

Ecological site BX012X02C026

Loamy, Calcareous 15-19 Inch Precipitation Zone Lost River Mountains

Last updated: 5/19/2025
Accessed: 07/20/2025

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): 012X—Lost River Valleys and Mountains

Major Land Resource Area (MLRA) 012X, Lost River Valleys and Mountains, consists of approximately 4.85 million acres in Idaho. MLRA 012X is broken into two Land Resource Units (LRU) based on geology, landscape, common soils, water resources, and plant community potentials. The elevation ranges from approximately 3,600 feet (1,100 meters) in the valleys and extends to the highest point in Idaho, Mt. Borah, at 12,662 feet (3,869 meters). Annual precipitation has a significant range from six to 47 inches, with the driest areas in the valley bottoms and the wettest areas on the mountain summits. This MLRA encompasses portions of the Salmon-Challis National Forest, small amounts of private land, as well as other public land managed by the State of Idaho and the Bureau of Land Management. The Continental Divide runs through the Beaverhead Mountain Range directly east of the MLRA and adjacent forests and parks include the Beaverhead National Forest, Custer Gallatin National Forest, Caribou-Targhee National Forest, and Craters of the Moon National Park.

LRU notes

The Lost River Mountain LRU is located on the Lemhi, Lost River, and White Knob Mountain Ranges. These mountain ranges extend from Salmon, Idaho to the north, Craters of the Moon National Monument to the south, the Beaverhead Mountain Range to the east, and the Sawtooth Mountains to the west. This LRU borders MLRA 043B - Central Rocky Mountains, and a small portion of MLRA 010X - Central Rocky Mountains and Foothills.

The geology of this LRU is comprised mostly of colluvium from the Challis Volcanic Group, limestone from the Permian to Mississippian Period, and till from Pleistocene glacial deposits. Additionally, metasedimentary formations from the Proterozoic dominate the Lemhi Range. The elevation range of this LRU is similar to that of the MLRA (approximately 4,000 to 12,500 feet). The boundary of the unit begins where the three mountain ranges meet the valley floor and extends to the mountain peaks. Effective precipitation (estimate of the moisture available for plant use and soil forming processes at a given site) generally ranges between 10 to greater than 36 inches. The soil temperature regimes present are frigid and cryic, and the soil moisture regimes include xeric and udic. The soils for the LRU are dominated by mollisols and inceptisols from limestone and quartzite parent material, as well as glacial till.

Classification relationships

Relationship to Other Established Classification Systems

National Vegetation Classification System (NVC):

3 Semi-Desert

3.B.1 Cool Semi-Desert Scrub & Grassland

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M170 Great Basin-Intermountain Dwarf Sagebrush Steppe & Shrubland Macrogroup

G308 Intermountain Low and Black Sagebrush Steppe and Shrubland Group

A3219 Little Sagebrush Steppe and Shrubland Alliance

CEGL001412 Little Sagebrush/Bluebunch Wheatgrass Shrub Grassland Association

Ecoregions (EPA):

Level I: 10 Northwestern Forested Mountains

Level II: 10.1 Western Cordillera

Level III: 10.1.4 Middle Rockies

Ecological site concept

This site does not receive additional water and is not greatly impacted by slope or aspect.

These soils:

- o Are not saline, saline-sodic, or sodic
- o Are highly calcareous within the 10 to 20 inch (25 to 50 centimeter) portion of the soil profile.
- o Are moderately deep, deep, or very deep
- o Consist of fine sandy loam to clay loam textures (includes silt loams, loams, and sandy clay loams)
- o Are moderately productive

The primary resource limitation for this ecological site is relative effective annual precipitation and soil chemistry. This site is not impacted by depth to a restriction, slope steepness, or high volumes of coarse fragments within the soil profile.

Associated sites

BX012X02C063	Shallow to Loamy, Calcareous 15-19 Inch Precipitation Zone Lost River Mountains This site is also found on limestone parent material.
BX012X02B020	Limy 10 to 14 Inch Precipitation Zone Lost River Mountains This site is also usually found on limestone parent material but in a lower climatic subset (10-14 inch precipitation zone)
BX012X02C068	Skeletal 15-19 Inch Precipitation Zone Lost River Mountains This site can be adjacent on the landscape, however has a higher volume of coarse fragments in the soil profile.
BX012X02C072	Steep Skeletal 15-19 Inch Precipitation Zone Lost River Mountains This site can be found adjacent on slopes greater than 30 percent.
BX012X02C034	Rocky Hills 15-19 Inch Precipitation Zone Lost River Mountains This site can be found on rock outcroppings and ridges where soil is shallow to bedrock.

Similar sites

BX012X02B020	Limy 10 to 14 Inch Precipitation Zone Lost River Mountains This site has highly calcareous soils in the top 4 inches (10cm).
BX012X02C063	Shallow to Loamy, Calcareous 15-19 Inch Precipitation Zone Lost River Mountains This site has highly calcareous soils in the 4-10 inch (10-25cm) range of the soil profile.
BX012X02B026	Loamy Calcareous 10-14 Inch Precipitation Zone Lost River Mountains This site also has highly calcareous soils in the 10-20 inch (25-20cm) range of the soil profile.
BX012X02C034	Rocky Hills 15-19 Inch Precipitation Zone Lost River Mountains This site will often have calcareous soils in the top 20 inches (50cm), but usually occurs on ridges and rock outcroppings where depth to bedrock is shallow.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia arbuscula</i> ssp. <i>longiloba</i> (2) <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Poa secunda</i>

Legacy ID

Physiographic features

This site can occur on mountain slopes, alluvial fans, canyon walls, or outwash terraces all within the mountain landscape. The site is not aspect-dependent, though aspect may influence the elevation at which it occurs. Additionally, this site is not influenced by slope percentage, however occurs on slopes ranging from five to 29 percent. Runoff is low to moderate and flooding and ponding do not occur.

Landscape Definition:

Mountains -- A region or landscape characterized by mountains and their intervening valleys.

Landform Definition:

Mountain Slope -- A part of a mountain between the summit and the foot.

Canyon wall -- The steep to near vertical slope between a canyon bottom and higher, adjacent hillslopes, mountain slopes, or summits. Canyon walls are generally dominated by rock outcrop and or bedrock within the soil profile.

Outwash terrace -- A flat-topped bank of outwash with an abrupt outer face (scarp or riser) extending along a valley downstream from an outwash plain or terminal moraine; a valley train deposit.

Alluvial fan -- A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes, shaped like an open fan or a segment of a cone, deposited by a stream (best expressed in semiarid regions) at the place where it issues from a narrow mountain or upland valley.

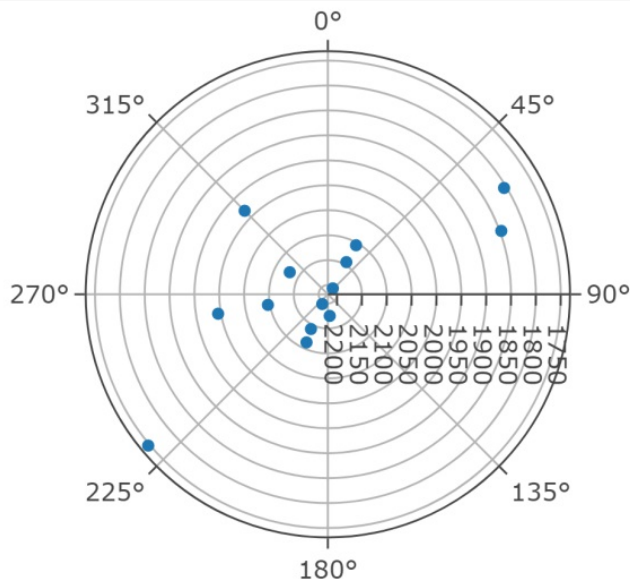


Figure 1.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Alluvial fan (2) Mountains > Mountain slope (3) Mountains > Canyon wall (4) Mountains > Outwash terrace
Runoff class	Negligible to medium
Flooding frequency	None
Ponding frequency	None
Elevation	6,437–7,027 ft
Slope	5–29%
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	5,731–7,228 ft
Slope	4–60%

Climatic features

In the Lost River Mountain LRU, both precipitation and temperatures fluctuate significantly throughout the seasons and year to year. Relative effective annual precipitation (estimate

of the moisture available for plant use and soil forming processes at a given site) generally ranges between 10 to greater than 36 inches. Average daily temperatures during the growing season (April to August) range from 33 to 57 degrees Fahrenheit. These wide fluctuations in temperature and precipitation are largely due to elevation and aspect differences as well as lower relative humidity and drier air in the mountainous terrain of the LRU. The wettest months in terms of rainfall are May and June. The growing season varies across the LRU in relation to topographical and local conditions; however, generally ranges between 30 to 90 days. Most primary growth occurs from late April through June. Soil temperature regimes include cryic and frigid and soil moisture regimes include xeric and udic.

