USDA Natural Resources
Conservation Service

# Ecological site R047XY009ID
# Mountain Loam 18-22 PZ ACGRG/ARTRV/PSSP6

Last updated: 2/11/2025
Accessed: 05/13/2025

## 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): 047X–Wasatch and Uinta Mountains

MLRA 47 occurs in Utah (86 percent), Wyoming (8 percent), Colorado (4 percent), and Idaho (2 percent). It encompasses approximately 23,825 square miles (61,740 square kilometers). The northern half of this area is in the Middle Rocky Mountains Province of the Rocky Mountain System. The southern half is in the High Plateaus of the Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south, and the Uinta Mountains, which trend east and west. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. The Uinta Mountains have a broad, gently arching, elongated shape. Structurally, they consist of a broadly folded anticline that has an erosion-resistant quartzite core. The Wasatch and Uinta Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters).
The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifers. An ancient shoreline of historic Bonneville Lake is evident on the footslopes along the western edge of the area. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments, but Precambrian rocks are exposed in the Uinta Mountains. The Uinta Mountains are one of the few ranges in the United States that are oriented west to east. The southern Wasatch Mountains consist of Tertiary volcanic rocks occurring as extrusive lava and intrusive crystalline rocks.
The average precipitation is from 8 to 16 inches (203 to 406 mm) in the valleys and can range up to 73 inches (1854 mm) in the mountains. In the northern and western portions of the MLRA, peak precipitation occurs in the winter months. The southern and eastern portions have a greater incidence of high-intensity summer thunderstorms; hence, a significant amount of precipitation occurs during the summer months. The average annual temperature is 30 to 50 degrees Fahrenheit (-1 to 15 C). The freeze-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.
The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. Mesic temperature regimes come in on the lower elevations and south facing slopes in the southern portion of this MLRA. The soil moisture regime is typically xeric in the northern part of the MLRA, but grades to ustic in the extreme eastern and southern parts. The minerology is generally mixed and the soils are very shallow to very deep, generally well-drained, and loamy or loamy–skeletal.

## LRU notes

Major Land Resource Unit 47A is located in the northern half of the Middle Rocky Mountains Province of the Rocky Mountain System. This MLRA includes the Wasatch Mountains which tend to run north and south. These steeply sloping, precipitous mountains have narrow crests and deep valleys. They are primarily fault blocks that have been tilted up. The alluvial fans located at the base of these mountains are important recharge zones for valley aquifers.

## Ecological site concept

The soils of this site formed mostly in mixed colluvium over bedrock derived from sandstone and/or quartzite. Surface soils are mostly gravelly very fine sandy loam, very channery silt loam, very gravelly loam and gravelly silt loam. Rock fragments may be present on the soil surface and throughout the profile, and generally make up more than 35 percent of the soil volume. These soils are deep, well-drained, and have moderately slow to moderately rapid permeability. Available water-holding capacity ranges from 2 to 6 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly typic xeric and the soil temperature regime is frigid. Precipitation ranges from 18 to 22 inches annually.

## Associated sites

| | |
|---|---|
| F047XA508UT | **High Mountain Loam (quaking aspen)** |

## Similar sites

| | |
|---|---|
| R047XY010ID | **High Mountain Loam 25-35 PZ ACSAG2/PHMA5/BRCA5** |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Acer grandidentatum var. grandidentatum* |
| Shrub | (1) *Artemisia tridentata ssp. vaseyana* |
| Herbaceous | (1) *Pseudoroegneria spicata* |

## Physiographic features

This site occurs on mountain slopes and alluvial fans between 4,900 and 6,600 feet in elevation. It is most commonly found on east and northeast aspects, but may occur on other aspects as well. Slopes are gentle to very steep ranging from 12 to 65 percent. Runoff is medium and flooding and ponding do not occur on the site.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Mountain slope<br>(2) Hillslope |
| Runoff class | Medium |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 1,494–2,012 m |
| Slope | 12–65% |
| Aspect | NE, E |

## Climatic features

The climate of this site is characterized by cold, snowy winters and cool dry summers. The average annual precipitation ranges from 18 to 22 inches with an average of around 19. Distribution is 55 to 60 percent during the plant dormant period (October to March). Winter snow and spring rain provide the most dependable supply of moisture for plant growth.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 77 days |
| Freeze-free period (average) | 108 days |
| Precipitation total (average) | 432 mm |

