



CMG GardenNotes #511

# Colorado Plant Ecosystems

---

Outline: Plant ecosystems, page 1  
Grassland/semi-desert shrublands, page 2  
Foothills, page 2  
Montane, page 3  
Sub-alpine, page 3  
Alpine, page 3  
Special considerations, page 3

---

## Plant Zone Ecosystems

Colorado is defined by its topography and climate. Natural settings are described in terms of ecosystems, which are localized areas where non-living and living components interact. These interactions result in communities of organisms influenced by variations in the factors needed for survival. In the case of plant communities, factors such as light, temperature, soil, slope and exposure influence which species are found in particular locations. The study of natural plant communities can offer hints to gardeners about local conditions and the plant species that may thrive in landscapes with characteristics similar to the natural setting.

Ecosystems in Colorado are named for the region, soil type and plant species of an area. Broad ecosystem descriptions include grassland, shrubland, coniferous forest and alpine, defined by elevation and plant type. These broad categories can be further defined by the specific location and dominant plant type; examples include Subalpine Engelmann spruce forest, Colorado Plateau Pinyon-Juniper woodland and Foothill grassland. Within each ecosystem, microclimates are created by variations in site conditions. The plant community on a south facing slope will differ from that found on a north facing slope, even when elevation and soil conditions are similar.

The details of Colorado ecosystems and plant communities change as more is learned about how species interact and how communities react to natural processes. The Colorado landscape is most often divided into five vegetation zones, based primarily on elevation. Within these distinct vegetation zones, the overall climate is relatively uniform. Microclimates result in plant communities that may be unique or a variation on the overall theme.

The five vegetation zones of Colorado are grassland/semidesert shrubland, foothills, montane, subalpine and alpine. Each vegetation zone is named for the dominant woody species (grasslands are the exception), but each zone has herbaceous plants that thrive under the same conditions as the woody backbone of the landscape.

### **Grasslands/Semi-desert Shrublands**

The lowest elevations in Colorado are found on the eastern plains, the western slope and in the San Luis Valley. But elevation alone cannot define these areas, since the variation in soil and weather patterns result in different vegetative communities. The plains of the eastern third of Colorado are dominated by grass species while the western slope and the San Luis Valley are more commonly dominated by native shrub species.

Plains grasslands cover the eastern third of Colorado (up to 6,000 feet) and are made up of primarily short-grass species. The climate is hot in the summer and highly variable in winter. Summer thunderstorms and winter blizzards, which provide up to 16 inches of moisture annually, can be sudden and violent. Wind driven fires played a role in development of this ecosystem. Agriculture and urban sprawl have impacted the health of prairies and few areas in Colorado retain a truly native ecosystem.

Semi-desert shrublands extend to 7,000 feet on the western slope, to 8,000 feet in the San Luis valley, and east of the Continental Divide from the Arkansas River basin to New Mexico. Plants here are low growing, drought tolerant, deciduous shrubs. Diversity tends to be low in comparison with grasslands, due primarily to lower annual precipitation and colder winters. Soils are variable but are often alkaline with poor water infiltration and high runoff.

### **Foothills**

The foothills zone is the transition from the grassland/semi-desert shrublands of the lower elevations to the coniferous forests found in the montane zone. This ecosystem is dominated by deciduous shrub communities and Piñon-Juniper woodlands. Shrublands are dominated by Gambel oak, Mountain mahogany and Sagebrush. The species that make up the Piñon-juniper community are conifers that can grow at low elevation under similar conditions to those found in mountain shrublands.

Plant species native to this ecosystem generally have extensive lateral root systems to maximize water uptake and leaves with waxy coatings or hairs to reduce water loss during the growing season. The deciduous growth habit found in the shrublands helps reduce winter water loss.

Foothills plant communities thrive on south facing slopes, which are hot in summer and have winter conditions are moderated by solar heating. Competition between plant species in the shrublands is high, primarily due to intermittent precipitation.

This ecosystem is most commonly found from 5,500 feet to 8,000 feet, but some plant communities may reach as high as 10,000 feet on the western slope. Gambel

oak dominates many south facing slopes but is most common south of I-70 on the Front Range. Mountain mahogany, which appears to tolerate slightly colder temperature than Gambel oak, is more dominant north of I-70. On the western slope, Gambel oak and sagebrush species dominate the shrublands.

