USDA Natural Resources Conservation Service

# Ecological site R047XA474UT
# Mountain Very Steep Stony Loam (mountain big sagebrush)

Last updated: 2/05/2025
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## 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 mineralogy 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.

## Classification relationships

Modal Soil: Cutoff Family GRV-SCL, Moist 30-70% — loamy-skeletal, mixed frigid Calcixerollic Xerochrepts

## Ecological site concept

The soils of this site formed in colluvium and slope alluvium derived from sandstone, limestone, shale, conglomerate, and quartzite. Rock fragments are found on the soil surface and make up greater than 35 percent of the soil volume. Surface textures are gravelly loams, very stony sandy clay loams, or very cobbly fine sandy loams. These soils are well-drained, moderately deep to deep, and have moderately slow to moderate permeability. Water-holding capacity ranges from 2.2 to 4.2 inches of water in the upper 40 inches of soil. The soil moisture regime is xeric and the soil temperature regime is frigid.

## Associated sites

| | |
|---|---|
| R047XA402UT | **Mountain Clay (slender wheatgrass)** |
| R047XA430UT | **Mountain Loam (mountain big sagebrush)** |

## Similar sites

| | |
|---|---|
| R047XA406UT | **Mountain Gravelly Loam (mountain big sagebrush)** |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Artemisia tridentata ssp. vaseyana* |
| Herbaceous | (1) *Pseudoroegneria spicata* |

## Physiographic features

This site is found on steep mountain slopes at elevations between 6,500 and 7,800 feet. Slopes range from 30 to 70 percent and runoff is high.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Mountain slope |
| Runoff class | High |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 1,981–2,377 m |
| Slope | 30–70% |
| Aspect | W, SE |

## Climatic features

The climate of this site is characterized by cold, snowy winters and cool, dry summers. The distribution of precipitation is 55 to 60 percent during the plant dormant period (October to March). This cool-season precipitation is the most dependable supply of moisture for plant growth. Lower precipitation and high evapotranspiration rates during July and August causes a reduction in growth of all plant species and dormancy in many of the grasses and forbs. The soil moisture regime for this site is xeric and the soil temperature regime is frigid.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 75 days |
| Freeze-free period (average) | 90 days |
| Precipitation total (average) | 635 mm |

## Influencing water features

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

## Wetland description

N/A

## Soil features

The soils of this site formed in colluvium and slope alluvium derived from sandstone, limestone, shale, conglomerate, and quartzite. Rock fragments are found on the soil surface and make up greater than 35 percent of the soil volume. Surface textures are gravelly loams, very stony sandy clay loams, or very cobbly fine sandy loams. These soils are well-drained, moderately deep to deep, and have moderately slow to moderate permeability. Water-holding capacity ranges from 2.2 to 4.2 inches of water in the upper 40 inches of soil. The soil moisture regime is xeric and the soil temperature regime is frigid.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Colluvium–igneous, metamorphic and sedimentary rock<br>(2) Slope alluvium–igneous, metamorphic and sedimentary rock |
| Surface texture | (1) Gravelly loam<br>(2) Very stony sandy clay loam<br>(3) Very cobbly fine sandy loam |
| Family particle size | (1) Loamy |
| Drainage class | Well drained |
| Permeability class | Moderately slow to moderate |
| Soil depth | 102–152 cm |
| Surface fragment cover <=3" | 20–31% |
| Surface fragment cover >3" | 5–21% |
| Available water capacity (0-101.6cm) | 5.59–10.67 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Electrical conductivity (0-101.6cm) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 6.6–8.4 |
| Subsurface fragment volume <=3" (Depth not specified) | 26–33% |
| Subsurface fragment volume >3" (Depth not specified) | 5–21% |

## Ecological dynamics

Plant species likely to invade this site upon deterioration are cheatgrass, annual forbs, knotweed, Utah juniper, pinyon pine, rubber rabbitbrush and snakeweed.

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 (Galatowitsch 1990). 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 (Parson 1996). In the 1860s, Europeans brought cattle and horses to the area, grazing large numbers of them on unfenced parcels year-long (Parson 1996). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

Below is a State and Transition Model diagram to illustrate 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, 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.

