**Flora of the San Luis Valley**

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in:  
*San Luis Basin (Colorado), James, H. L.; [ed.], New Mexico Geological Society 22nd Annual Fall Field Conference Guidebook, 340 p. [https://doi.org/10.56577/FFC-22](https://doi.org/10.56577/FFC-22)*

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*This is one of many related papers that were included in the 1971 NMGS Fall Field Conference Guidebook.*

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FLORA OF THE SAN LUIS VALLEY

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The Rocky Mountains in southern Colorado present a broad spectrum of vegetation types ranging from dry grasslands to moist spruce-fir forests. Where the different types of vegetation are found depends upon the environment and how it effects the plants by satisfying requirements or by exceeding the tolerances of the plants.

All species of plants have distinctive ranges of distribution which coincide with and which are controlled by patterns of the environment. The ranges of plants overlap in various combinations, usually in fairly constant associations which are called plant communities. These plant communities, composed of reasonably constant plant associations, are named for the dominant species in each community. Dominant species are the most obvious and abundant plants in the community. For example, ponderosa pine forests are dominated by ponderosa pines, but in this community type there are dozens of other plants which are overlooked due to small size or lack of abundance. In this paper we will consider the distribution of plant communities in the San Luis Valley as they relate to environment and as they can be identified by the dominant species. (Appendix 1 is a taxonomic key for the identification of the specific plants listed below.)

The distribution, or zonation, of plant communities is most obviously related to altitude, especially where the gradient is steep as in the Sangre de Cristo Mountains. (NOTE: There have been other, perhaps more familiar, schemes proposed for the naming of vegetation. Some of these different schemes are compared in Table 1). Of many environmental factors which change with altitude, two might be singled out as more important than others: (1) Temperatures decrease with altitude. (2) At higher altitudes there is more water available because of increased precipitation (annual precipitation at Alamosa is seven inches, while that at Wolf Creek Pass is over forty inches), and a decrease in the evaporative power of the air because of increasing relative humidities.

GREASEWOOD: Commonly called “chico” in the San Luis Valley, greasewood (Sarcobatus vermiculatus) is a low shrub which is adapted to areas where drainage is poor and where high concentrations of salt in the soil are common.

RABBITBRUSH: Several varieties of Chrysothamnus nauseosus are found on the valley floor. The distribution of the varieties is related to elevation and depth to water-table. Toward the lower parts of the valley, this small, greenish shrub is found intermingled with the greasewood in communities where the two plants are dominant, but away from the center of the valley the rabbitbrush becomes dominant.

GRASSLAND-SHRUB STEPPE: The grassland which originally occupied the region between the rabbitbrush type and the pihon-juniper woodland has been severely overgrazed. As a consequence, the original grasses have been replaced by several types of low-growing woody plants which include several types of rabbitbrush and other shrubs.

SAGEBRUSH: Probably because of slightly greater amounts of snow in the eastern parts of the valley, sage-

<table>
<thead>
<tr>
<th>COMMUNITY TYPE</th>
<th>ALTITUDINAL DISTRIBUTION (ft. above sea level X 1000)</th>
<th>BAILEY (1913)</th>
<th>RAMALEY (1942)</th>
<th>MARR (1964)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tundra</td>
<td>11.5–14</td>
<td>Arctic-alpine</td>
<td>Not mentioned</td>
<td>Alpine tundra</td>
</tr>
<tr>
<td>Spruce-fir</td>
<td>10.5–12.5</td>
<td>Hudsonian</td>
<td>Coniferous forest Subalpine</td>
<td></td>
</tr>
<tr>
<td>Lodgepole pine</td>
<td>9.5–11</td>
<td>Transition</td>
<td>Coniferous forest Subalpine</td>
<td></td>
</tr>
<tr>
<td>Mixed Conifer</td>
<td>8–11</td>
<td>Transition</td>
<td>Coniferous forest Coniferous forest</td>
<td></td>
</tr>
<tr>
<td>Douglas fir</td>
<td>8–10.5</td>
<td>Transition</td>
<td>Coniferous forest Coniferous forest</td>
<td></td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>8.5–10</td>
<td>Transition</td>
<td>Coniferous forest Coniferous forest</td>
<td></td>
</tr>
<tr>
<td>Pithon-juniper</td>
<td>8.5–9.5</td>
<td>Upper Sonoran</td>
<td>Coniferous forest Upper montane</td>
<td></td>
</tr>
<tr>
<td>Sagebrush</td>
<td>8–9</td>
<td>Transition</td>
<td>Coniferous forest Upper montane</td>
<td></td>
</tr>
<tr>
<td>Scrub-oak</td>
<td>8–9</td>
<td>Upper Sonoran</td>
<td>Coniferous forest Lower montane</td>
<td></td>
</tr>
<tr>
<td>Grassland-shrub-steppe</td>
<td>7.7–8.5</td>
<td>Upper Sonoran</td>
<td>Greasewood scrub Plains grassland</td>
<td></td>
</tr>
<tr>
<td>Rabbitbrush</td>
<td>7.5–9</td>
<td>Upper Sonoran</td>
<td>Greasewood scrub Plains grassland</td>
<td></td>
</tr>
<tr>
<td>Greasewood</td>
<td>7.5–8</td>
<td>Lower Sonoran</td>
<td>Greasewood scrub Plains grassland</td>
<td></td>
</tr>
<tr>
<td>Aspen</td>
<td>8–11.5</td>
<td>Canadian</td>
<td>Aspen groves</td>
<td>Subalpine</td>
</tr>
<tr>
<td>Limber-Bristle-cone pine</td>
<td>8–12.5</td>
<td>Canadian</td>
<td>Coniferous forest Upper montane</td>
<td></td>
</tr>
<tr>
<td>Willow-cottonwood</td>
<td>7.5–11</td>
<td>Upper Sonoran</td>
<td>Stream-valley</td>
<td>Lower montane</td>
</tr>
</tbody>
</table>
brush (Artemisia tridentata) replaces the dried shrub-steppe vegetation. South of Mount Blanca, sagebrush forms extensive stands below the piñon-juniper woodland. Soils in the sagebrush type are deep and fine textured and are very productive when cultivated.