For this Loamy Calcareous ecological site, the effective precipitation is 15 to 19 inches. Effective precipitation is a modeled value that considers annual precipitation, aspect, elevation, slope, and slope shape. Often this value will be greater than or less than annual precipitation values in relation to these other characteristics. Below 15 inches and above 19 inches, a notable shift will occur in dominant plant community composition, canopy cover, and production value. Because of the loamy textures present at this ecological site, higher amounts of available moisture may be present when compared to adjacent ecological sites in the same climatic subset.

Precipitation and temperature data were taken from representative Snotel stations in the area. Snotel and other weather monitoring stations in the mountains of MLRA 12 are limited, so climatic values may not specifically represent the range of conditions present at a given ecological site. Frost-free days are calculated for temperature and moisture regimes in MLRA 12.

Table 4. Representative climatic features

Frost-free period (characteristic range)	30-60 days
Freeze-free period (characteristic range)	40-65 days
Precipitation total (characteristic range)	18-27 in
Frost-free period (actual range)	25-75 days
Freeze-free period (actual range)	40-85 days
Precipitation total (actual range)	14-31 in
Frost-free period (average)	45 days
Freeze-free period (average)	60 days
Precipitation total (average)	21 in

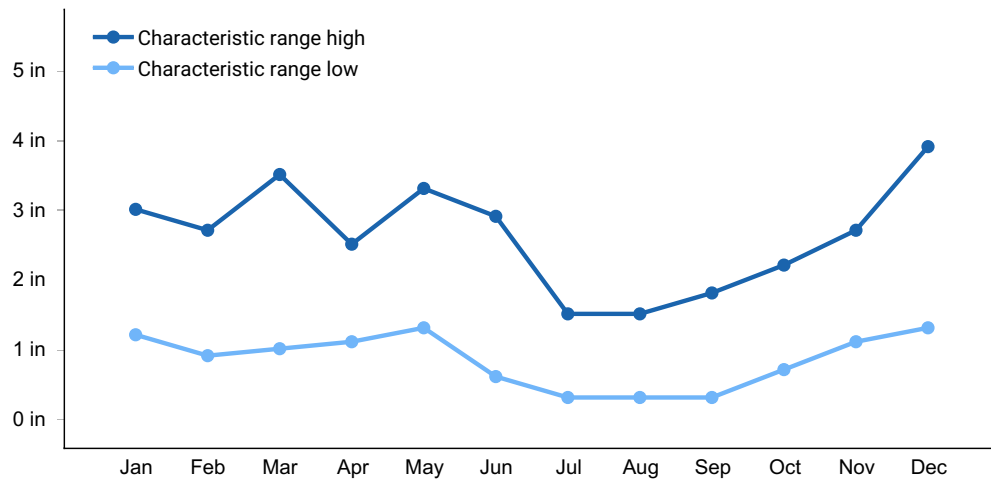


Figure 2. Monthly precipitation range

