USDA Natural Resources Conservation Service

# Ecological site F048AY439UT
# Mountain Shallow Loam (Ponderosa pine)

Last updated: 3/05/2024
Accessed: 05/11/2025

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

## MLRA notes

Major Land Resource Area (MLRA): 048A–Southern Rocky Mountains

MLRA 48A makes up about 45,920 square miles (119,000 square kilometers) and is the southern part of the Rocky Mountains. The Southern Rocky Mountains lies east of the Colorado Plateau, south of the Wyoming Basin, west of the Great Plains, and north of the Rio Grande Rift. It is in western and central Colorado, southeastern Wyoming, eastern Utah, and northern New Mexico. The headwaters of major rivers such as the Colorado, Yampa, Arkansas, Rio Grande, North Platte and South Plate rivers are located here. This MLRA has numerous national forests, including the Medicine Bow National Forest in Wyoming; the Routt, Arapaho, Roosevelt, Pike, San Isabel, White River, Gunnison, Grand Mesa, Uncompahgre, Rio Grande, and San Juan National Forests in Colorado; the Carson National Forest and part of the Santa Fe National Forest in New Mexico. Rocky Mountain National Park also is in this MLRA.

MLRA 48A is the southern Rocky Mountains physiographic region. The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. Some high mesas and plateaus are included. It is characterized by mountain ranges that were uplifted during the Laramide Orogeny and then had periods of glaciation. The ranges include the Sangre de Cristo Mountains, the Laramie Mountains, and the Front Range in the east and the San Juan Mountains and the Sawatch and Park Ranges in the west. The ranges are dissected by many narrow stream valleys having steep gradients. In some areas the upper mountain slopes and broad crests are covered by snowfields and glaciers. Elevation typically ranges from 6,500 to 14,400 feet (1,980 to 4,390 meters) in this area. The part of this MLRA in central Colorado includes the highest point in the Rockies, Mount Elbert, which reaches an elevation of 14,433 feet (4,400 meters). More than 50 peaks in the part of the MLRA in Colorado are at an elevation of more than 14,000 feet (4,270 meters). Many small glacial lakes are in the high mountains.

The mountains in this area were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. This large MLRA can be subdivided into at least 4 large general divisions. First is the Rockies on the east side of this area are called the “Front Range,” which is a fault block that has been tilted up on edge and uplifted and is largely igneous and metamorphic geology. It was tilted up on the east edge, so there is a steep front on the east and the west side is more gently sloping and in the south east there are rocks exposed in the mountains are mostly Precambrian igneous and metamorphic rocks. Second is the tertiary rocks, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are throughout this area (San Juan Mountains Area). The third division is Northwest part of the MLRA is dominantly sedimentary rock from the cretaceous/tertiary and Permian/ Pennsylvanian periods. The fourth subset is the long and narrow Sangre de Cristos mountains uplifted in the Cenozoic are between the Rio Grande rift and the great plains. Many of the highest mountain ranges were reshaped by glaciation during the Pleistocene. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. They also are important sources of sand and gravel.

The average annual precipitation ranges predominantly from 12 to 63 inches. Summer rainfall commonly occurs as high-intensity, convective thunderstorms. About half of the annual precipitation occurs as snow in winter; this proportion increases with elevation. In the mountains, deep snowpacks accumulate throughout the winter and

generally persist into spring or early summer, depending on elevation. Some permanent snowfields and small glaciers are on the highest mountain peaks. In the valleys at the lower elevations, snowfall is lighter and snowpacks can be intermittent. The average annual temperature is 26 to 54 degrees F (-3 to 12 degrees C). The freeze-free period averages 135 days and ranges from 45 to 230 days, decreasing in length with elevation. The climate of this area is strongly dependent upon elevation; precipitation is greater, and temperatures are cooler at the higher elevations. The plant communities vary with elevation, aspect and change in latitudes due to changing in precipitation kind and timing and temperature.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the area dominantly have a frigid or cryic soil temperature regime and an ustic or udic soil moisture regime. Mineralogy is typically mixed, smectitic, or paramicaceous. In areas with granite, gneiss, and schist bedrock, Glossocryalfs (Seitz, Granile, and Leadville series) and Haplocryolls (Rogert series) formed in colluvium on mountain slopes. Dystrocryepts (Leighcan and Mummy series) formed on mountain slopes and summits at the higher elevations. In areas of andesite and rhyolite bedrock, Dystrocryepts (Endlich and Whitecross series) formed in colluvium on mountain slopes. In areas of sedimentary bedrock, Haplustolls (Towave series) formed on mountain slopes at low elevations and with low precipitation. Haplocryolls (Lamphier and Razorba series), Argicryolls (Cochetopa series), and Haplocryalfs (Needleton series) formed in colluvium on mountain slopes at high elevations.