SCRUB OAK: In the northern end of the valley, Quercus gambelii, a shrub 6 to 12 feet high, is found just below the piñon-juniper woodland. Dense stands of scrub oak are associated with rich soils and are frequently mixed with sagebrush.

PIÑON-JUNIPER: The woodland vegetation type is dominated by the piñon (Pinus edulis) and by either Rocky Mountain Juniper (Juniperus scopulorum) or one-seed juniper (Juniperus monosperma). All are small shrub-like trees seldom exceeding 20 feet in height. Soils in this vegetation type are rocky and well drained and support little except the piñon and juniper. Along water courses and on north-facing hillsides occasional stands of ponderosa pine and Douglas fir occur.

PONDEROSA PINE: Lying above and intermingled with the piñon-juniper type is the ponderosa pine vegetation type (Pinus ponderosa). These tall (up to 100 feet), open-spaced pines are found throughout the Southwest and are often logged. In topographic situations which allow for greater amounts of soil moisture, the Douglas fir or mixed-conifer type of vegetation will replace the ponderosa pine.

DOUGLAS FIR: When compared with the same species in the Pacific Northwest, Douglas firs (Pseudotsuga menziesii) in the southern Rocky Mountains are small (rarely over 2 feet in diameter or 70 feet in height). In the San Luis Valley these trees are found in pure stands above the ponderosa pine type and on north-facing slopes from 8,000 to 11,000 feet altitude.

MIXED-CONIFER: The mixed-conifer vegetation type is frequently found in a narrow, ill-defined band just above ponderosa pine, and in the ponderosa pine type along water courses on cool, shaded hillsides along the canyons. This type is composed of several trees which include aspen (Populus tremuloides), white fir (Abies concolor), Douglas fir, and Colorado Blue Spruce (Picea pungens).

SUBALPINE SPRUCE-FIR: The subalpine spruce (Picea engelmannii) and subalpine fir (Abies lasiocarpa) form the highest forest type in the Rockies. These trees, reaching heights of 100 feet, are shaped like tall pyramids and gradually become more and more stunted toward timberline. The spruce makes good lumber and most of the logging in the San Luis Valley is in this high altitude forest type.

TUNDRA: The alpine tundra is found above timberline where all vegetation is characteristically long-growing. Dwarf willows and other shrubs dominate parts of the tundra while grasses, sedges, and other herbaceous plants dominate others. Soils in the tundra are unstable because they contain abundant water and because of frequent freeze-thaw cycles. Consequently only those plants adapted to moving soil are successful in many areas. Also, constant strong winds in the tundra dry and kill the foliage of exposed plants, they carry snow and other materials which abrade the plants, and they move the snow about so that plants on windswept ridges receive little moisture.
Bluebells from snow while plants on leeward slopes receive a great deal.

ASPEN: Aspen groves, found throughout the Rocky Mountains, are the first trees to become established following forest fires and logging. When aspen trees are shaded by invading conifers they are unable to compete and tend to be replaced by the conifers; however, stands of aspen are frequently permanent on sites where there is sufficient moisture. Aspens range altitudinally from below 8,000 feet to timberline. These trees are generally not large and trunks with a diameter of 1 foot or heights of over 50 feet are considered large.

