

Chapter 2. Vegetation of the Upper Gunnison Basin

In the Upper Gunnison Basin, as in many other parts of the Rocky Mountains, vegetation appears different at different elevations. These are called vegetation zones by Rydberg (1917) and

Daubenmire (1943-1944), although some scientists have called them “belts” (Löve 1970). The vegetation zones that are usually used are shown in Figure 2-1 and Table 2-1.

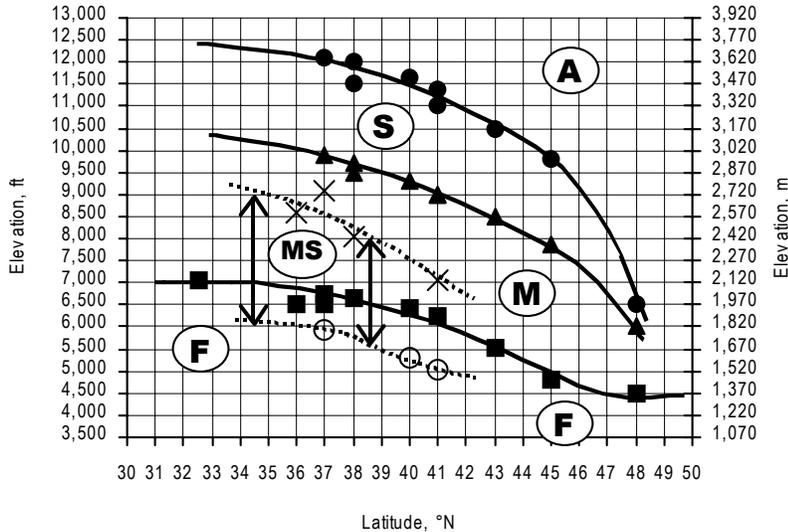


Fig. 2-1. Elevational boundaries between zones in the Rocky Mountains (after Daubenmire 1944, Gregg 1963, Marr 1964, Cronquist and others 1972). A = Alpine Zone, S = Subalpine Zone, M = Montane Zone, F = Foothills Zone. MS = Mountain Shrub. The double arrows show the elevational range of piñon-juniper.

Table 2-1. Life zones and vegetation used by various workers (adapted from a table in Gregg 1963). Plant species names are explained in Appendix A.

Vegetation in the Upper Gunnison Basin	Merriam 1898 Life Zones	Rydberg 1916 Vegetation Zones	Daubenmire 1943a Plant Zones	Harrington 1954 Vegetation Zones	Marr 1967 Zones	This Classification Zones
tundra meadows, grasses, sedges, cushion plants	Arctic-Alpine	Alpine	Alpine	Alpine	Alpine	Alpine
Engelmann spruce, subalpine fir, limber pine, Thurber fescue, meadows, fens, planeleaf & Wolf willows	Hudsonian	Subalpine	Spruce-fir	Spruce-fir	Subalpine	Subalpine
Douglas-fir, lodgepole pine, ponderosa pine, Arizona fescue (south) – Idaho fescue (north), Saskatoon serviceberry, serviceberry & blue willows	Canadian	Montane	Douglas-fir	Douglas-fir and Ponderosa Pine	Upper Montane	Montane
ponderosa pine, blue spruce (uplands)	Transition	Submontane	Ponderosa Pine	Mountain	Lower Montane	Mountain Shrub
canyon forest, oak, Saskatoon-Utah serviceberries, mountain-mahogany, yellow-Geyer-Bebb willows			Oak - Mountain-Mahogany			
Rocky Mtn. juniper, short grasses, yucca, Wyoming big sagebrush, bottomland forest	Upper Sonoran	Upper Sonoran	Piñon-Juniper	Shrub	Plains	Piñon-Juniper
saltbush, greasewood (very little in UGB)	Lower Sonoran	Lower Sonoran	plains or shrub	Piñon-Juniper		
			steppe	Plains and Semi-Desert		Shrub

Table 2-2. Vegetation zones in the Upper Gunnison Basin. Plant species names are explained in Appendix A.