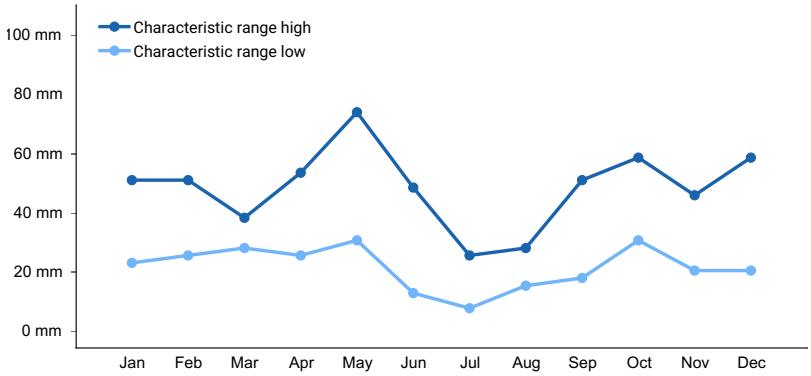



**Figure 1. Monthly precipitation range**

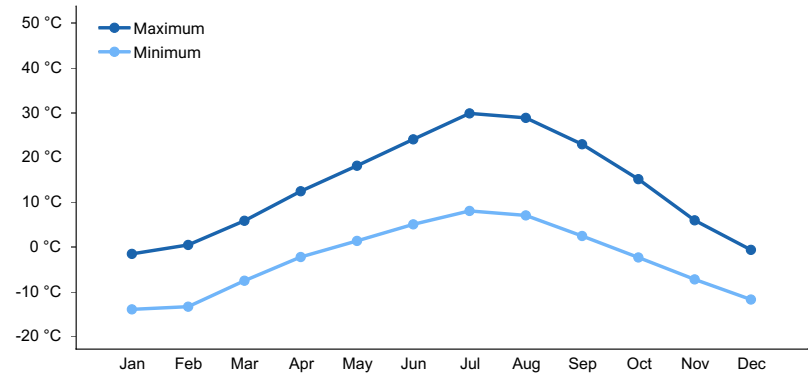



**Figure 2. Monthly average minimum and maximum temperature**

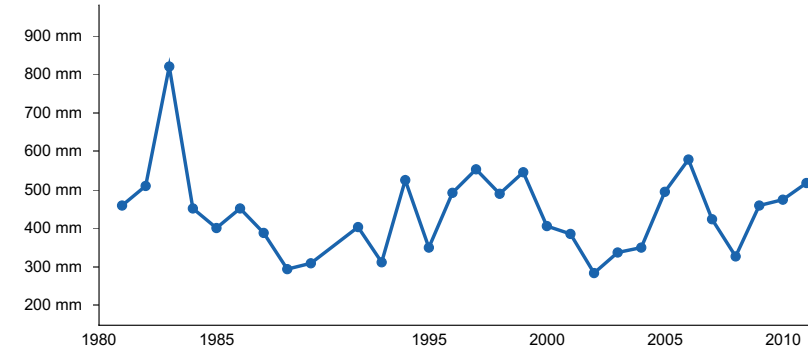



**Figure 3. Annual precipitation pattern**

## Climate stations used

- (1) BERN [USC00100803], Bern, ID

## Influencing water features

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

## Wetland description

N/A

## Soil features

The soils of this site formed mostly in mixed colluvium over bedrock derived from sandstone and quartzite. Surface soils are mostly gravelly very fine sandy loam, very channery silt loam, very gravelly loam and gravelly silt loam. Rock fragments may be present on the soil surface and throughout the profile, and generally make up more than 35 percent of the soil volume. These soils are deep, well-drained, and have moderately slow to moderately rapid

permeability. Available water-holding capacity ranges from 2 to 6 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly typic xeric and the soil temperature regime is frigid. Precipitation ranges from 18 to 22 inches annually.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Colluvium–sandstone<br>(2) Colluvium–quartzite |
| Surface texture | (1) Gravelly very fine sandy loam<br>(2) Gravelly silt loam<br>(3) Very gravelly loam<br>(4) Very channery silt loam |
| Family particle size | (1) Loamy-skeletal |
| Drainage class | Well drained |
| Permeability class | Moderately slow to moderately rapid |
| Depth to restrictive layer | 102–152 cm |
| Soil depth | 102–152 cm |
| Surface fragment cover <=3" | 0–35% |
| Surface fragment cover >3" | 0–5% |
| Available water capacity (Depth not specified) | 5.08–15.24 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) | 6.1–7.8 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–52% |
| Subsurface fragment volume >3" (Depth not specified) | 0–41% |