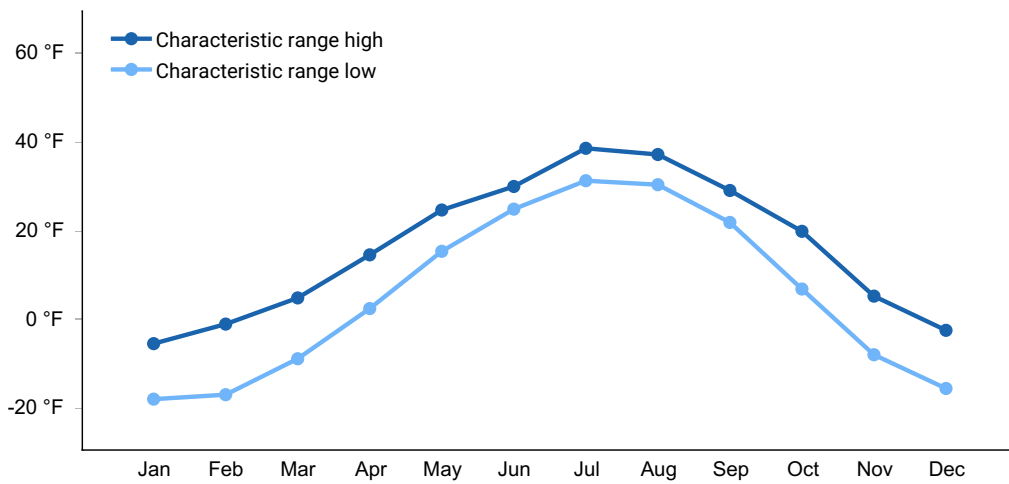


Figure 3. Monthly minimum temperature range

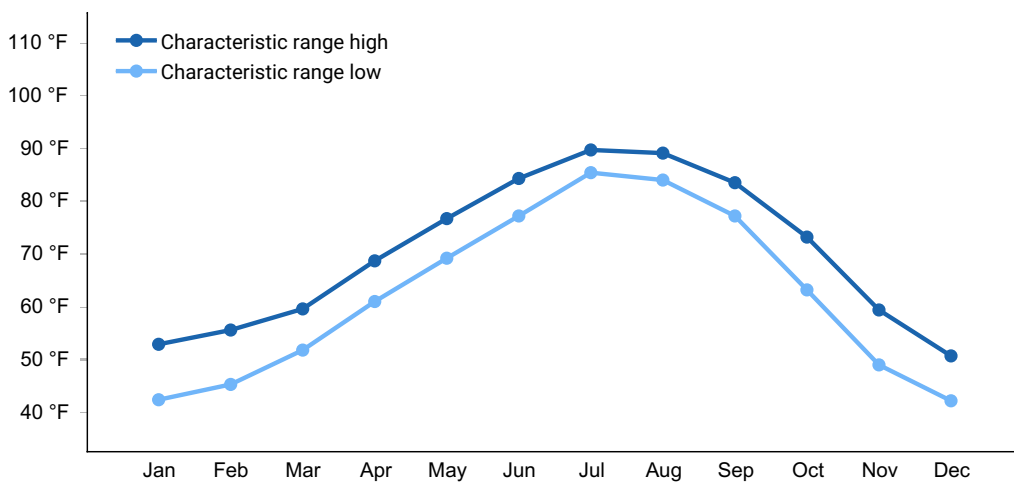


Figure 4. Monthly maximum temperature range

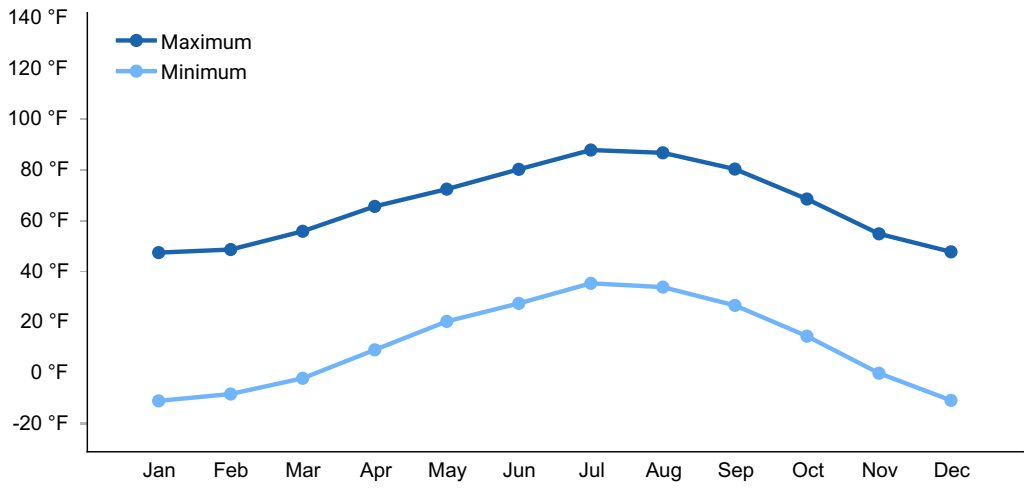


Figure 5. Monthly average minimum and maximum temperature

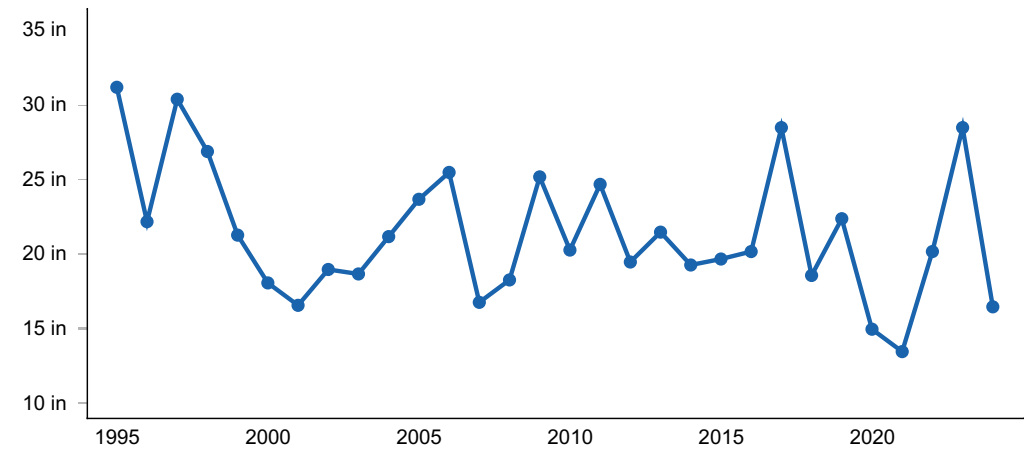


Figure 6. Annual precipitation pattern

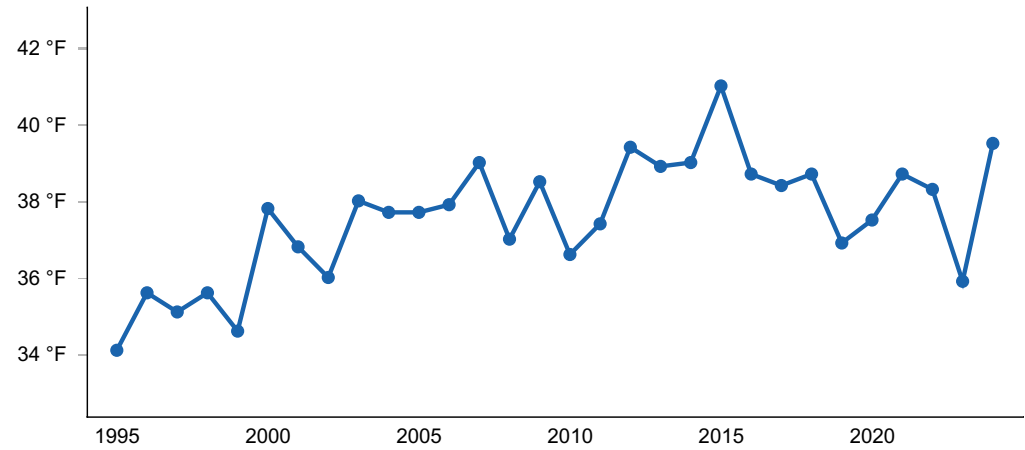


Figure 7. Annual average temperature pattern

Influencing water features

This is an upland ecological site and is not influenced by additional water beyond the precipitation the site receives.

Wetland description

This ecological site is not associated with wetlands.

Soil features

The soils of this site are moderately deep to very deep, ranging from 20 to greater than 60 inches (50 to 150 centimeters) and consist of textures ranging from fine sandy loams to clay loams. Soils can be skeletal (greater than 35 percent coarse fragments) and are primarily formed from slope alluvium and colluvium derived from limestone. Soils are highly calcareous within the 10 to 20 inch (25 to 50 centimeter) section of the soil profile. This is represented by a calcium carbonate equivalency (CCE) greater than 15 percent which is identified by having a pH of 7.8 or greater coupled with an effervescence of strong or higher. These soils are well-drained.

Representative Soil Taxonomy:
Loamy-skeletal, mixed, superactive Calcic Haplocryolls
Fine-loamy, mixed, superactive Calcic Argicryolls

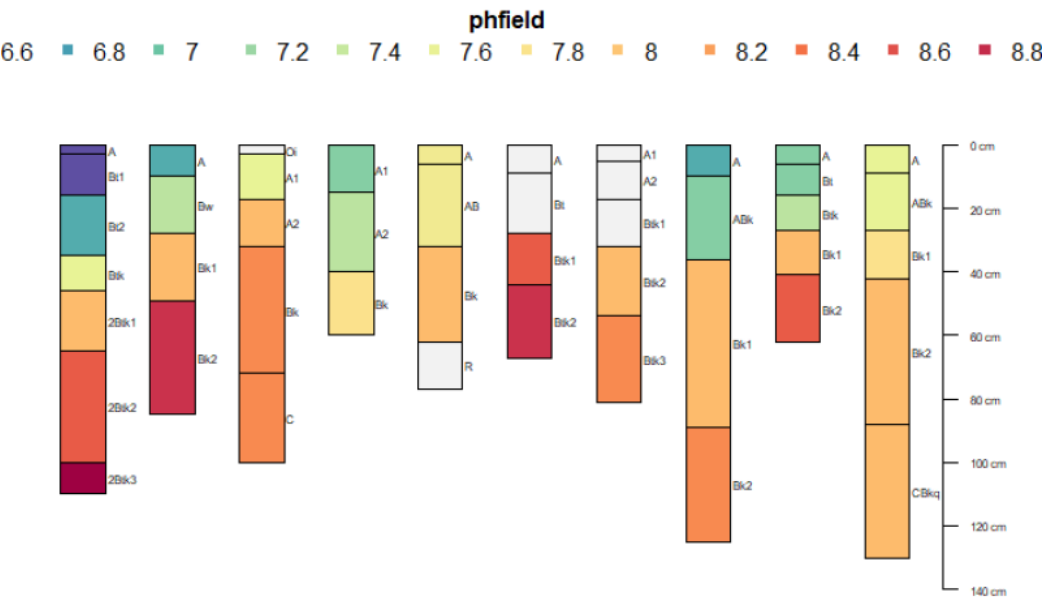


Figure 8.