Piñon-Juniper woodlands are found throughout western and southern Colorado. The proportion of Piñon pine to junipers changes according to the elevation and climate conditions of a site. Populations range from almost exclusively one species of juniper to a mix of pine and one or more juniper species.

### **Montane**

The montane ecosystem ranges from 8,000 to 10,000 feet and is dominated by pines, Douglas-fir and aspen. Ponderosa pine, which can be found growing in the adjoining Foothills ecosystem as low as 5,600 feet, is more common on dry, south facing slopes east of the Continental Divide and in the southwestern portion of Colorado. On north facing slopes, moist areas and in northwest Colorado, Douglas-fir is the dominant plant. Lodgepole pine and aspen are common at the upper elevations of the montane.

Ponderosa pine and Douglas-fir are tolerant of mid-elevation conditions, including a longer growing season than at higher elevation, warm summers, cold winters, and intermittent summer moisture. The understory community is dependent on the amount of light and moisture available. Ponderosa pine forests tend to be more open than Douglas-fir and have greater understory diversity. Douglas-fir tends to naturally grow closer together, which restricts the growth of most other plants. Aspen are found throughout the montane ecosystem in microclimates that receive 25 or more inches of moisture annually and are cooler than sites in lower elevation ecosystems.

### **Subalpine**

Englemann spruce, subalpine fir, limber pine and bristlecone pine are common inhabitants of the subalpine ecosystem. The zone ranges from 9,500 to 11,400 feet and is characterized by a short growing season, high snowfall and cold temperatures, and locally strong winds.

### **Alpine**

The alpine zone exists at elevations above treeline throughout the Rocky Mountains. Treeline ranges from 11,200 feet in northern Colorado to around 12,000 feet in southern Colorado. Herbaceous plants and low growing woody shrubs frequent this harsh environment. Successful species must complete growth and reproduction in the short growing season available and withstand strong winds and intense sunlight.

### **Special considerations**

The ecosystem that a particular plant species inhabits is a function of the many environmental conditions of a site. Plants thrive in specific areas because conditions allow them to outcompete or coexist with other species. Plant communities are adapted to specific conditions, including sun or shade, wet or dry

and long or short growing season. Many plant species are adapted to survive drought, wind or fire. In addition, plants must be able to reproduce successfully; each species has specific conditions for germination and seedling growth.

There are rarely clear dividing lines between ecosystems. The edges of individual ecosystems intermingle in transition zones, with grassland species growing among Ponderosa pines and stands of subalpine fir surrounded by alpine wildflowers.

In any of the above ecosystems, areas exist that are dominated by herbaceous species. These can be small openings in the forest, large meadows or areas where fire has destroyed the woody plants and the process of ecological succession has begun. These areas will contain plant species that favor conditions of that site and will vary according to soil, moisture, sun and length of growing season.

All ecosystems have areas into which water drains. The edges of lakes, ponds, streams and rivers are referred to generally as riparian areas and are further defined by the ecosystem where they are found. The plant species found within these narrow bands differ by elevation, but are dominated by plants that prefer high moisture levels or tolerate being partially submerged during high runoff. Cottonwoods, willows, alders, plums, poison ivy, cattails and tall-grass species are common in these moist areas.

Riparian areas tend to have high levels of plant diversity and are often home to plant species more common to the eastern plains or to adjoining ecosystems. Water courses are heavily used by native animals, agriculture and for recreation and are impacted by seasonal flooding and drought as well as human activities.

Colorado gardeners can use published information about local native plant communities to plan successful landscapes. Conditions in an individual yard have much in common with the surrounding natural setting, sharing similar soil, precipitation, length of growing season and light intensity. By studying the characteristics of plants that thrive in a specific area, gardeners can make wise choices for their personal landscape.

---

Authors: Linda McMulkin, with Laurel Potts, Darrin Parmenter, Irene Shonle, and David Whiting, Colorado State University Extension

- Colorado Master Gardener *GardenNotes* are available online at [www.cmg.colostate.edu](http://www.cmg.colostate.edu).
- Colorado Master Gardener training is made possible, in part, by a grant from the *Colorado Garden Show, Inc.*
- Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.
- Extension programs are available to all without discrimination.
- No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.
- Copyright Colorado State University Extension. All Rights Reserved. *CMG GardenNotes* may be reproduced, without change or additions, for nonprofit educational use with attribution.

Revised August 2010