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, 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 and Pasture Handbook (USDA-NRCS 2003), 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 1: Reference State

Community Phase 1.1: Reference State
The Reference State 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 familiarity with rangeland relict areas where they exist. The least modified plant community would have been co-dominated by mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana) and a mixture of herbaceous species. Dominant grasses would have included slender wheatgrass (*Elymus trachycaulus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and Letterman’s needlegrass (*Achnatherum lettermanii*), and forbs would have included sticky purple geranium (*Geranium viscosissimum*), shortstem buckwheat (*Eriogonum brevicaule*), and lupines (*Lupinus caudatus* ssp. caudatus and *L. argenteus*), among others (1.1). The primary disturbance factor prior to European colonization would have been wildfire (1.1a), which would have removed the sagebrush and allowed the herbs to dominate for a time (1.2) As the time elapsed since the last wildfire grew longer (1.2a), mountain big sagebrush would have increased, and the herbaceous component would have decreased correspondingly. A more complete list of species by lifeform for the Reference State is available in the accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this document.

Community Phase 1.1: mountain big sagebrush-steppe/ rich and productive herbaceous component
This plant community would have been characterized by the presence of mountain big sagebrush with a rich and

productive herbaceous layer.

Community Pathway 1.1a:
Wildfire would remove sagebrush, allowing the herbs to dominate for a time.

Community Phase 1.2: herb dominated
This phase would have been dominated by herbaceous species and having few, if any, mountain big sagebrush present.

Community Pathway 1.2a:
Over time, sagebrush would increase, and the herbaceous understory would decrease slightly.

Transition T1a: (State 1 to State 2)
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. Reversal of such historic changes (i.e. a return pathway) back to State 1 is not practical.

State 2: Mountain Big Sagebrush-Steppe/ Introduced Non-natives State

State 2 is identical to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions of native species, and a different climate. State 2 is a description of the ecological site shortly following Euro-American settlement. This State can be regarded as the current potential. This State varies in the amount of mountain big sagebrush present based upon the time elapsed since the last wildfire. The least modified plant community is a mountain big sagebrush-steppe, characterized by the co-dominance shrubs and herbaceous species. Mountain big sagebrush is the dominant shrub, but other minor shrubs may be present. There is a rich and diverse mixture of herbs as well. Dominant grasses include slender wheatgrass, bluebunch wheatgrass, and Letterman's needlegrass, and forbs include sticky purple geranium, shortstem buckwheat, and lupines, among others (2.1). A small component of non-natives will also be present. Wildfire (2.1a) will remove sagebrush and allow the community to become dominated by herbaceous species for a time (2.2). As the length of time elapsed since the last wildfire grows longer (2.2a), sagebrush will re-establish, and the herbs will decrease slightly. This State is maintained by periodic wildfire and by a healthy, productive, and diverse plant community that can provide native seed sources and promotes soil stability, water infiltration, and soil moisture retention. These sites are more resistant to accelerated soil erosion because of the self-armament of many of these gravelly soils. The resiliency of this State will be maintained by reducing or altering seasons of use and number of livestock. Conversely, this State's resiliency will be negatively impacted by continuous season-long livestock use.

Community Phase 2.1: Mountain big sagebrush-steppe/ rich and productive herbaceous component
This plant community is characterized by co-dominance of mountain big sagebrush and a rich and productive understory of herbs.

Community Pathway 2.1a:
Wildfire will remove sagebrush, allowing the herbs to dominate for a time.

Community Phase 1.2: herb dominated
This phase is dominated by herbaceous species and having few, if any, mountain big sagebrush present.

Community Pathway 1.2a:
Over time, sagebrush will increase, and the herbaceous understory will decrease slightly.

Transition T2a: from State 2 to State 3 (Mountain Big Sagebrush-Steppe/ Introduced Non-natives State to Mountain Big Sagebrush Super-dominance State)
Lack of fire and continued heavy livestock grazing during the growing season of grasses will cause State 2 to transition into the Mountain Big sagebrush Super-dominance State (State 3). The approach to this transition is indicated by a loss of the perennial grass understory, an increase in the shrub component relative to the grasses, and evidence of soil loss. The trigger causing this transition is heavy growing season grazing.