## Ecological site concept

The soils of this site formed mostly in residuum weathered from sandstone. Surface soils are loam, fine sandy loam to gravelly sandy loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but generally make up less than 35 percent of the soil volume. These soils are shallow, well-drained, and have slow to moderately rapid permeability. pH is neutral to slightly alkaline.. Available water-holding capacity ranges from 1 to 6 inches of water in the upper 20 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is frigid. Precipitation ranges from 16-22 inches annually.

## Associated sites

| | |
|---|---|
| R048AY436UT | **Mountain Shallow Loam (Mountain Big Sagebrush)**<br>Mountain shallow loam (Mountain big sagebrush) often occurs adjacent to this site. |

## Similar sites

| | |
|---|---|
| F048AY457UT | **Mountain Stony Loam (Ponderosa pine)**<br>Mountain stony loam (Ponderosa pine) is similar to this site. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Pinus ponderosa* |
| Shrub | (1) *Quercus gambelii* |
| Herbaceous | (1) *Carex geyeri* |

## Physiographic features

Benches and Cuestas of Foothills and Mountain Slopes

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Cuesta<br>(2) Escarpment<br>(3) Structural bench<br>(4) Outwash fan |
| Runoff class | High to very high |
| Flooding frequency | None |
| Ponding frequency | None |

| | |
|---|---|
| Elevation | 2,256–2,804 m |
| Slope | 8–65% |
| Ponding depth | Not specified |
| Water table depth | Not specified |

## Climatic features

The climate of this site is characterized by cold, snowy winters and warm, dry summers. The average annual precipitation ranges from 16 to 22 inches. July, August, and October are typically the wettest months with June being the driest. The most reliable sources of moisture for plant growth are the snow that accumulates over the winter and spring rains. Summer thunderstorms are intermittent and sporadic in nature, and thus, are not reliable sources of moisture to support vegetative growth on this site.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 50-100 days |
| Freeze-free period (characteristic range) | |
| Precipitation total (characteristic range) | 406-559 mm |

## Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

## Soil features

The soils of this site formed mostly in residuum weathered from sandstone. Surface soils are loam, fine sandy loam to gravelly sandy loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but generally make up less than 35 percent of the soil volume. These soils are shallow, well-drained, and have slow to moderately rapid permeability. pH is neutral to slightly alkaline.. Available water-holding capacity ranges from 1 to 6 inches of water in the upper 20 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is frigid. Precipitation ranges from 16-22 inches annually.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Residuum–sandstone |
| Surface texture | (1) Fine sandy loam<br>(2) Loam<br>(3) Gravelly sandy loam |
| Family particle size | (1) Loamy |
| Drainage class | Well drained |
| Permeability class | Slow to moderately rapid |
| Depth to restrictive layer | 25–51 cm |
| Soil depth | 25–51 cm |
| Surface fragment cover <=3" | 8–20% |
| Surface fragment cover >3" | 2–10% |
| Available water capacity (Depth not specified) | 2.54–15.24 cm |
| Calcium carbonate equivalent (Depth not specified) | 0% |
| Electrical conductivity (Depth not specified) | 0 mmhos/cm |

| | |
|---|---|
| Sodium adsorption ratio (Depth not specified) | 0 |
| Soil reaction (1:1 water) (Depth not specified) | 6.6–7.8 |
| Subsurface fragment volume <=3" (Depth not specified) | 10–20% |
| Subsurface fragment volume >3" (Depth not specified) | 3–35% |