LODGEPOLE PINE: Lodgepole pine (Pinus contorta) is another tree which is successional following fires. Found on La Veta Pass and in the northwest part of the basin, these trees are characterized by having trunks with little taper. (Plains Indians used saplings of this species for their lodgepoles, hence the name). Cones, which remain closed on the trees for many years, release millions of seeds when the heat of fires softens the resins which stick the cone scales together. At lower elevations the lodgepole pine is replaced by ponderosa pine, Douglas fir, or mixed-conifer and at higher altitudes it is replaced by spruce-fir.

LIMBER PINE, BRISTLECONE PINE: Scattered throughout the mountains on rocky, wind-swept ridges are many local stands of limber pine (Pinus flexilis) at low altitudes and bristlecone pine (Pinus aristata) at high altitudes. These trees are small (seldom over 30 feet high), and much-branched. They are not successful except on ridgetops.

COTTONWOOD-WILLOW: At elevations below 11,000 feet, the banks of streams are characteristically occupied by cottonwood (Populus spp.) and willows (Salix spp.). These plants require much water and are restricted to situations where there is ample, shallow water.

COMMON JUNIPER: Although not a dominant in any vegetation type, Juniperus communis is frequently encountered in all types above pinyon-juniper and deserves some mention. This dense, low shrub is common to all mountainous regions and is a distinctive part of many communities.
KEY TO SOME DOMINANT NATIVE TREES AND SHRUBS OF THE SAN LUIS VALLEY

1. Plants evergreen, leaves needle-like, scale-like, or awl-like ......................................................... 2 (conifers)
2. Leaves needle-like, more than ½ inch long .......................................................... 3
3. Leaves awl or scale-like, less than ½ inch long ....................................................... 12 (junipers)
4. Needles fascicled (in groups surrounded by papery sheaths) .......................................... 4 (pines)
5. Needles not fascicled, single .......................................................... 8
6. Needles in groups of 5 (sometimes 4) ........................................................................ 5 (white pines)
7. Needles in groups of 3 (sometimes 2) ........................................................................ 6 (yellow pines)
8. Mature cones long, without bristles ........................................................................... Pinus flexilis (limber pine)
9. Mature cones short, with bristles .............................................................................. Pinus aristata (bristlecone pine)
10. Mature cones closed, top-shaped, less than 2 inches long, remain on tree many years  Pinus contorta (lodgepole pine)
11. Mature cones open, ovoid, more than 2 inches long, fall soon after maturity ................. 7
12. Needles more than 3 inches long ..................................................................................
13. Needles less than 3 inches long ..................................................................................
14. Needles square or diamond-shaped in cross section, sharp-pointed ......................... 9 (spruce)
15. Needles flat in cross section, not sharp-pointed .........................................................
16. Tree growing at high altitude, cone less than 2 inches long ................................................ Picra engelmannii (Engelmann spruce)
17. Tree growing at low altitude, cones more than 2 inches long ........................................... Picra pungens (Colo. Blue Spruce)
18. Buds pointed; cones dry, pendant, with 3-lobed bracts, falling entire ......................... Pseudotsuga menziesii (Douglas fir)
19. Buds round; cones fleshy, upright, falling apart on tree .............................................. 11 (true firs)
20. Leaves more than 1½ inches long; usually found below 11,000 feet ......................... Pinus ponderosa (ponderosa pine)
21. Leaves less than 1 inch long; found above 11,000 feet ................................................... Abies lasiocarpa (subalpine fir)
22. Leaves 4 to 6 times longer than wide ........................................................................... Abies concolor (white fir)
23. Leaves about as long as wide .....................................................................................
24. Buds sticky with resin ..................................................................................................
25. Buds without resin .....................................................................................................
26. Bark not white at base ..............................................................................................
27. Leaves deeply lobed; plants of dry hillsides ................................................................. Quercus gambelli (scrub oak)
28. Leaves shallowly toothed; streamside plants ............................................................. Populus angustifolia (narrowleaf cottonwood)
29. Leaves cyclindrical, succulent; brittle thorns present ................................................ Sarcobatus vermiculatus (greasewood)
30. Leaves flat, not succulent; thorns absent ................................................................. 20
31. Trees, with single trunks generally over 6 inches in diameter .................................... Abies lasiocarpa (subalpine fir)
32. Shrubs, with many small, woody stems ......................................................................
33. Fruits usually with more than 1 seed; branches in flat sprays ........................................ Juniperus communis (common juniper)
34. Fruits with 1 seed; branches not in flat sprays .......................................................... Juniperus scopulorum (Rky. Mt. juniper)
35. Fruits, with single trunks generally over 6 inches in diameter .................................... Abies lasiocarpa (subalpine fir)
36. Leaves deeply lobed, about twice as long as broad ................................................... Quercus gambelli (scrub oak)
37. Leaves not deeply lobed, more than 3 times as long as broad .................................... Salix spp. (willows)
38. Shrubs of streamsides ............................................................................................... Chrysothamnus nauseosus (rabbitbrush)
39. Shrubs of dry areas ..................................................................................................