State 3: Mountain Big Sagebrush Super-dominance State

This State is characterized by a super-dominance of mountain big sagebrush with a markedly diminished grass component which occurs in the absence of fire and with continued heavy impacts from livestock grazing. The stability of this State is maintained by the lack of a healthy, productive and diverse herb component capable of providing native seed source, soil stabilization, and soil moisture retention, and by an abundant seed source for mountain big sagebrush. The resiliency of this State will be maintained by decreased grazing during the growing season of grasses. Conversely, the resiliency of this State will be negatively impacted by continued heavy growing season livestock use.

Community Phase 3.1: abundant Mountain big sagebrush / diminished perennial herbs
This plant community is characterized by a dramatic increase in mountain big sagebrush with substantial reduction in the perennial herbaceous component as compared to State 2.

Transition T3a: from State 3 to State 4 (Mountain Big Sagebrush Super-dominance State to Yellow Rabbitbrush State)
Wildfire or brush management, either by mechanical means or prescribed fire, will temporarily remove the mountain big sagebrush. However, an increase in yellow rabbitbrush (*Chrysothamnus viscidiflorus*) is expected in most circumstances. The herbaceous component will also increase after fire or brush beating. The approach to this transition is indicated by an increase in rabbitbrush seedlings. The transition is triggered by wildfire or mechanical removal of sagebrush accompanied by heavy grazing.

Transition T3b: from State 3 to State 5 (Mountain Big Sagebrush Super-dominance State to Native Perennial Grass State)
Brush management using 2, 4-D or 2, 4-5T will remove both the shrub and forb components, leaving the grasses. This transition is triggered by herbicide application.

Transition T3c: from State 3 to State 6 (Mountain Big Sagebrush Super-dominance State to Introduced Grassland State)
This transition occurs when a decision is made to increase forage production by tilling and re-seeding with intermediate wheatgrass (*Thinopyrum intermedium*), smooth brome (*Bromus inermis*), or orchardgrass (*Dactylis glomerata*) –all introduced (non-native) species.

Restoration Pathway: R3a
Prescribed grazing during the non-growing season of the grasses and forbs will allow the native perennial herbaceous species to re-establish, returning the community to a mountain big sagebrush-steppe (State 2).

State 4: Yellow Rabbitbrush State

This State is characterized by having an abundance of yellow rabbitbrush and forb species and a reduced amount of mountain big sagebrush. This State occurs when the sagebrush is removed by fire or mechanical means from an area where it was previously super-dominant. This State is maintained by lack of sagebrush seedling establishment. It could also be maintained by periodic sagebrush removal by fire.

Community Phase 4.1: yellow rabbitbrush and forbs abundant/ mountain big sagebrush reduced
This Phase is characterized by having an abundance of yellow rabbitbrush and forb species and having a reduced amount of mountain big sagebrush.

Transition T4a: from State 4 to State 3 (Yellow Rabbitbrush State to Mountain Big Sagebrush Super-dominance State)
Heavy continuous season long grazing will impact the herbaceous component, allowing the shrubs to return to dominance.

State 5: Native Perennial Bunchgrass State

This State is dominated by native perennial bunchgrasses such as slender wheatgrass, bluebunch wheatgrass, and Letterman’s needlegrass. Shrubs and have been reduced and forbs eliminated by 2,4-D™ or 2,4-5T™ application.

This State is maintained by the lack of shrub and forb seed source, and the abundance of native perennial grass seed source.