## Ecological dynamics

State 1

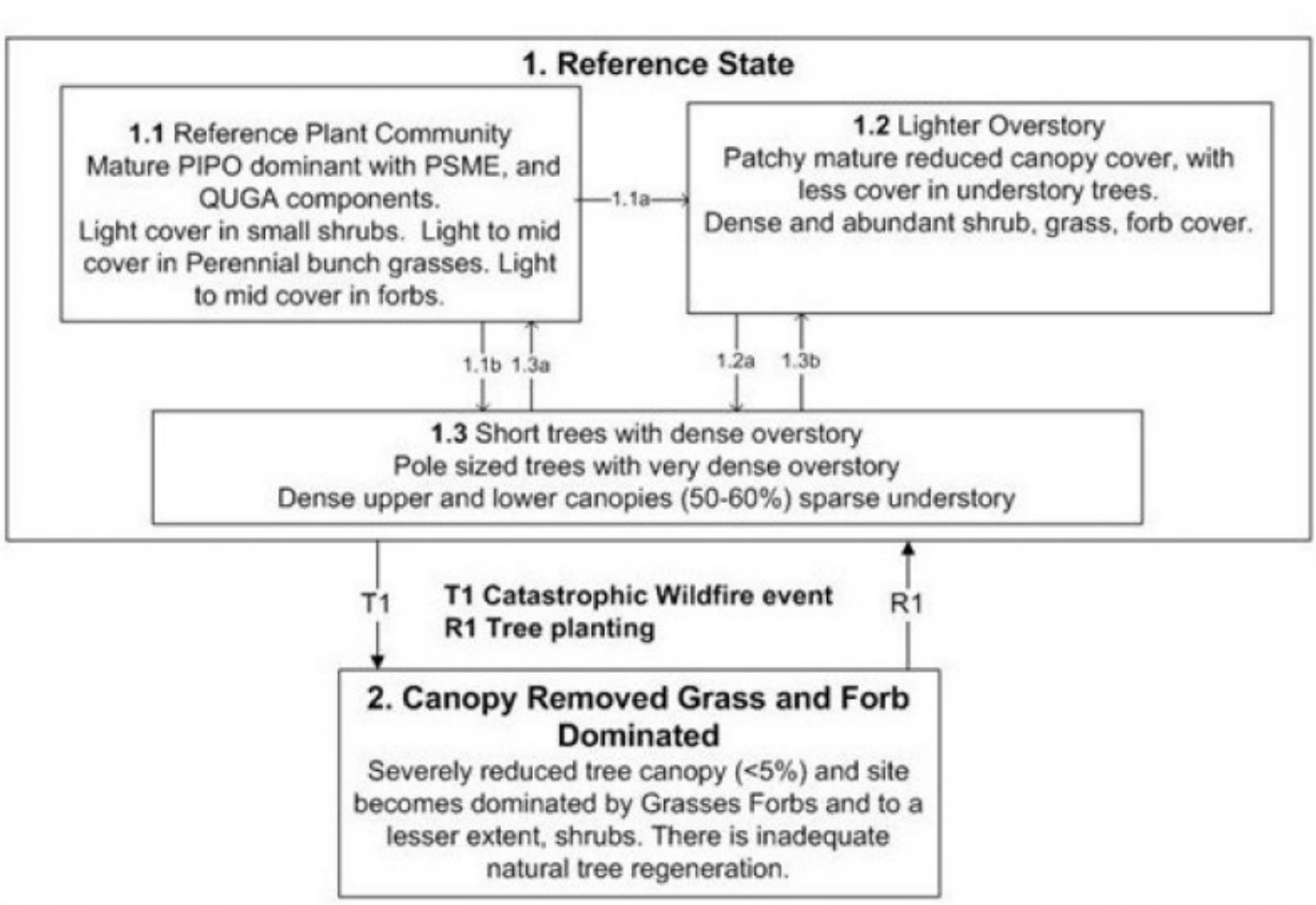
Community Phase 1.1
Open mature ponderosa pine with a large diversity of grasses and forbs and pockets of shrubs. Pre-settlement forests were irregularly spaced, uneven-aged stands with trees growing together in small even-aged groups and grassy meadows between these age groups.

Community Phase 1.2
The reduced canopy results in higher production on the forest floor of grass, forbs and to some extent shrubs.

Community Phase 1.3
Canopy openings are filled in by ponderosa pine, Douglas fir and associated shrubs forming an even aged stand of young trees.

State 2
Tree canopy drastically reduced leaving site dominated by grasses, forbs and sprouting shrubs.