Zone	Dominants	Elevation on north and east slopes, ft	Elevation on south and west slopes, ft	Soil Temperature Regime(s)	Soil Moisture Regime(s)
Alpine	Gravity and freeze-thaw processes, mostly very low herbaceous plants such as curly sedge, alpine avens, tufted hairgrass	>11,800	>12,200 ft	Pergelic, Cryic	Udic
Subalpine	Subalpine fir, Engelmann spruce, aspen, lodgepole pine, Douglas-fir, bristlecone pine, mountain big sagebrush, Thurber fescue, planeleaf and Wolf willows, Idaho fescue	9,700-11,800	10,100-12,300	Cryic	Mostly Udic, some Ustic
Montane	Douglas-fir, ponderosa pine, lodgepole pine, aspen, Arizona fescue, big sagebrush, Saskatoon serviceberry, blue and serviceberry willows	9,100-10,700	9,400-11,100	Frigid	Udic above to Ustic lower
Mountain Shrub	Douglas-fir, big sagebrush, muttongrass, Utah serviceberry, Gambel oak, yellow-Geyer-Bebb willows, narrowleaf cottonwood	7,600-10,100		Frigid	Ustic above to Aridic lower
Piñon-Juniper*	Missing	Missing		Mesic	Aridic (Torrict)
Foothills-Semidesert Shrub	Wyoming big sagebrush, Indian ricegrass, Needle-and-thread, Rocky Mountain juniper, narrowleaf cottonwood	<8,400		Mesic	Aridic (Torrict)

*. Piñon-Juniper is sparsely represented in the Upper Gunnison Basin.

Table 2-2 shows the five elevational zones that are apparent in the Upper Gunnison Basin, based on the elevational distribution of ecological series (Fig. 2-2). All the ecotones (shown as dashed rectangles in Fig. 2-2) are broad and poorly defined. Most zones overlap considerably, except for the well-defined Alpine.

It is difficult to delineate zones accurately on a map of any scale, because the zones overlap broadly, and the ecotones between them are wide and influenced by small changes in microsite and microclimate. In fact, it is probably improper to delineate zones on a map, based on these data.

ALPINE ZONE

The Alpine Zone is the best defined in the UGB, in part because upper treeline provides such a sharp boundary between different climates. The Alpine Zone is not dominated by vegetation, but primarily by the processes of gravity and freeze-thaw. Most of the landscape in the Alpine Zone is dominated by rocks of various kinds on various slopes. Sometimes large slopes of rock will be moving downward, forming a rock glacier (White 1965). Vegetation in the Alpine Zone is all short to very short, mostly below 8 cm (3 in) tall. Vegetation growth and soil formation are slow to very slow processes.

ALPINE-SUBALPINE ECOTONE

We have defined the Alpine – Subalpine ecotone (A in Fig. 2-2) by:

1. The distribution of Series 8b (Krummholz). This belt of wind-formed short trees, which forms the Alpine – Subalpine boundary is broad in some places.
2. The lower extent of Alpine ecological types A3, A5, A7, A13, and A16. These are characteristic

alpine types, dominated by very short vegetation.

3. The upper extent of short-willow series 15, 16, and 17. These short willow ecological types, dominated by such species as planeleaf willow, bareground willow, Wolf willow, and bog birch, are fundamentally subalpine types. In some places, these willow bottoms are located above upper treeline, where they represent an upper extension of the Subalpine Zone.
4. The upper extent of forested series 3 (bristlecone pine) and 8a (fir-spruce tall forests). These are characteristic subalpine types.

SUBALPINE ZONE

In the northern part of the Basin, away from deep rainshadows, the lower line of continuous forest is often formed by a narrow or broad transitional belt of mixed aspen, Douglas-fir, and subalpine fir. There may also be stands dominated by aspen to the exclusion of conifer trees.

In the southern part of the Basin where rainshadow climates are dominant, the lower forest edge is often formed by a narrow to broad transitional belt of mixed-conifer forest, with blue spruce, Douglas-fir, and aspen, sometimes mixed with bristlecone pine on rocky slopes at the forest edge.

Across the whole Upper Gunnison Basin, the belt between the transitional belt below and the upper treeline is usually a broad expanse of conifer forest, of subalpine fir and Engelmann spruce.