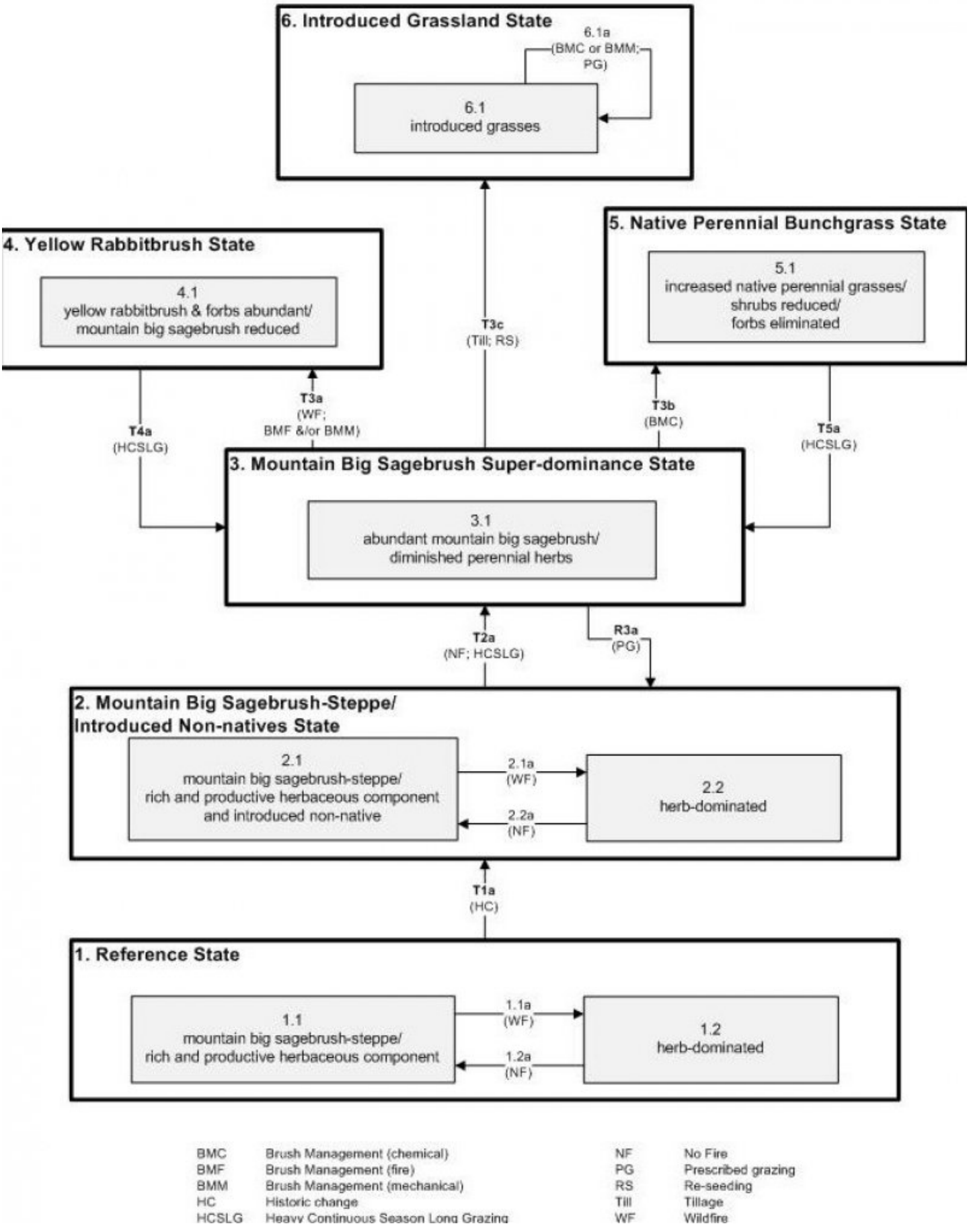
Community Phase 5.1: increased native perennial grasses/ shrubs reduced/ forbs eliminated
This Phase is characterized by the dominance of perennial native bunchgrasses such as slender wheatgrass, bluebunch wheatgrass, and Letterman's needlegrass. Shrubs and have been reduced and forbs eliminated.

Transition T5a: from State 5 to State 3 (Native Perennial Bunchgrass State to Mountain Big Sagebrush Super-dominance State)
Heavy continuous season long grazing will impact the native graminoids, allowing the shrubs to return to dominance. The approach to this transition is indicated by an increase in sagebrush seedlings. This transition is triggered by heavy growing season livestock grazing.

