Occasional summer thunderstorms add additional precipitation then. Plant communities include montane coniferous forests, meadows, montane chaparral, and alpine fellfields.

California's deserts experience yet another climate: there, precipitation is less than 10 inches annually. Precipitation may be scattered through winter and early spring in the Mojave but also occurs as occasional cloudbursts in summer in the Colorado desert. Winter temperatures vary from very cold for high deserts to mild and warm for low deserts, but summers are always very hot. Desert communities include creosote bush scrub, shadscale scrub, Joshua tree woodland, pinyon-juniper woodland, and sagebrush scrub.

SOILS

Soils and slope constitute the edaphic factors. Direction of slope--north or south, east or west--determines how much summer sun plants receive, which in turn determines how fast plants use up water. North slopes remain much cooler and wetter than south slopes.

Soils greatly influence vegetation. Depth of soil, soil pH, soil nutrients, and soil texture are all important. Generally the coarser the soil texture, the less water retention and lower the nutrient value. Clay soils have very dense soil texture and retain water well, with high availability of nutrients, but allow very little oxygen exchange.

Soil pH--the measure of acidity, neutrality, or alkalinity—is important to plant nutrition. Acid soils are low in nitrogen and eliminate many plants that way. Alkaline soils are low in other nutrients and toxically high in salts, eliminating most other plants. Certain plant communities are characterized by particularly acid soils--bogs and conifer forests, for example, whereas other plant communities are typified by alkaline soils, such as coastal salt marsh and shadscale scrub.

Soils derived from special kinds of parent materials (rocks) are also noteworthy for their unusual vegetation--particularly, serpentinite and limestone derived soils.

BIOTIC FACTORS

Finally, the factors involving interactions between plants and plants or plants and animals are important in shaping vegetation. Many fascinating examples illustrate this. Some factors include mutually beneficial relationships, such as those between certain soil fungi and plant roots. Such mycorrhizal associations benefit the plant by allowing passage of mineral nutrients from fungus to root and benefit the fungus by feeding it sugars from plant roots.

Pollination and seed dispersal, already commented on, are two all-important processes that depend on interactions between plants and animals in many communities. Riparian trees depend, for the most part, on wind for these processes, whereas redwood forest herbs often depend on ants and birds for seed dispersal.

Many interactions are also negative; many chaparral and desert shrubs carry on allelopathy or chemical warfare with their neighbors to eliminate competition for water. Plants are also constantly defending themselves against insects browsers and mammal grazers. All of these interactions, and many more, help shape the kinds of vegetation found in any one place.

COASTAL PLANT COMMUNITIES

Although the Regional Parks Botanic Garden features geographic regions, within these regions are several plant communities. Many geographical sections are planted according to local versions of plant communities there.

Below are several typical coastal plant communities familiar to nature lovers of the Bay Area.

COASTAL STRAND is a plant community represented by the beaches and sand dunes along the coast. Strong winds, mild temperatures, summer fog, and sandy soil are among the most important factors. Plants here are adapted to wind and sand by growing close to the ground, having succulent or fuzzy leaves, and long taproots or other underground storage devices. Brightly colored flowers may appear throughout the year. Typical plants include native dune ryegrass (*Elymus mollis*), sea rocket (*Cakile* spp.), sand verbena (*Abronia* spp.), dune bursage (*Ambrosia chamissonis*), dune sun cups (*Camissonia cheiranthifolia*), dune tansy (*Tanacetum* spp.), coast buckwheat (*Eriogonum latifolium*), mock heather (*Haplopappus ericoides*), dune sagebrush (*Artemisia pycnocephala*), and wallflowers (*Erysimum* spp.).