## Ecological dynamics

Ecological Dynamics of the Site:
It is impossible to determine in any quantitative detail the historic climax plant community (HCPC) for this ecological site because of the lack of direct historical documentation preceding all human influence. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area. However, up to the 1870s the Shoshone Indians, prevalent in northern Utah and neighboring states, grazed horses and set fires to alter the vegetation for their needs. In the 1860s, Europeans brought cattle and horses to the area, grazing large numbers of them on unfenced parcels year-long. Itinerant and local sheep flocks followed, largely replacing cattle and horses as the proportion of browse increased.

Below is a State and Transition Model diagram that illustrates the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, fuel wood harvest, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

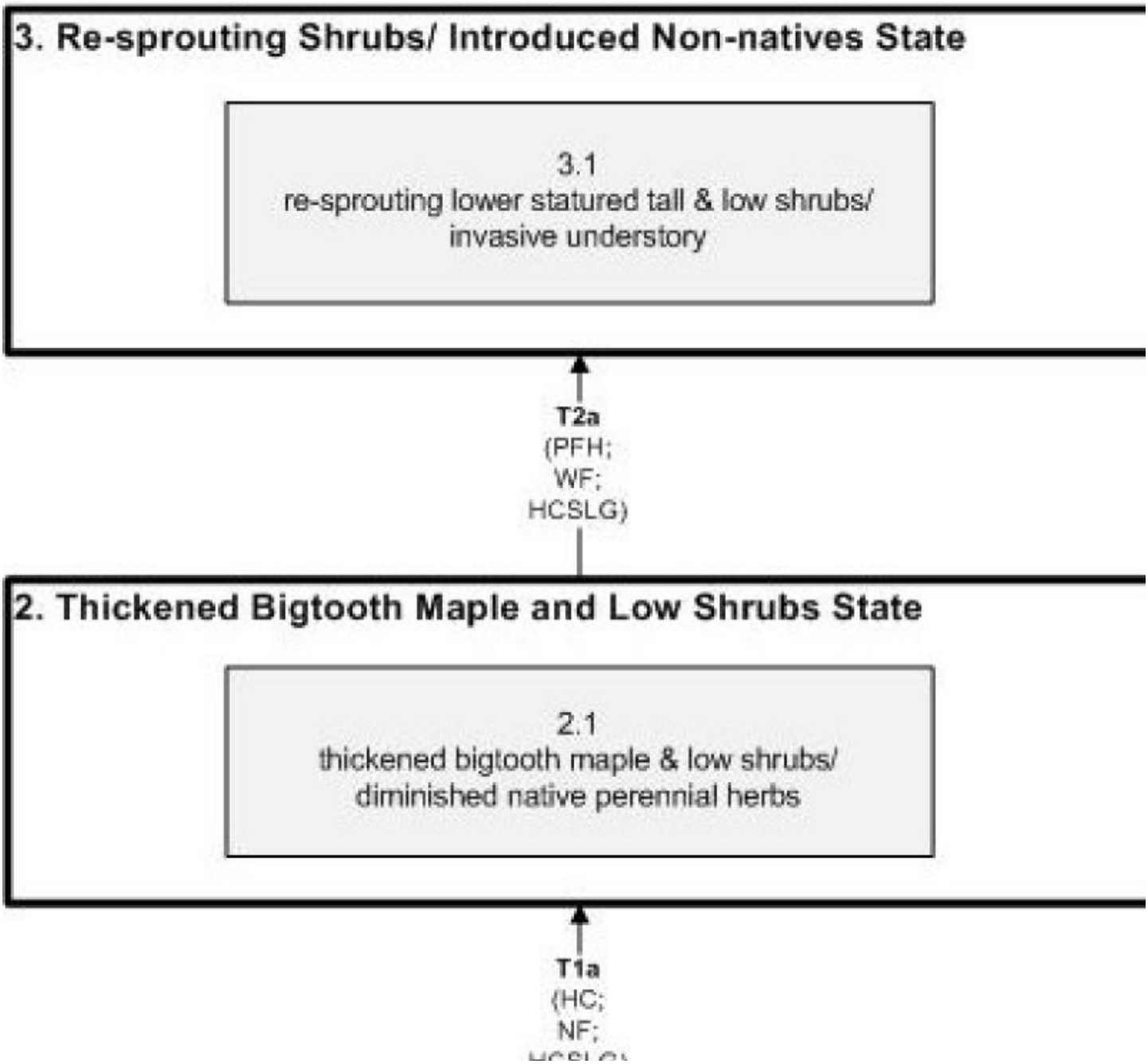
The major successional pathways within states, (“community pathways”) are indicated by arrows between phases.