Within the Subalpine Zone in the Upper Gunnison Basin, there are openings in the forest of various kinds. There are several large parks – Taylor Park and Waunita Park, for example – where cold air drainage eliminates trees. These parks are dominated by mountain big sagebrush or

fescue grasslands. Within the grasslands, Thurber fescue is often prominent, sometimes with Arizona fescue or Idaho fescue also present. There are also many other, smaller parks and openings with mountain big sagebrush or fescue grasslands. Shallower clay soils may have low sagebrush.

Riparian areas in the lower part of the Subalpine Zone have blue spruce, Engelmann spruce, and thinleaf alder along the coarser, higher-gradient streams. Blue (Drummond) willow, serviceberry willow, and beaked sedge often dominate finer-textured, lower-gradient riparian areas, wet pockets in a slope, or wetlands.

Riparian areas and other wet sites in the upper part of the Subalpine Zone are usually dominated by short shrubs – planeleaf willow, Wolf willow, and bog birch – with water sedge and other wet-site plants. Forested riparian areas are dominated by Engelmann spruce, with or without subalpine fir.

The Subalpine Zone is usually formed of a continuous belt of adjacent stands of conifer forest, dominated by subalpine fir and Engelmann spruce. Other trees in the forest can include bristlecone pine, lodgepole pine, Douglas-fir, or aspen. Within the Subalpine Zone, parks can be large expanses or small openings, often of mountain big sagebrush at lower elevations within the Zone, and Thurber fescue or Idaho fescue grasslands at upper elevations. Riparian areas are either forested with Engelmann spruce, or willow carrs with one or more short (< 1 m tall) willows. Rocky sites can be sparse grassland, sparse shrubland, limber pine or bristlecone pine forest, or unvegetated.

The indicated climatic climaxes for the macroclimate of the Subalpine Zone are:

1. Ecological Type FLO9. Fir-spruce/whortleberry – Cold light-colored soils (ABB12-PIEN/VAMY0), for upper elevations within the Subalpine.
2. Ecological Type GA05. Thurber-Idaho fescues–Deep cold dark soils (FETH/FEID), for upper elevations within the Subalpine.
3. Ecological Type FLO1. Fir-Douglas-fir/pachistima–Moderately cold soils (ABB12-PSME/PAMY), for lower elevations within the Subalpine.
4. Ecological Type SU1. Mountain sagebrush/Thurber-Arizona fescues–Deep cold clay soils (ARTRV/FETH-FEAR2), for lower elevations within the Subalpine.

In the UGB, the lowest line of continuous forest is usually at the lower end of the Subalpine Zone, irregular in shape, and formed by aspen mixed with conifers. The conifer series to which aspen is seral is most typically Series 4 (Douglas-Fir) or Series 7 (Subalpine Fir-Douglas-Fir), but may be any of the following:

- Series 2. Ponderosa Pine
- Series 4. Douglas-Fir
- Series 5. Blue Spruce Uplands
- Series 7. Subalpine Fir-Douglas-Fir
- Series 8a. Subalpine Fir-Engelmann Spruce, Tall

SUBALPINE–MONTANE ECOTONE

We have defined the Subalpine – Montane ecotone (B in Fig. 2-2) by:

1. The lower extent of subalpine series 7 (fir-Douglas-fir), 31 (low sagebrush), 32 (silver sagebrush), and 21 (osha). Series 20 (Thurber fescue) and 30 (mountain sagebrush) were not included because they sometimes occur in cold-drainage bowls at lower elevations.
2. The upper extent of series 25 (serviceberry).

MONTANE ZONE

Between the Mountain Shrub Zone and the lower line of continuous forest lies the Montane Zone. In the UGB it is mostly not forested, but usually dominated by big sagebrush, sometimes with antelope bitterbrush codominant. Ponderosa pine and Douglas-fir do not often form a continuous belt here, as they do in other places, such as the Front Range of northeastern Colorado (Rydberg 1917, Marr 1967). In those areas, the Montane zone is synonymous with the “Ponderosa Pine – Douglas-Fir Zone.” As before, shallow clay soils on the southerly or westerly slopes are usually dominated by black sagebrush. Many riparian areas are now dominated by big sagebrush; in good condition, a variety of tall shrubs such as yellow willow, serviceberry willow, thinleaf alder, Bebb willow, and Geyer willow. Protected areas may have Saskatoon serviceberry or mountain-mahogany.