Table 5. Representative soil features

Parent material	(1) Alluvium–limestone (2) Colluvium–limestone (3) Slope alluvium–limestone (4) Colluvium–metasedimentary rock (5) Colluvium–volcanic rock (6) Colluvium–quartzite
-----------------	---

Surface texture	(1) Gravelly silt loam (2) Gravelly loam (3) Gravelly sandy loam (4) Sandy loam (5) Loam (6) Silt loam
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to moderately rapid
Soil depth	40–80 in
Surface fragment cover ≤ 3 "	5–40%
Surface fragment cover > 3 "	0–15%
Available water capacity (0-20in)	2.3–2.6 in
Calcium carbonate equivalent (10-20in)	15–25%
Soil reaction (1:1 water) (0-20in)	7.1–7.8
Subsurface fragment volume ≤ 3 " (0-20in)	15–25%
Subsurface fragment volume > 3 " (0-20in)	0–5%

Table 6. Representative soil features (actual values)

Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	Not specified
Surface fragment cover ≤ 3 "	0–45%
Surface fragment cover > 3 "	0–20%
Available water capacity (0-20in)	2.3–2.74 in
Calcium carbonate equivalent (10-20in)	Not specified
Soil reaction (1:1 water) (0-20in)	6.6–8.4
Subsurface fragment volume ≤ 3 " (0-20in)	15–55%
Subsurface fragment volume > 3 " (0-20in)	0–31%

Ecological dynamics

The Loamy Calcareous ecological site in the 15 to 19-inch precipitation zone is dominated by low sagebrush and bluebunch wheatgrass. It consists of two states, a Reference and a Disturbed state. Within those states are four different plant communities. The primary driver for state transitions is disturbance, with frequent or severe fire and intense grazing that results in chronic defoliation being the most prominent.

A state-and-transition model (STM) diagram for this ecological site is depicted in this section. Thorough descriptions of each state, transition, plant community phase, and pathway are found after the state-and-transition model. This STM is based on available experimental research, field observations, professional consensus, and interpretations. While based on the best available information, the STM will change over time as knowledge of ecological processes increases.

Plant community composition within this ecological site has a natural range of variability across the LRU due to the natural variability in weather, soils, and aspect. The reference plant community may not fit management goals. Selection of other plant communities is valid if the identified range health attributes have none to slight or slight departures from the Reference State. The biological processes on this site are complex; therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species potentially occurring on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the ecological site.

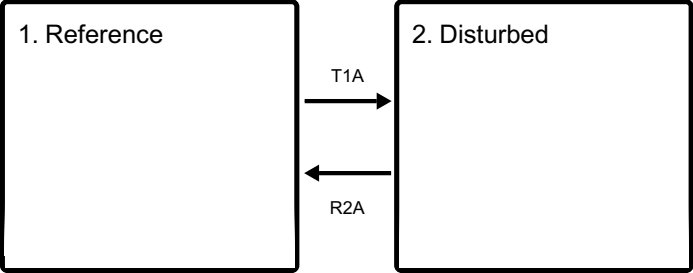
Both percent species composition by weight and percent cover are used in this ecological site description. Foliar cover is used to define plant community phases and states in the STM. Cover drives the transitions between communities and states because of the influence of shade and interception of rainfall.

Species composition by dry weight remains an important descriptor of the herbaceous community and of site productivity as a whole and includes both herbaceous and woody species. Calculating the similarity index requires data on species composition by dry weight.

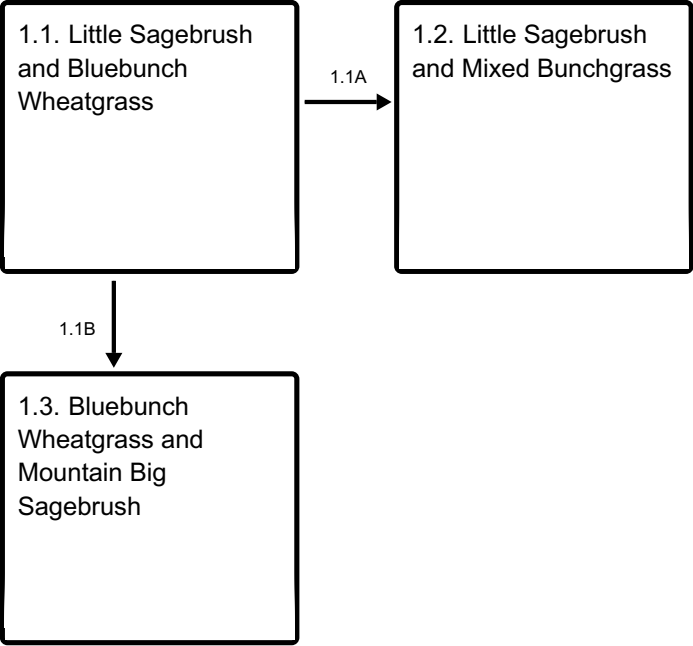
Although there is considerable qualitative experience supporting the pathways and transitions within the state-and-transition model, no quantitative information exists that specifically identifies threshold parameters between Reference state and Degraded state in this ecological site.

State and transition model

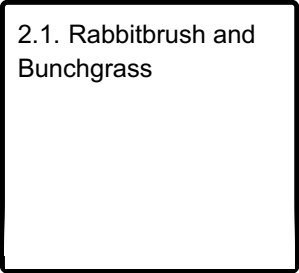
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference



The Reference state consists of three dominant plant communities: a little sagebrush (*Artemisia arbuscula* ssp. *longiloba*) dominated community, a black sagebrush (*Artemisia nova*) dominated community, and a community where overstory shrub canopy dominance consists of big sagebrush species, primarily mountain big sagebrush (*Artemisia tridentata* spp. *vaseyana*). The greatest difference between the three plant communities is the composition and foliar cover of sagebrush species. Generally, mountain big sagebrush foliar cover increases on sites that are closer to the higher end of the effective precipitation range (15 to 19 inch) or the calcium carbonate concentration in the soil is lower, closer to the minimum 15 percent required in the site concept. This community also occurs more often when calcareous soil presence is deeper in the soil profile, closer to a depth of 20 inches (50cm). Processes (both natural and anthropogenic) that can result in state and community changes include fire, grazing, land use change, and establishment of invasive species (Davies et al., 2011).

Characteristics and indicators. The shift between plant communities at this site is generally driven by calcium carbonate concentration in soils, effective precipitation, and sagebrush-killing disturbances or lack thereof. Historically, low to mixed-severity fires occurred at relatively frequent fire return intervals of 10 to 25 years, limiting sagebrush canopy density and creating a mosaic of sagebrush stands and more open grasslands (Knick, Holmes, & Miller, 2005). Exclusion of fire (in conjunction with climate change) increases sagebrush canopy cover and can lead to more severe stand-replacing fires, oftentimes at more frequent intervals. These severe fires can drive shifts to grassland communities as well as create opportunities for invasive species establishment (Roadhouse, Irvine, and Bowerstock, 2020; Knick et al., 2005). Improper grazing practices can also lead to an increase in sagebrush canopy cover and an increased risk of severe, stand-replacing fire occurrence. Removal of understory grasses can lessen the opportunities for low severity fire occurrence which leads to increased canopy densities and increases potential for severe fire disturbance events (Knick et al., 2005).

Resilience management. This site has moderate resilience as a result of the cryic soil temperature regime and xeric soil moisture regime. Resistance and resilience of a specific

site have been attributed with abiotic conditions favorable to plant growth and reproduction (Maestas et al. 2016). Soils that fall within the cryic (cold) temperature regime and xeric (wet) moisture regime tend to have higher diversity and production, and are therefore more resilient, specifically in terms of resisting or recovering from invasion post disturbance (Maestas et al., 2016). Although both black sagebrush and little sagebrush species are both susceptible to fire damage and usually killed by fire events, fire events within these communities are usually rare. These communities generally lack the fine fuels required to carry fire, promoting relatively infrequent fire return intervals (Steinberg, 2002). Mountain big sagebrush is also highly susceptible to damage and mortality from fire events. These communities also tend to have higher fuel loading and carry fire more easily and frequently than in the black and little sagebrush communities (Innes, 2017).