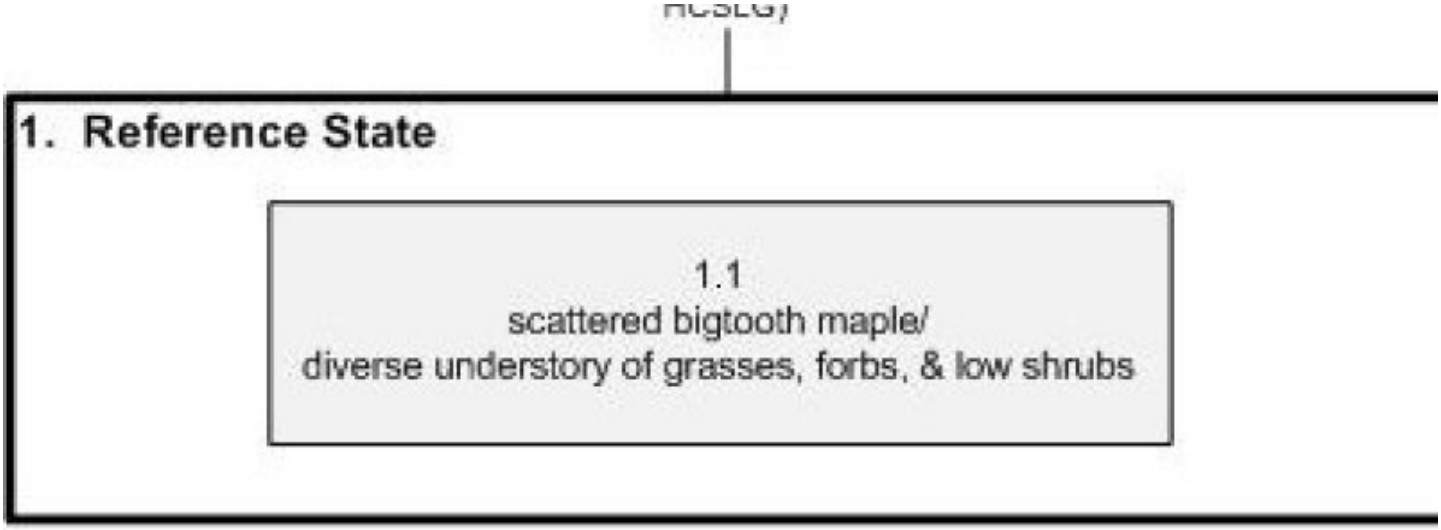
“Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion.

When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more details.

Plant Community Narratives:
The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range & Pasture Handbook, Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

### State and transition model






| | |
|---|---|
| HC | Historic Change |
| HCSLG | Heavy Continuous Season Long Grazing |
| NF | No Fire |
| PFH | Post & Firewood Harvest |
| WF | Wildfire |

**State 1**
**Reference State**

**Community 1.1**
**Reference Community Phase**

The Reference Community Phase is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and the familiarity of rangeland relict areas where they exist. The least modified plant community would have been dominated by bigtooth maple (*Acer grandidentatum*). Rocky Mountain juniper (*Juniperus scopulorum*) may also have been a common associate. The understory shrubs would have included mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana), antelope bitterbrush (*Purshia tridentata*), and chokecherry (*Prunus virginiana*). Forbs would have included common yarrow (*Achillea millefolium*), arrowleaf balsamroot (*Balsamorhiza sagittata*), sticky purple geranium (*Geranium viscosissimum*), milkvetch (Astragalus spp.), and buckwheats (Eriogonum spp.), among others. Bluebunch wheatgrass (*Pseudoroegneria spicata*), basin wildrye (*Leymus cinereus*), and muttongrass (*Poa fendleriana*) would have been the dominant grasses (1.1). A more complete list of species by lifeform for the Reference State is available in accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this document. Community Phase 1.1: scattered bigtooth maple/ diverse understory of grasses, forbs, & low shrubs This community is characterized by scattered bigtooth maple with a diverse understory of grasses, forbs and low shrubs. This is the Reference State. Transition T1a: from State 1 to State 2 (Reference State to Thickened Maple and Low Shrubs State) The simultaneous introduction of exotic species, both plants and animals, possible extinctions of native flora and fauna, and climate change has caused State 1 to transition to State 2. The advent of heavy continuous season-long grazing by livestock and fire prevention also contributed to this transition. Reversal of such historic changes (i.e. a return pathway) back to State 1 is not practical.