State 6: Introduced Grassland State

This state is characterized by the dominance of seeded grasses such as intermediate wheatgrass, smooth brome, or orchardgrass. This state occurs when a decision is made to increase forage production by tilling and re-seeding introduced grasses. Periodic brush management is required to maintain the grass-dominance of this state. This resiliency of this State can be maintained by sustainable levels of livestock grazing as determined by monitoring. Conversely, continued heavy use will negatively impact the resiliency of this state.

## State and transition model




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

**Community 1.1**

## Reference State

This site has a general but somewhat scattered aspect of shrubs. The vegetation is approximately 65 percent perennial grasses, 10 percent forbs, and 25 percent shrubs by air-dry weight.

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

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Grass/Grasslike | 547 | 984 | 1130 |
| Shrub/Vine | 211 | 379 | 435 |
| Forb | 84 | 151 | 174 |
| **Total** | **842** | **1514** | **1739** |

**Table 6. Ground cover**

| | |
|---|---|
| Tree foliar cover | 0% |
| Shrub/vine/liana foliar cover | 14-16% |
| Grass/grasslike foliar cover | 34-36% |
| 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 | – | – | 34-36% | – |
| >0.6 <= 1.4 | – | 14-16% | – | – |
| >1.4 <= 4 | – | – | – | – |
| >4 <= 12 | – | – | – | – |
| >12 <= 24 | – | – | – | – |
| >24 <= 37 | – | – | – | – |
| >37 | – | – | – | – |

## Additional community tables

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

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Shrub/Vine** | | | | | |
| 0 | **Dominant Shrubs** | | | 251–392 | |
| | mountain big | ARTRV | *Artemisia tridentata* ssp. *vaseyana* | 157–235 | |

| | | | | | |
|---|---|---|---|---|---|
| | mountain big sagebrush | ARTRV | *Artemisia tridentata ssp. vaseyana* | 157–235 | – |
| | alderleaf mountain mahogany | CEMO2 | *Cercocarpus montanus* | 47–78 | – |
| | antelope bitterbrush | PUTR2 | *Purshia tridentata* | 47–78 | – |
| 3 | **Sub-Dominant Shrubs** | | | 157–471 | |
| | Shrub (>.5m) | 2SHRUB | *Shrub (>.5m)* | 78–157 | – |
| | Saskatoon serviceberry | AMAL2 | *Amelanchier alnifolia* | 16–63 | – |
| | yellow rabbitbrush | CHVIV4 | *Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus* | 16–63 | – |
| | creeping barberry | MARE11 | *Mahonia repens* | 16–63 | – |
| | plains pricklypear | OPPO | *Opuntia polyacantha* | 16–63 | – |
| | mountain snowberry | SYOR2 | *Symphoricarpos oreophilus* | 16–63 | – |
| **Grass/Grasslike** | | | | | |
| 0 | **Dominant Grasses** | | | 643–863 | |
| | bluebunch wheatgrass | PSSP6 | *Pseudoroegneria spicata* | 471–549 | – |
| | slender wheatgrass | ELTR7 | *Elymus trachycaulus* | 78–157 | – |
| | wood bluegrass | PONE | *Poa nemoralis* | 47–78 | – |
| | Letterman's needlegrass | ACLE9 | *Achnatherum lettermanii* | 47–78 | – |
| 1 | **Sub-DOminant Grasses** | | | 314–785 | |
| | Grass, annual | 2GA | *Grass, annual* | 78–157 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 78–157 | – |
| | Geyer's sedge | CAGE2 | *Carex geyeri* | 16–47 | – |
| | squirreltail | ELEL5 | *Elymus elymoides* | 16–47 | – |
| | sheep fescue | FEOV | *Festuca ovina* | 16–47 | – |
| | needle and thread | HECO26 | *Hesperostipa comata* | 16–47 | – |
| | prairie Junegrass | KOMA | *Koeleria macrantha* | 16–47 | – |
| | basin wildrye | LECI4 | *Leymus cinereus* | 16–47 | – |
| | spike fescue | LEKI2 | *Leucopoa kingii* | 16–47 | – |
| | oniongrass | MEBU | *Melica bulbosa* | 16–47 | – |
| | muttongrass | POFE | *Poa fendleriana* | 16–47 | – |
| | Sandberg bluegrass | POSE | *Poa secunda* | 16–47 | – |
| **Forb** | | | | | |
| 2 | **Sub-Dominant Forbs** | | | 424–1271 | |
| | Forb, annual | 2FA | *Forb, annual* | 78–235 | – |
| | Forb, perennial | 2FP | *Forb, perennial* | 78–235 | – |
| | common yarrow | ACMI2 | *Achillea millefolium* | 16–47 | – |
| | tapertip onion | ALAC4 | *Allium acuminatum* | 16–47 | – |
| | white sagebrush | ARLU | *Artemisia ludoviciana* | 16–47 | – |
| | arrowleaf balsamroot | BASA3 | *Balsamorhiza sagittata* | 16–47 | – |
| | Wyoming Indian paintbrush | CALI4 | *Castilleja linariifolia* | 16–47 | – |
| | bastard toadflax | COUM | *Comandra umbellata* | 16–47 | – |
| | shortstem buckwheat | ERBR5 | *Eriogonum brevicaule* | 16–47 | – |