Dominant plant species

- little sagebrush (*Artemisia arbuscula* ssp. *longiloba*), shrub
- black sagebrush (*Artemisia nova*), shrub
- mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass

Community 1.1

Little Sagebrush and Bluebunch Wheatgrass



Figure 9. Little Sage/Bluebunch Wheatgrass community

Community 1.1 is well adapted to the abiotic conditions of the Lost River Mountain LRU. Both little sagebrush (*Artemisia arbuscula*) and black sagebrush (*Artemisia nova*) have adaptations that allow them to thrive on the highly calcareous soils that form from limestone parent material. Little sagebrush more often dominates the canopy at this ecological site; however, it is not uncommon for the percent composition between black sagebrush and little sagebrush to be nearly equal. It is also possible that one of the two species is missing from the canopy completely. Black sagebrush prefers conditions where the highly calcareous soils are closer to the surface. Because the depth to calcareous

soils in the Loamy Calcareous ecological site is 10 inches (25cm), little sagebrush can outcompete black sagebrush (McArthur & Stevens, 2009; Tilley & St. John [2], 2012). Therefore, little sagebrush has a higher canopy cover (35 percent) and contributes more volume to overall ecological site production value. Little sagebrush/Bluebunch Wheatgrass communities can form in a mosaic distribution with other communities in this state (1.1 & 1.3) across the range of relative effective annual precipitation. As effective precipitation increases, the understory of bluebunch wheatgrass (*Pseudoroegneria spicata*) decreases in percent canopy cover. Other bunchgrasses such as Idaho fescue (*Festuca idahoensis*) increase in canopy cover as available moisture increases. Production in this community is lower than in other communities because of the low sagebrush overstory. Production ranges from 350 to 750 pounds per acre, averaging 550 pounds per acre. Shrub species contribute 200 to 445 pounds per acre, while grasses contribute 120 to 230 pounds per acre. Little sagebrush species account for up to 30 percent of the canopy cover, while bluebunch wheatgrass can reach 20 percent canopy cover.

Resilience management. Resilience is moderate in Community 1.1. Black sagebrush and little sagebrush are both drought-tolerant species able to withstand periods of below-average precipitation. Bluebunch wheatgrass is well suited to the variable climate experienced in the Lost River Mountains and is resilient to many natural disturbances including drought and fire. Bluebunch wheatgrass has been shown to recover to pre-fire disturbance population levels in one to seven years post-disturbance. Under certain conditions, canopy cover and production can exceed pre-fire values (Zlatnik, 1999). Bluebunch wheatgrass is a decreaser, reducing canopy cover and production in relation to grazing pressure. Under heavy grazing pressure, the species will shift towards areas such as under the canopy of shrubs, opening the canopy for the establishment of rhizomatous grass species, invasive species, or bare ground.

Dominant plant species

- little sagebrush (*Artemisia arbuscula* ssp. *longiloba*), shrub
- black sagebrush (*Artemisia nova*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- Indian paintbrush (*Castilleja*), other herbaceous
- stemless mock goldenweed (*Stenotus acaulis*), other herbaceous

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	200	323	445
Grass/Grasslike	122	174	227
Forb	31	42	52
Total	353	539	724

Table 8. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	20-36%
Grass/grasslike foliar cover	15-30%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	35-75%
Surface fragments >0.25" and <=3"	1-10%
Surface fragments >3"	0-9%
Bedrock	0%
Water	0%
Bare ground	2-10%

Table 9. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-3%
Grass/grasslike basal cover	2-5%
Forb basal cover	0-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	12-45%
Surface fragments >3"	0-18%
Bedrock	0%
Water	0%
Bare ground	35-65%

Community 1.2

Little Sagebrush and Mixed Bunchgrass



Figure 11. Little Sagebrush/Mixed Bunchgrass community

Community 1.2 has a mixed low sagebrush overstory (little sagebrush and black sagebrush) and a mixed bunchgrass understory (Idaho fescue and bluebunch wheatgrass). The primary difference between Community 1.1 and 1.2 is the addition of Idaho fescue and to a lesser extent, Geyer's sedge (*Carex geyeri*) in the understory composition. This community occurs towards the upper end of the 15 to 19 inch relative effective annual precipitation range of the site. Both bluebunch wheatgrass and Idaho fescue thrive in the loamy soil textures of the Loamy Calcareous ecological site. Ideal conditions for Idaho fescue includes soils that lack carbonates or the carbonates are deeper in the soil. Additionally, Idaho fescue prefers slightly higher amounts of relative effective annual precipitation than the other grass species found at this ecological site (Zouhar, 2000). Understories dominated by Idaho fescue become more predominant on the upper end of the 15 to 19 inch climatic subset. Production in Community 1.2 ranges from 300 to 792 pounds per acre, averaging 610 pounds per acre. Canopy cover by functional group can be as high as 33 percent for shrubs, 36 percent for grasses, and 13 percent for forbs.

Resilience management. Resilience is moderate in Community 1.2. Black sagebrush and little sagebrush are both drought-tolerant species able to withstand periods of below-average precipitation. Bluebunch wheatgrass is well suited to the variable climate in the Lost River Mountains and is resilient to many natural disturbances including drought and fire. Having Idaho fescue as a co-dominant understory species adds diversity and with that diversity, increased resilience from insect and disease disturbances.

Dominant plant species

- little sagebrush (*Artemisia arbuscula* ssp. *longiloba*), shrub
- black sagebrush (*Artemisia nova*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- rosy pussytoes (*Antennaria rosea*), other herbaceous

- phlox (*Phlox*), other herbaceous
- tapertip hawksbeard (*Crepis acuminata*), other herbaceous

Table 10. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	150	300	400
Shrub/Vine	130	280	352
Forb	20	30	40
Total	300	610	792

Table 11. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	20-33%
Grass/grasslike foliar cover	20-36%
Forb foliar cover	7-13%
Non-vascular plants	0%
Biological crusts	0%
Litter	45-82%
Surface fragments >0.25" and <=3"	1-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	0-10%

Table 12. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-3%
Grass/grasslike basal cover	2-6%
Forb basal cover	0-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	3-25%

Surface fragments >3"	0-7%
Bedrock	0%
Water	0%
Bare ground	40-75%

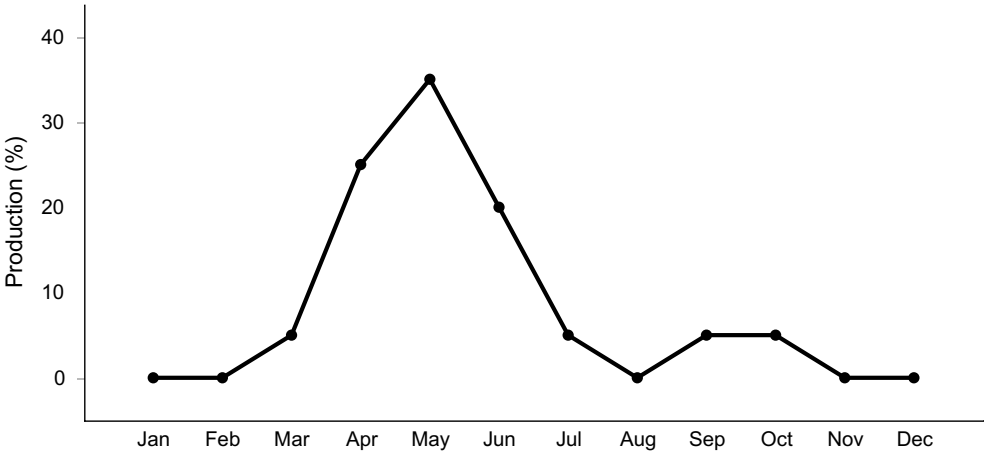


Figure 13. Plant community growth curve (percent production by month). ID0310, ARARL/FEID/ PSSPS. State 1.