COASTAL PRAIRIE AND VALLEY GRASSLAND

Both communities once represented true native grasslands in lowland California; the former along the coast, the latter inland. Deep soils, hot to cool dry summers, and gently rolling topography characterize these communities. Both once were dominated by varied species of perennial bunchgrasses rather than the annual green-to-brown grasses we mostly see today. The Regional Parks Botanic Garden is an excellent place to see important grass genera, including bluegrass (*Poa*), native rye grass (*Elymus*), needle grass (*Stipa* or *Nassella*), native oat grass (*Danthonia*), June grass (*Koeleria*), reedgrass (*Calamagrostis*), and numerous others.

Grasslands are famed for their displays of annual, perennial, and bulbous spring wildflowers; summer-hot areas favor a greater proportion of annuals, while summer-cool areas have many perennials. Genera here are almost too numerous to mention; important ones include: Annuals--clarkias, wallflowers, gillias, linanthuses, goldfields, poppies (*Eschscholzia*), tidy-tips, collomias, and lupines; Perennials--shooting stars (*Dodecatheon*), penstemons, sun cups (*Camissonia ovata*), blue-eyed grass (*Sisyrinchium*), checkerbloom (*Sidalcea*), and irises; Bulbs--brodiaeas (and their relatives triteleias and dichelostemmas), wild onions (*Allium*), mariposa tulips (*Calochortus*), star lilies (*Zygadenus*), soapplant, and fritillarias.

RIPARIAN WOODLAND

This special woodland consists of trees that are deciduous, winter dormant, and water wasteful because they border permanent floodplains and streambanks. Factors here include permanently high water tables; temperatures and growing seasons that vary widely according to elevation and latitude; and silty to sandy soils. Trees typical of such forests include alders (*Alnus*), bigleaf maple (*Acer macrophyllum*), box elder (*Acer negundo*), water birch (*Betula occidentalis*), aspen (*Populus tremuloides*), sycamore (*Platanus racemosa*), cottonwoods (*Populus* spp.), native

walnut (*Juglans hindsii*), ashes (*Fraxinus* spp.), and willows (*Salix*). Prominent adaptations in such trees are wind pollination and wind dispersal of seeds. Understory shrubs include snowberry, wild rose, squaw bush (*Rhus trilobata*), wild grape, and ninebark (*Physocarpus capitatus*).

COASTAL BLUFFS AND OTHER ROCK OUTCROPPINGS

Actually such topographical features create special "islands" within many different climates. Three climate regimes where rock outcroppings are common include coastal bluffs (mild temperatures, strong winds, foggy summers); foothill cliffs (hot dry summers, cool to cold winters); and alpine rockfields (short growing season, very cold winters, strong winds). All three share the rapid drainage and lack well developed soil. Rock islands at the Regional Parks Botanic Garden represent plants from such habitats. Of these, plants from coastal bluffs and foothill cliffs do best. Genera prominent in these habitats include stonecrops (*Sedum*), dudleyas, rock ferns (*Pentagramma*, *Pellaea*, *Cheilanthes*), lewisias, penstemons, and wild buckwheats (*Eriogonum*). Adaptations include flat rosettes of leaves, taproots, and fleshy or hairy leaves.

CHAPARRAL

This term actually covers several communities including a montane version and a coastal version (more _____ correctly, the coastal kinds are called coastal scrub or coastal sage). Factors for this shrubby community include poor, rocky soils, cool to very hot dry summers, intermittent fires, and mostly long winter/spring growing seasons. Adaptations include deeply penetrating roots, hard or small leaves to reduce water loss and, often, aromatic oils to protect against animal browsing and carry on chemical warfare with neighboring plants. We have a fine collection of shrubs typical of chaparral communities, including wild lilacs and deerbrushes (*Ceanothus* spp.), bush poppy (*Dendromecon rigida*), coffee berry (*Rhamnus californica*), poison oak (*Toxicodendron diversilobum*), bush monkeyflowers (*Diplacus* spp.), manzanitas (*Arctostaphylos* spp.), sugar bush and laurel sumac (*Rhus ovata* and *Malosma laurina*), silk-tassel bush (*Garrya elliptica*), and flannelbush (*Fremontodendron* spp.). Flowers occur in bursts of color at various times of the year; most species have evergreen leaves.