## State and transition model




Community Phase Pathway 1.1a
Partial removal of mature PIPO canopy achieved through fire and/or bark beetle infestation.

Community Phase Pathway 1.1b
Removal of majority of mature PIPO canopy achieved through fire and/or bark beetle infestation.

Community Phase Pathway 1.2a
Natural regeneration of PIPO.

Community Phase Pathway 1.3a
Trees mature and are heavily thinned through fire and/or insect infestation forming a patchy and mature canopy.

Community Phase Pathway 1.3b
Trees mature and are lightly thinned naturally by fire and/or insect infestation.

Transition 1
Catastrophic removal of most trees to the point of no natural regeneration.

Restoration Pathway 1
Tree planting restores forest community.

## State 1
## Reference State

## Community 1.1
## Reference State

a. Nature of Forest Community The overstory tree canopy cover is about 20 percent. Common understory plants are Gambel oak, serviceberry, greenleaf manzanita, bottlebrush squirreltail, Geyer sedge, and muttongrass. Understory composition by air-dry weight is approximately 30 percent perennial grasses and grasslike plants, 10 percent forbs, and 60 percent shrubs. Understory production ranges from 1000 pounds per acre in favorable years to about 400 pounds per acre in unfavorable years. Understory production includes the total annual production of all species within 4 ½ feet of the ground surface.

**Table 5. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Shrub/Vine | 269 | 471 | 673 |
| Grass/Grasslike | 135 | 235 | 336 |
| Forb | 45 | 78 | 101 |
| **Total** | **449** | **784** | **1110** |

## Additional community tables

## Animal community

a. Livestock Grazing

This site is suited to cattle and sheep grazing during the summer and fall. Livestock will often concentrate on this site taking advantage of the shade and shelter offered by the tree overstory. Many areas are not used because of steep slopes or lack of adequate water. Attentive grazing management is required due to steep slopes and erosion hazards. Harvesting trees under a sound management program can open up the tree canopy to allow increased production of understory species desirable for grazing.

Wildlife species seeking food and cover in this forest site include elk, mule deer, bear, porcupine, snowshoe hare, owl, and woodpecker.

## Wood products

6. Silvicultural Practices

a. Harvest cut selectively or in small patches (size dependent upon site conditions) to enhance forage production.

1. Thinning and improvement cutting – removal of poorly formed, diseased, and low vigor trees.

2. Harvest cutting – selectively harvest surplus trees to achieve desired spacing. Save large, healthy, full-crowned trees. Do not select only “high grade” trees during harvest.

b. Prescription burning program – to maintain desired canopy cover and manage site reproduction.

c. Selective tree removal on suitable sites – to enhance forage production and manage site reproduction.

d. Pest Control – use necessary and approved control for specific pests or diseases.

e. Fire hazard – fire is usually not a problem in mature grazed stands.

## Other information

4. Limitations and Considerations

a. Potential for sheet and rill erosion is moderate to severe depending on slope.

b. Moderate to severe equipment limitations on steeper slopes and on sites having extreme surface stoniness.

c. Proper spacing is the key to a well managed multiple use and multi-product forest.

5. Essential Requirements

a. Adequately protect from uncontrolled burning.

b. Protect soils from accelerated erosion.

c. Apply proper grazing management practices (see management guides)

**Table 6. Representative site productivity**

| Common Name | Symbol | Site Index Low | Site Index High | CMAI Low | CMAI High | Age Of CMAI | Site Index Curve Code | Site Index Curve Basis | Citation |
|---|---|---|---|---|---|---|---|---|---|
| ponderosa pine | *PIPO* | 37 | 40 | 10 | 25 | – | – | – | |

## Inventory data references

Information gathered from historic data collected by range professionals within the USDA.

## Other references

Youngblood, Andrew P., Mauk, Ronald L., “Coniferous Forest Habitat Types of Central and Southern Utah” General Technical Report, INT-187, October 1985, page 53, PIPO/QUGA

“Silvics of North America” Agriculture Handbook 654, Volume 1, Conifers

## Contributors

George S. Cook, David J. Somerville

## Approval

Kirt Walstad, 3/05/2024

## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

| | |
|---|---|
| Author(s)/participant(s) | |
| Contact for lead author | |
| Date | 05/11/2025 |

| | |
|---|---|
| Approved by | Kirt Walstad |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth ( in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**

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