Community 1.3
Bluebunch Wheatgrass and Mountain Big Sagebrush



Figure 14. Bluebunch Wheatgrass/Mountain Big Sagebrush community

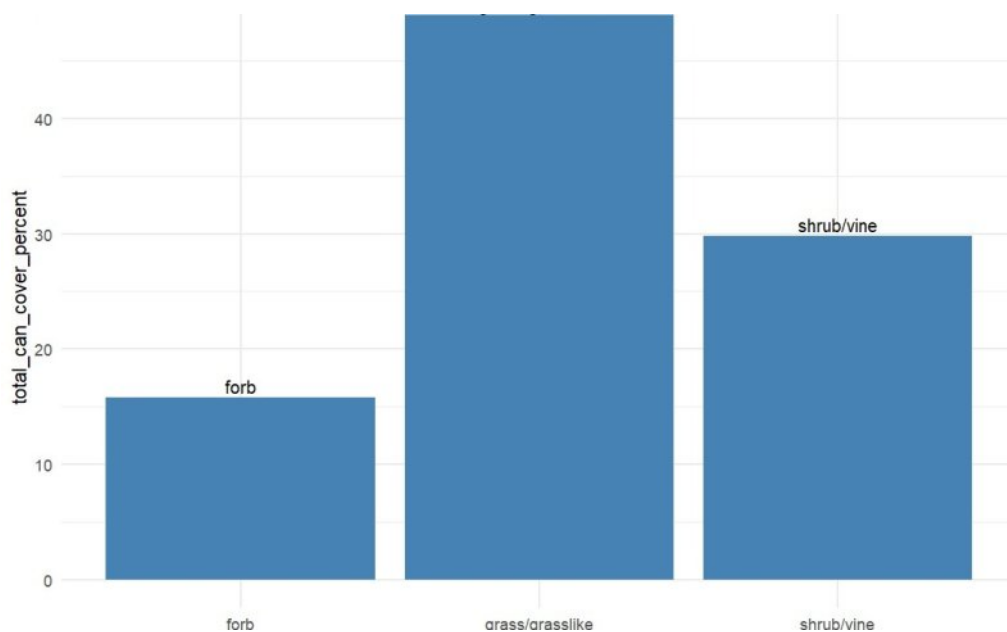


Figure 15. Canopy Cover Percent By Plant Functional Group (Tier III Data)

The Bluebunch Wheatgrass and Mountain Big Sagebrush community is well adapted to the abiotic conditions of the Lost River Mountain LRU. Mountain big sagebrush can occur on Mollisols, Aridisols, and Inceptisols, however, is most abundant on Mollisols (Innes, 2017). Mountain big sagebrush increases in canopy cover as highly calcareous soils are found deeper in the soil profile, which often coincides with a slight increase in relative effective annual precipitation. As seen in this community, mountain big sagebrush can form dense monocultures with little competition from other shrub species. The understory is dominated by bunchgrasses, primarily bluebunch wheatgrass, and to a lesser extent at the higher end of the effective precipitation range, Idaho fescue (*Festuca idahoensis*). Plant diversity in bluebunch wheatgrass/mountain big sagebrush-dominated communities is higher than with any other big sagebrush species. This is primarily due to high diversity in forb and grass understory species (Innes, 2017). Total annual production of Community 1.3 ranges from 550 to 1,100 pounds per acre, averaging 850 pounds per acre. Shrub canopy cover can be as high as 28 percent, with 23 percent comprised of mountain big sagebrush. Grass canopy cover can exceed 50 percent, the majority consisting of bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass (*Poa secunda*). Forb canopy cover can reach 22 percent, but is more often closer to 10 percent.

Resilience management. This community has moderately low resilience. Mountain big sagebrush is the least drought tolerant of the big sagebrush species. Mountain big sagebrush is highly flammable and fire typically kills plants within the disturbance area. Because this species reproduces via seed that is dispersed through wind, water, and zoochory, distance from a viable source population plays a major role in post-disturbance regeneration. When disturbance events cover a large area spatially, the regeneration timespan increases and the likelihood of transitioning to another state or community increases (Innes, 2017). Slow regeneration can open windows for erosion to occur and invasive species to establish. Post-disturbance seeding and planting can increase restoration success. Bluebunch wheatgrass is a much more resilient species to the local disturbance regimes. The species is drought tolerant and usually is not killed except during the most severe wildfire events. During severe disturbances that remove the sagebrush

overstory, bluebunch wheatgrass can persist as the dominant vegetation on this ecological site (Zlatnik, 1999). When Idaho fescue is the dominant understory or shares dominance in the understory, fire return intervals can be as frequent as 10 to 15 years. Although Idaho fescue fares better than mountain big sagebrush during fire events, mortality averages between 20 and 50 percent and can exceed 75 percent after severe events (Zouhar, 2000). Severe fire events prompt a shift into the Disturbed state. The additional effective precipitation received at this site (15 to 19 inch) adds resilience. Available moisture has been shown to be a key component of successful post-disturbance recovery (Chamber et al., 2014).

Dominant plant species

- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- rosy pussytoes (*Antennaria rosea*), other herbaceous
- Indian paintbrush (*Castilleja*), other herbaceous

Table 13. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	439	470	498
Grass/Grasslike	129	244	428
Forb	57	94	171
Total	625	808	1097

Table 14. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	24-29%
Grass/grasslike foliar cover	34-46%
Forb foliar cover	4-11%
Non-vascular plants	0%
Biological crusts	0-2%
Litter	25-82%
Surface fragments >0.25" and <=3"	2-5%
Surface fragments >3"	0-2%
Bedrock	0%
Water	0%
Bare ground	2-5%

Table 15. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-2%
Grass/grasslike basal cover	1-4%
Forb basal cover	0-1%
Non-vascular plants	0%
Biological crusts	0-3%
Litter	0%
Surface fragments >0.25" and <=3"	4-9%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	84-98%

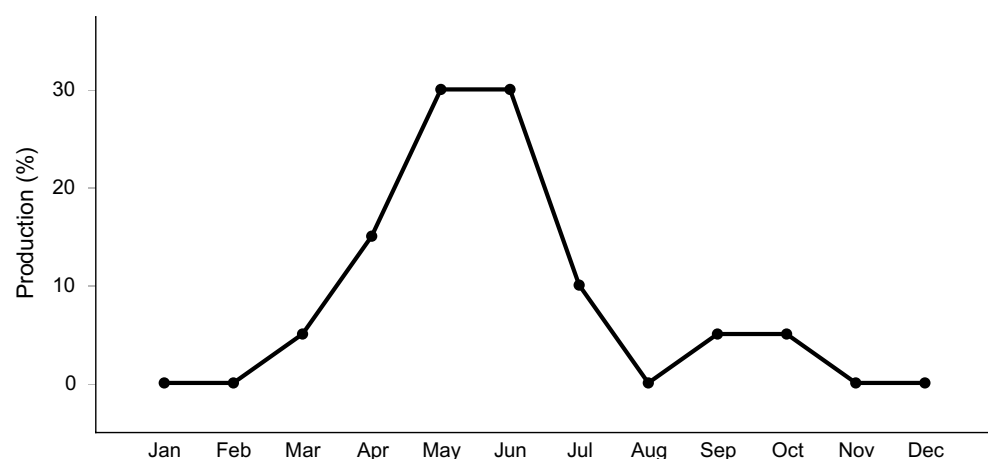


Figure 17. Plant community growth curve (percent production by month). ID0912, ARTRV-PSSP6 high elevation.

Pathway 1.1A

Community 1.1 to 1.2



Little Sagebrush and Bluebunch Wheatgrass



Little Sagebrush and Mixed Bunchgrass

The primary driver that differentiates Community 1.1 and Community 1.2 is a slight increase in relative effective annual precipitation (REAP). When a Loamy Calcareous

ecological site exists at the upper end of the 15 to 19 inch climatic subset, Idaho fescue is more likely to occupy a significant portion of the understory canopy. Idaho fescue prefers slightly higher volumes of effective precipitation and increases in canopy cover and production values accordingly (Zouhar, 2000).

Context dependence. The abiotic conditions that result in community transitions from Community 1.1 to 1.2 are site-specific and not directly influenced by anthropogenic or biotic interactions.