SALT MARSHES

Salt marshes are defined by the tidal backup that occurs periodically from incursions of the sea. Although soils are often saturated with water, the high salinity may actually be a detriment, drawing water from plant cells and causing their desiccation. Salt marsh plants adapt by pumping water in against the normal gradient, concentrating extra salts inside their cells, or actively excreting salt in the form of crystals. In addition, marshy soils are low in oxygen, so plants need to have air channels to their roots to supply the needed oxygen.

Because salt marsh conditions are so difficult, only a small number of plants have adapted to this environment. Major dominants include pickleweed (*Salicornia* spp.), sea blite (*Suaeda californica*), goosefoots (*Chenopodium* and *Atriplex* spp.), marsh rosemary (*Limonium californicum*), alkali heath (*Frankenia* spp.), salt grass (*Distichlis spicata*), cord grass (*Spartinafoliolosa*), and a few others.

CLOSED-CONE PINE FORESTS

These dense forests include relict species of pines and cypresses that survive on rocky, nutrient poor soils that occur on coastal promontories that receive heavy summer fogs. Both pines and cypresses are characterized by cones that remain tightly attached to branches and closed until fire opens them. The soils created here are acid and support an acid-loving understory where sufficient precipitation permits, mainly ferns, lichens, and members of the heather family *Ericaceae* and lily family *Liliaceae*.

Each area has its own unique mixture of conifers, including Monterey pine (*Pinus radiata*), bishop pine (*Pinus muricata*), beach pine (*Pinus contorta*), and various cypresses (genus *Cupressus*). Extreme forms of this forest, where soils have developed a hardpan and have been leached of most nutrients, are called pygmy forests because of the stunted trees.

REDWOOD FOREST

Coast redwoods thrive best on flood plains within the summer fog belt and don't occur where winters receive much snow. Although extensive logging has eliminated most of the original stands, we have protected a few virgin redwood forests; many others are second- or even third-growth forests that are recovering from earlier logging.

Coast redwoods create very shady; damp, acid conditions, limiting the understory, although associated plants are much more varied in the more open second-growth forests, along road and stream corridors, or where redwoods are mixed with shorter trees, such as tanbark oak (*Lithocarpus densiflorus*), California bay laurel (*Umbellularia californica*), madrone (*Arbutus menziesii*), or Douglas fir (*Pseudotsuga menziesii*).

MIXED-EVERGREEN FOREST

Inland from redwood forests or upslope from them, there occur mixtures of evergreen trees. The exact composition of such forests depends on past fire history, the extent to summer fog, the angle of the slope, and the latitude, so that there are diverse forms of this forest. Typically, Douglas fir, madrone, California bay laurel, tanbark oak, various live oaks (coast live, canyon live), California nutmeg form the framework for this forest, but seldom do more than two to five kinds occur together.

The understory here also is diverse, according to the amount of available moisture, the degree of openness or density of trees, and the summer temperatures. Many shrubs and herbaceous plants are associated with these forests.

OAK WOODLANDS

Inland from mixed-evergreen forest, often as far as the foothills surrounding the Central Valley, oak woodlands represent an even drier phase of wooded places. Oaks may form a nearly continuous canopy on north-facing slopes or be scattered among grasses on the hottest, driest slopes. Oak woodlands comprise diverse species of oaks, including blue oak (*Quercus douglasii*), valley oak (*Q. lobata*), California black oak (*Q. kelloggii*), canyon live oak (*Q. chrysolepis*), coast live oak (*Q. agrifolia*), Oregon oak (*Q. garryana*), and interior live oak (*Q. wislizenii*). Seldom are there more than two or three kinds of oaks in any one place. Often mingled with oaks will be California buckeye (*Aesculus californica*) and gray pine (*Pinus sabiniana*).

Oak woodlands are home to many associated shrubs and herbs, including broad swaths of annual wildflowers where trees are widely spaced.