In the UGB, there is a great deal of overlap between the Montane Zone and the Mountain Shrub Zone. They could be considered the same zone, except that the ecological series usually included in Mountain Shrub extend below the Montane.

There are some places in the UGB where ponderosa pine or Douglas-fir form large stands. Douglas-fir forests often have lodgepole pine or aspen as present dominants.

There is only one indicated climatic climax for the macroclimate of the Montane Zone in the UGB.

1. Ecological Type SS3. Big sagebrush/oatgrass-Arizona fescue–Dark clay soil (ARTR2/DAPA2-FEAR2)

MONTANE–MOUNTAIN SHRUB ECOTONE

We have defined the Montane – Mountain Shrub ecotone (C in Fig. 2-2) by:

1. The lower extent of series 30 (mountain sagebrush), 19 (Arizona fescue), and 14 (blue-serviceberry-booth willows).
2. The upper extent of series 2 (ponderosa pine).

MOUNTAIN SHRUB ZONE

The Mountain Shrub Zone lies between the semidesert shrubs and the Montane Zone. The Mountain Shrub Zone is not continuous in the UGB, as it is in other areas of the Western Slope of Colorado, but occurs as smaller patches and stripes of serviceberry and oak, alternating with “islands” of Douglas-fir forest on steep, north-facing slopes. These patches and stripes often interfinger into the Montane Zone above or the Foothills Zone below.

MOUNTAIN SHRUB–FOOTHILLS-DESERT SHRUB ECOTONE

We have defined the Mountain Shrub – Foothills-Semidesert Shrub ecotone (D in Fig. 2-2) by:

1. The upper extent of series 27 (Wyoming sagebrush).
2. The lower extent of sagebrush series 28 (black sagebrush) and 29 (big sagebrush-bitterbrush). These clearly belong to the Mountain Shrub zone. It is significant that series 25 (serviceberry) does not help in defining this ecotone.
3. The lower extent of series 31 (low sagebrush) 32 (silver sagebrush), 10 (aspen), and 20 (Thurber fescue).

The Foothills-Semidesert Shrub Zone is largely non-forested, although there are islands of Douglas-fir, sometimes mixed with aspen, on some protected upper slopes. This zone is of limited, patchy occurrence in the UGB. It consists of dry benches and windswept ridges in the very bottom of the Basin. Apparently these sites have been dry, in severe rainshadows, and warm for some time, for the soils are usually poorly-developed and Aridic.

Most of the Foothills-Semidesert Shrub Zone is dominated by big sagebrush. Shallow clay soils on the slopes are usually dominated by black sagebrush. Many riparian areas are now dominated by big sagebrush; in good condition, they have narrowleaf cottonwood and a variety of tall shrubs such as thinleaf alder, Bebb willow, and Geyer willow. Protected areas, such as lee (east) sides of ridges may have Utah serviceberry or Gambel oak.

The UGB has very few stands of semidesert shrubs characteristic of other areas of the Western Slope, such as saltbush. The Piñon-Juniper Zone occurs in a very few stands in the UGB, in the far eastern part of the basin in deep rainshadows; it is essentially absent from the basin.



Middle Pauline Creek, a tributary of Cochetopa Creek. August 12, 1992.



From the top of Sapinero Mesa, looking northwest towards Blue Mesa Reservoir, Dillon Pinnacles, Soap Creek inlet, and the West Elk Mountains. The bench between us and the lake is Wyoming big sagebrush in the Foothills-Desert Shrub Zone. The hills beyond the lake show the broad, largely non-forested, sagebrush-dominated Montane Zone with taller shrub stands of the Mountain Shrub zone interfingering. Above that, the more or less continuous forest of the Subalpine Zone, dominated by subalpine fir and Engelmann spruce. On the tops of the mountains is the treeless Alpine Zone. July 29, 1992.



Looking west into Gothic Research Natural Area, northeast of Crested Butte in the Elk Mountains. Fir-spruce forest of the Subalpine Zone in the middleground, the treeless Alpine Zone above that. Planeleaf willow/water sedge riparian wetland in the foreground, about 1 m (3 ft) tall. September 24, 1993.