Pathway 1.1B

Community 1.1 to 1.3



Little Sagebrush and
Bluebunch Wheatgrass



Bluebunch Wheatgrass and
Mountain Big Sagebrush

The transition from Community 1.1 to 1.3 is a product of higher volumes of REAP and slight changes in soil characteristics. Of all the big sagebrush species, mountain big sagebrush prefers sites with higher available moisture. Mountain big sagebrush thrives in deep soils that lack shallow concentrations of calcium carbonates (Innes, 2017). As carbonates are pushed deeper into the soil profile, conditions become more ideal for mountain big sagebrush dominance. Likewise, Idaho fescue increases in the understory with increased REAP, closer to 19 inches (Zouhar, 2000).

Context dependence. The abiotic conditions that result in community transitions from Community 1.1 to 1.3 are site-specific and not directly influenced by anthropogenic or biotic interactions.

State 2

Disturbed



Figure 18. Loamy Calcareous 15-19 Inch Ecological Site in the Disturbed State

The Disturbed state is a result of both natural and anthropogenic disturbance events that result in widespread sagebrush mortality at a given site. The primary natural disturbance resulting in sagebrush mortality at this ecological site is wildfire; however, flooding, intense freeze events, and insect and disease can also occur. Mountain big sagebrush is highly susceptible to stand-replacing fires and often experiences complete canopy loss during moderate and severe wildfire events (Innes, 2017; Tirmenstein, 1999). Because this LRU exists primarily on publicly managed lands (US Forest Service, Bureau of Land Management, and State of Idaho), widespread anthropogenic disturbance events are infrequent. Examples of anthropogenic disturbance events include brush management through sagebrush mowing or removal treatments, chemical treatments, or improper grazing techniques that result in high-intensity hoof disturbance. A combination of natural and anthropogenic disturbance is possible and can result in increased severity of disturbance, decreased resilience, and greater difficulty returning to the Reference state. For example, improper grazing practices post-fire disturbance can increase bare ground cover, increase erosion potential, and slow the reestablishment of grass species that preclude the return of overstory sagebrush canopy (Zlatnik, 1999).

Characteristics and indicators. The primary indicator of the Disturbed state is a near-complete loss of overstory sagebrush species, often replaced by shrub species that can take advantage of the local disturbance regime. Common replacement species include *Artemisia tripartita* (threetip sagebrush) and *Chrysothamnus viscidiflorus* (yellow rabbitbrush). A shift towards an increase in native and disturbance-tolerant grasses and forbs is likely with the removal of resource competition associated with the sagebrush overstory presence. Severe disturbance events also increase the opportunity for invasion of annual grasses and weeds such as cheatgrass (*Bromus tectorum*) and thistle species. The canopy cover percentage of these species is usually dependent on the distance of a seed source post disturbance, but mostly stays under five percent (Zlatnik, 1999).

Resilience management. Resilience in this state is moderate. Many of the post-

disturbance grasses and shrubs that are common in this state establish quickly and reach a representative canopy within 10 years post-disturbance. Grasses and shrubs continue to increase until the overstory canopy of sagebrush begins to return. However, local resilience in this state is highly dependent on current soil moisture availability, seed sources, timing and severity of the disturbance. In the instance of fire disturbance, bluebunch wheatgrass mortality can be significantly lower if the fire occurs in the spring as opposed to fall. Recovery can be impacted by the quantity of immediate post-fire precipitation (Zlatnik, 1999). More severe disturbances increase the possibility of post-disturbance invasion. The greater the establishment of invasives, the lower the site resilience becomes

Dominant plant species

- yellow rabbitbrush (*Chrysothamnus viscidiflorus*), shrub
- threetip sagebrush (*Artemisia tripartita*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- Idaho fescue (*Festuca idahoensis*), grass

Community 2.1

Rabbitbrush and Bunchgrass



The Rabbitbrush and Bunchgrass community is driven by the disturbance-related removal of the primary overstory of sagebrush species. Both natural and anthropogenic disturbances that result in near complete removal of the sagebrush overstory create opportunities for increased establishment of both native and non-native grasses and forbs, as well as disturbance tolerant shrubs. In this community, the primary sagebrush removal disturbance at this ecological site is frequent or severe fire. The frequency and severity of these fire disturbances are highly influenced by the overstory composition of the specific site in the Reference state, before disturbance. The composition and extent of the sagebrush species in the overstory impacts that respective fire regime. Communities in the Reference state with mountain big sagebrush overstory are highly susceptible to stand-replacing fire events with fire return intervals ranging from five to 70 years (Innes, 2017 & Termenstein, 1999). This increases the likelihood of transition from the Reference state to the Disturbed state (Community 2.1) following fire disturbances. In Community 2.1, the overstory is comprised of disturbance-tolerant shrubs at a reduced canopy. The primary overstory species include yellow rabbitbrush (*Chrysothamnus viscidiflorus*) and threetip sagebrush (*Artemisia tripartita*). Bunchgrasses, primarily bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*) and Sandberg bluegrass

(*Poa secunda*) primarily occupy the understory. Canopy cover of bunchgrasses is often higher early in the successional period following a disturbance, decreasing as the yellow rabbitbrush or threetip sagebrush canopy increases.

Resilience management. This plant community is moderately resilient because the grasses and forbs that dominate the composition are resistant to a variety of disturbances and able to re-establish quickly in the event of more severe disturbances. Both bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*) are rarely harmed by fire events except for in the most severe instances. Both plants can reduce the amount of heat transfer to the root systems, allowing successful regrowth (Zlatnik, 1999 & Howard, 1997). Studies show that in the absence of grazing, bluebunch wheatgrass-dominated systems can return to pre-fire production levels eight years post-disturbance (Zlatnick, 1999). Sandberg bluegrass has been shown to fully re-establish post-plowing events in as little as 7 years (Howard, 1997). Idaho fescue (*Festuca idahoensis*) is less resilient to both fires and grazing. Idaho fescue can often survive low-severity fires, however, moderate to severe fires are more destructive, resulting in a 30-year return to pre-disturbance canopy cover (Zouhar, 2000). Both yellow rabbitbrush and threetip sagebrush are often the first shrub species to re-establish on this ecological site following a disturbance and can increase in relation to the severity or frequency of the disturbance. Although yellow rabbitbrush can exist in relatively small numbers within the Reference state, it becomes the dominant shrub species in highly disturbed systems (Terminstein, 1999).

Dominant plant species

- yellow rabbitbrush (*Chrysothamnus viscidiflorus*), shrub
- threetip sagebrush (*Artemisia tripartita*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- rosy pussytoes (*Antennaria rosea*), other herbaceous

Table 16. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	310	500	600
Shrub/Vine	100	175	260
Forb	100	125	140
Total	510	800	1000

Table 17. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	3-12%

Grass/grasslike foliar cover	20-45%
Forb foliar cover	5-12%
Non-vascular plants	0%
Biological crusts	0%
Litter	20-40%
Surface fragments >0.25" and <=3"	5-35%
Surface fragments >3"	0-10%
Bedrock	0%
Water	0%
Bare ground	2-10%

Table 18. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0-2%
Grass/grasslike basal cover	2-6%
Forb basal cover	0-3%
Non-vascular plants	0%
Biological crusts	0%
Litter	4-15%
Surface fragments >0.25" and <=3"	3-15%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	0-5%