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

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Shrub/Vine | 740 | 829 | 919 |
| Grass/Grasslike | 555 | 622 | 689 |
| Forb | 370 | 415 | 460 |
| Tree | 185 | 207 | 230 |
| **Total** | **1850** | **2073** | **2298** |

**Table 6. Ground cover**

| | |
|---|---|
| Tree foliar cover | 24-26% |
| Shrub/vine/liana foliar cover | 14-16% |
| Grass/grasslike foliar cover | 14-16% |
| Forb foliar cover | 4-6% |
| Non-vascular plants | 0% |
| Biological crusts | 0% |
| Litter | 0% |
| Surface fragments >0.25" and <=3" | 0% |
| Surface fragments >3" | 0% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 0% |

**Table 7. Canopy structure (% cover)**

| Height Above Ground (M) | Tree | Shrub/Vine | Grass/ Grasslike | Forb |
|---|---|---|---|---|
| <0.15 | – | – | – | – |
| >0.15 <= 0.3 | – | – | – | 4-6% |
| >0.3 <= 0.6 | – | – | 14-16% | – |
| >0.6 <= 1.4 | – | 14-16% | – | – |
| >1.4 <= 4 | 24-26% | – | – | – |
| >4 <= 12 | – | – | – | – |
| >12 <= 24 | – | – | – | – |
| >24 <= 37 | – | – | – | – |
| >37 | – | – | – | – |

## State 2
## Thickened Bigtooth Maple and Low Shrubs State

## Community 2.1
## Thickened Bigtooth Maple and Low Shrubs State

State 2 is a description of the ecological site shortly following Euro-American settlement, which has been influenced by the introduction of several non-native plants and animals, possible extinctions of native species, and a different climate. The plant community will be very similar to State 1 with the exception that some introduced species are likely to be present. The herbaceous species still left in the understory are those more tolerant of grazing pressure and/or are relatively unpalatable to livestock such as Woods' rose (*Rosa woodsii*) and mule-ears (*Wyethia amplexicaulis*). This state has potential of accelerated soil erosion. Where accelerated soil erosion has not yet

occurred, the potential for stability in this state is high. Community Phase 2.1: thickened bigtooth maple & low shrubs/ diminished native perennial herbs This community is characterized by thickened bigtooth maple and low shrubs, such as mountain big sagebrush, antelope bitterbrush, Woods' rose, and chokecherry. While native perennial herbs have diminished, some, including arrowleaf balsamroot, common yarrow, and mules-ear are present. Transition T2a: from State 2 to State 3 (Thickened Bigtooth Maple and Low Shrubs State to Re-sprouting Shrubs/ Introduced Non-natives State) Firewood harvest and wildfire will remove the trees while continued heavy livestock grazing during the growing season will further reduce the understory and open it up to introduced non-native species such as cheatgrass (*Bromus tectorum*) and bulbous bluegrass (*Poa bulbosa*). A key indicator of the approach to this transition is the reduction of desirable forage and a loss of larger stems of maple. Sustained heavy grazing is the trigger for this transition.

## State 3
## Re-sprouting Shrubs/ Introduced Non-natives State

### Community 3.1
### Re-sprouting Shrubs/ Introduced Non-natives State

This state occurs following heavy, sustained grazing in conjunction with tree removal for firewood and fence-posts. Community Phase 3.1: re-sprouting lower statured tall & low shrubs/ invasive understory This state is characterized by re-sprouting lower statured tall and low shrubs, such as yellow rabbitbrush (*Chrysothamnus viscidiflorus*), rubber rabbitbrush (*Ericameria nauseosa*), and broom snakeweed (*Gutierrezia sarothrae*). Among the few native grasses are an abundance of non-native grasses such as cheatgrass.