| | | | | | |
|---|---|---|---|---|---|
| | sticky purple geranium | GEVI2 | *Geranium viscosissimum* | 16–47 | – |
| | showy goldeneye | HEMU3 | *Heliomeris multiflora* | 16–47 | – |
| | oneflower helianthella | HEUN | *Helianthella uniflora* | 16–47 | – |
| | hairy false goldenaster | HEVI4 | *Heterotheca villosa* | 16–47 | – |
| | western stoneseed | LIRU4 | *Lithospermum ruderale* | 16–47 | – |
| | tailcup lupine | LUCAC3 | *Lupinus caudatus ssp. caudatus* | 16–47 | – |
| | Tolmie's owl's-clover | ORTO | *Orthocarpus tolmiei* | 16–47 | – |
| | low beardtongue | PEHU | *Penstemon humilis* | 16–47 | – |
| | Munro's globemallow | SPMU2 | *Sphaeralcea munroana* | 16–47 | – |

## Animal community

Livestock grazing is limited because of steep slopes.
This site is good habitat for many species of wildlife.
This site is good habitat for chukars, quail, sage grouse, mule deer, antelope, elk, squirrels, snowshoe hare, songbirds, coyotes, wildcats, cougars, golden eagles and bear.

## Hydrological functions

These soils are in hydrologic group c and the curve number is 74 when the vegetation is in good condition.

## Recreational uses

This steep site has good aesthetic appearance and natural beauty. It has a variety of grasses, forbs and shrubs which add diversity and color to the landscape. Hunting for upland game birds, deer and elk is good to excellent.

## Wood products

None

## 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

Galatowitsch, S.M. 1990. Using the original land survey notes to reconstruct pre-settlement landscapes in the American West. Great Basin Naturalist: 50(2): 181-191. Keywords: [Western U.S., conservation, history, human impact]

Parson, R. E. 1996. A History of Rich County. Utah State Historical Society, County Commission, Rich County, Utah. Keywords: [Rich County, Utah, Historic land use, European settlements]

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]

## Contributors

Darryl Trickler

## Approval

Kendra Moseley, 2/05/2025

## 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) | V. Keith Wadman (NRCS Retired). |
| Contact for lead author | shane.green@ut.usda.gov |
| Date | 11/27/2012 |
| Approved by | Kendra Moseley |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:** Rills are fairly common. Their expression may be less defined where coarse fragments (i.e., gravels and/or channers) dominate the soil surface. Rill occurrence may increase slightly on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Rills should be <1 inches deep, somewhat long (10 to 15 feet) and somewhat widely spaced (8-12 feet). An increase in rill development may be observed immediately following major thunderstorm or spring runoff events.

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2. **Presence of water flow patterns:** Sinuous flow patterns are common and wind around perennial plants and surface rock. Evidence of flow patterns is expected to increase somewhat as slopes approach 80%. Water flow patterns are long (20 to 30 feet), somewhat narrow (1 to 2 feet wide), and spaced widely (5 to 10 yards) and more closely spaced(3 to 6 yards) on slopes nearing 70 to 80%.

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3. **Number and height of erosional pedestals or terracettes:** Small pedestals will form at the base of plants that occur on the edge of water flow patterns, 2 to 4% of plants show minor exposed roots. Terracettes are fairly common, forming behind debris dams of small to medium sized litter (up to 2 inches in diameter) in water flow patterns. These debris dams may accumulate smaller litter (leaves, grass and forb stems) and sediment.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20–25%. (Soil surface is typically covered by 15-60% surface fragments). Most bare ground is associated with water flow patterns, rills, and gullies. Bare ground spaces not associated with flow patterns should not be greater than 1 to 2 feet in diameter.

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5. **Number of gullies and erosion associated with gullies:** Few. A few gullies may occur. Any gullies preaent may

extend down the length of the site until they reach a stream or other area where water and sediment is deverted or accumulates. Gullies show slightly more indication of erosion as slopes approach 80%, or where the site occurs adjacent to watershed areas with concentrated flow patterns.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Perennial shrubs along with surface coarse fragments on this site help break the wind and reduce the potential for wind erosion.

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7. **Amount of litter movement (describe size and distance expected to travel):** Because of the sites very steep slopes, some litter redistribution downslope caused by water movement is normal. Some litter removal may occur in flow channels with deposition occurring within 3 to 5 feet at points of obstruction. The majority of litter still accumulates at the base of plants. Some grass leaves, stems and small woody twigs may accumulate in soil depressions adjacent to plants. Woody stems are likely to move 1 to 2 feet. A slight increase in litter movement is expected following runoff resulting from heavy spring runoff or thunderstorms.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have an erosion rating of 4 or 5. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Cutoff) Soil surface A horizon is typically up to 5 inches deep. Texture is a gravelly loam. Structure is weak fine granular. Color is dark grayish brown (10YR 4/2). A Ochric epipedon extends 5 inches into the soil profile. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Good spatial distribution of well developed biological soil crusts (where present) intercept raindrops, reducing splash erosion and providing areas of increased surface detention to store water, allowing additional time for infiltration.

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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):** None. Fractured sandstone bedrock occurs at about 35 inches. Some soils may have natural textural variability within their profiles, including changes in clay and coarse fragment content, these should not be mistaken for a compaction pans.

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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: Non-sprouting shrubs (Mountain big sagebrush) > cool season perennial grasses (bluebunch wheatgrass, muttongrass) >> rhizomatous grasses (slender wheatgrass).

    Sub-dominant: Sprouting shrubs (bitterbrush, green rabbitbrush) > forbs (arrowleaf balsamroot, shortstem wild buckwheat)

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same

as the native species in the reference state. Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

Additional: Factors contributing to temporal variability include insects and other pathogens, drought, extreme precipitation events, etc. Factors contributing to spatial variability include slope, amount of rock fragments, aspect, etc. Following a recent disturbance such as fire, drought or insects, that may remove the woody vegetation, forbs and perennial grasses (herbaceous species) may become more dominate in the community. These conditions may reflect different functional community phases within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above-average precipitation, there should be very little recent mortality or decadence apparent on shrubs, or grasses. There may be partial mortality on individual bunchgrasses and shrubs during drought periods, and complete mortality of individual plants during severe drought periods.

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14. **Average percent litter cover (%) and depth ( in):** Cover should be composed mostly of fine litter. Depth should vary from a 1/2 thickness in the interspaces, to up to 1 under herbaceous canopies, and up to 1 1/2” under shrub canopies. Litter cover may increase to 30% on some years due to increased production of plants.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 1300 - 4000#/acre on an average year, but could range from 700 to 1600#/acre during periods of prolonged drought or above average precipitation.

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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:** Few invasive species are capable of dominating this site. When invasion does occur, cheatgrass, alyssum, and mustard species are the most likely species to invade.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species is present during average and above average growing years.

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