## Additional community tables

**Table 8. Community 1.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Tree** | | | | | |
| 0 | **Dominant Trees** | | | 101–202 | |
| | Grass, annual | 2GA | *Grass, annual* | 101–202 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 101–202 | – |
| | Columbia needlegrass | ACNE9 | *Achnatherum nelsonii* | 20–61 | – |
| | Geyer's sedge | CAGE2 | *Carex geyeri* | 20–61 | – |
| | slender wheatgrass | ELTR7 | *Elymus trachycaulus* | 20–61 | – |
| | oniongrass | MEBU | *Melica bulbosa* | 20–61 | – |
| | western wheatgrass | PASM | *Pascopyrum smithii* | 20–61 | – |
| | Kentucky bluegrass | POPR | *Poa pratensis* | 20–61 | – |
| | Sandberg bluegrass | POSE | *Poa secunda* | 20–61 | – |
| 4 | **Sub-dominant Tree** | | | 0–101 | |
| **Shrub/Vine** | | | | | |
| 0 | **Dominant Shrubs** | | | 222–404 | |
| | Forb, annual | 2FA | *Forb, annual* | 101–202 | – |
| | Forb, perennial | 2FP | *Forb, perennial* | 101–202 | – |
| | common yarrow | ACMI2 | *Achillea millefolium* | 20–61 | – |
| | nettleleaf giant hyssop | AGUR | *Agastache urticifolia* | 20–61 | – |
| | white sagebrush | ARLU | *Artemisia ludoviciana* | 20–61 | – |
| | lesser rushy milkvetch | ASCO12 | *Astragalus convallarius* | 20–61 | – |
| | arrowleaf balsamroot | BASA3 | *Balsamorhiza sagittata* | 20–61 | – |
| | gypsyflower | CYOF | *Cynoglossum officinale* | 20–61 | – |

| | | | | | |
|---|---|---|---|---|---|
| | gypsyflower | | *Cynoglossum officinale* | | |
| | shortstem buckwheat | ERBR5 | *Eriogonum brevicaule* | 20–61 | – |
| | sticky purple geranium | GEVI2 | *Geranium viscosissimum* | 20–61 | – |
| | common motherwort | LECA2 | *Leonurus cardiaca* | 20–61 | – |
| | tailcup lupine | LUCAC3 | *Lupinus caudatus ssp. caudatus* | 20–61 | – |
| | western coneflower | RUOC2 | *Rudbeckia occidentalis* | 20–61 | – |
| | yellow salsify | TRDU | *Tragopogon dubius* | 20–61 | – |
| | stinging nettle | URDI | *Urtica dioica* | 20–61 | – |
| | mule-ears | WYAM | *Wyethia amplexicaulis* | 20–61 | – |
| 3 | **Sub-Dominant Shrubs** | | | 222–565 | |
| **Grass/Grasslike** | | | | | |
| 0 | **Dominant Grasses** | | | 282–605 | |
| | Shrub (>.5m) | 2SHRUB | *Shrub (>.5m)* | 101–202 | – |
| | alderleaf mountain mahogany | CEMO2 | *Cercocarpus montanus* | 20–61 | – |
| | yellow rabbitbrush | CHVIV4 | *Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus* | 20–61 | – |
| | broom snakeweed | GUSA2 | *Gutierrezia sarothrae* | 20–61 | – |
| | creeping barberry | MARE11 | *Mahonia repens* | 20–61 | – |
| | Woods' rose | ROWO | *Rosa woodsii* | 20–61 | – |
| | mountain snowberry | SYOR2 | *Symphoricarpos oreophilus* | 20–61 | – |
| 1 | **Sub-Dominant Grasses** | | | 363–888 | |
| | Rocky Mountain juniper | JUSC2 | *Juniperus scopulorum* | 0–101 | – |
| **Forb** | | | | | |
| 2 | **Sub-Dominant Forbs** | | | 504–1311 | |

## Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used.

## Other references

USDA-NRCS. 2003. National Range and Pasture Handbook. in USDA, editor, USDA-Natural Resources Conservation Service-Grazing Lands Technology Institute. Keywords: [Western US, Federal guidelines, Range pasture management]

Western Regional Climate Center, Western U.S. Climate Historical Summaries. Available at: http://www.wrcc.dri.edu/summary/Climsmut.html. Accessed 15 June 2009.

Web Soil Survey, Official Soil Series Descriptions. Available at: http://soils.usda.gov/technical/classification/osd/index.html. Accessed 15 June 2009.

## Contributors

Dean Stacy

## Approval

Sarah Quistberg, 2/11/2025

## 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 | 05/13/2025 |
| Approved by | Sarah Quistberg |
| 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:**

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

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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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