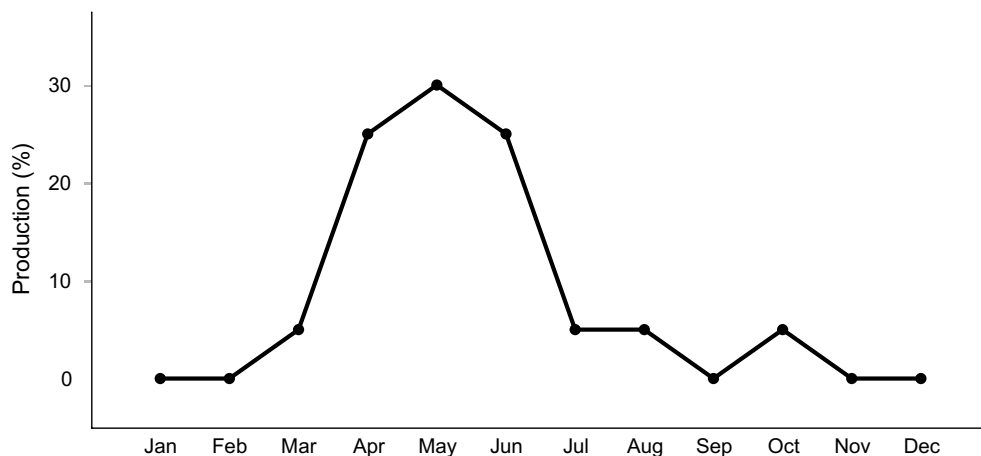
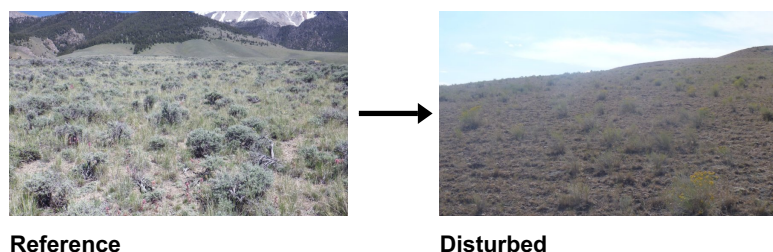


Figure 20. Plant community growth curve (percent production by month). ID1205, FEID-PSSPS. State 1.

Transition T1A State 1 to 2

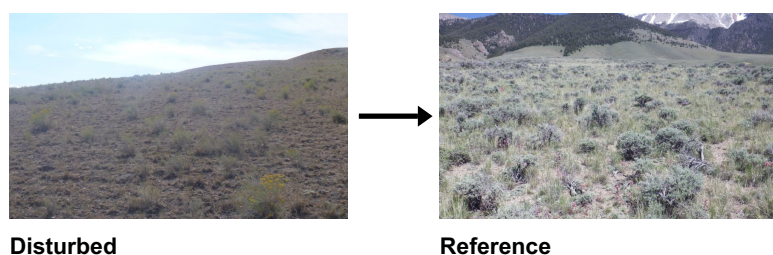


Transition from the Reference to the Disturbed state is a mechanism of moderate to severe disturbance, both natural and anthropogenic. The most likely disturbance to cause this transition is wildfire. Other disturbances include but are not limited to flooding events, freeze kill events, insect and disease, overgrazing, and mechanical brush removal.

Constraints to recovery. The primary constraint to recovery is the distance to a seed source and time. When the disturbance is severe and the extent is great, seed source populations for sagebrush species may be removed from the vicinity. In this case, immigration and re-establishment of overstory sagebrush species can be slow. Re-establishment to pre-disturbance canopy cover and extent of mountain big sagebrush cover generally exceeds 25 years even in ideal conditions (Innes, 2017). This time period can be greatly reduced through seeding and planting interventions.

Context dependence. The primary factors driving the likelihood of restoration success are post-disturbance weather patterns and distance from a viable seed source. Disturbances that cover a larger extent increase the distance to seed sources. Prolonged periods of drought can slow restoration processes. Alternately, average to above average precipitation post disturbance can greatly increase speed and success in re-establishment of sagebrush species (Robin, 2017; Steinberg, 2002; and Fryer, 2009).

Restoration pathway R2A State 2 to 1



The most important mechanism driving restoration from the Disturbed state to the reference is time without sagebrush removing disturbance. Distance from overstory species (sagebrush) seed source can also impact the speed of restoration. Seeding or planting of desired overstory species found in the Reference state can speed restoration

efforts.

Context dependence. Restoration is highly dependent on time without disturbance. New sagebrush seedlings are moderately sensitive to disturbances such as flood, freeze, and insect and disease. They are highly sensitive to herbivory and even low-severity fire events (Fryer, 2009 & Steinberg 2002). Seeding and planting of desired species can speed up the restoration process, however; regeneration success with or without planting is highly dependent on localized weather patterns during the restoration period. Periods of drought will slow the process significantly, whereas periods of above normal precipitation aid in sagebrush regeneration and establishment (Innes, 2017; Steinberg 2002 & Fryer, 2009).

Additional community tables

Table 19. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1				78–567	
	little sagebrush	ARARL	<i>Artemisia arbuscula</i> ssp. <i>longiloba</i>	68–450	5–35
	black sagebrush	ARNO4	<i>Artemisia nova</i>	5–150	1–10
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	5–90	1–5
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	0–20	0–5
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	5–20	0–4
	threetip sagebrush	ARTR4	<i>Artemisia tripartita</i>	0–11	0–5
Grass/Grasslike					
2				69–279	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	62–200	10–20
	bluegrass	POA	<i>Poa</i>	8–135	2–10
	sedge	CAREX	<i>Carex</i>	0–20	0–3
Forb					
3				20–63	
	alpine bluebells	MEAL7	<i>Mertensia alpina</i>	0–10	0–2
	pussytoes	ANTEN	<i>Antennaria</i>	2–10	0–2
	Indian paintbrush	CASTI2	<i>Castilleja</i>	2–9	0–2
	phlox	PHLOX	<i>Phlox</i>	2–9	0–2
	ragwort	SENEC	<i>Senecio</i>	0–9	0–2
	hawksbeard	CREPI	<i>Crepis</i>	0–9	0–1
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–4	0–2

Table 20. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1				130–352	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	50–200	5–15
	little sagebrush	ARARL	<i>Artemisia arbuscula ssp. longiloba</i>	50–200	0–12
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	0–50	0–4
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	0–25	0–2
Grass/Grasslike					
2				150–400	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	100–240	7–20
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	20–175	2–12
	bluegrass	POA	<i>Poa</i>	0–40	0–4
Forb					
3				20–40	
	rosy pussytoes	ANRO2	<i>Antennaria rosea</i>	0–15	1–4
	phlox	PHLOX	<i>Phlox</i>	5–15	1–4
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	0–15	1–3
	milkvetch	ASTRA	<i>Astragalus</i>	0–10	0–2

Table 21. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1				454–484	
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	414–464	23–27
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	30–37	1–3
	common snowberry	SYAL	<i>Symphoricarpos albus</i>	0–25	2
	little sagebrush	ARARL	<i>Artemisia arbuscula ssp. longiloba</i>	0–15	1
	mountain snowberry	SYOR2	<i>Symphoricarpos</i>	0–15	0–1

			<i>oreopniius</i>		
	curl-leaf mountain mahogany	CELE3	<i>Cercocarpus ledifolius</i>	0–15	0–1
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–15	0–1
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	1–9	0–1
Grass/Grasslike					
2				187–336	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	112–400	32–60
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	10–125	2–18
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	0–50	0–7
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–25	0–5
	needlegrass	ACHNA	<i>Achnatherum</i>	0–15	0–1
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–10	0–1
	bluegrass	POA	<i>Poa</i>	0–10	0–1
	sedge	CAREX	<i>Carex</i>	0–10	0–1
Forb					
3				76–133	
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	5–58	1–5
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10–45	3–4
	Indian paintbrush	CASTI2	<i>Castilleja</i>	10–40	2–7
	strawberry clover	TRFR2	<i>Trifolium fragiferum</i>	0–32	0–3
	pussytoes	ANTEN	<i>Antennaria</i>	2–27	1–12
	ballhead sandwort	ARCO5	<i>Arenaria congesta</i>	0–21	0–2
	milkvetch	ASTRA	<i>Astragalus</i>	0–20	0–2
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	0–15	0–2
	lupine	LUPIN	<i>Lupinus</i>	0–15	0–2
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–10	0–3
	cushion phlox	PHPU5	<i>Phlox pulvinata</i>	0–5	0–1
	hawksbeard	CREPI	<i>Crepis</i>	0–5	0–1
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	0–5	0–1
	ragwort	SENEC	<i>Senecio</i>	0–5	0–1
	stoneseed	LITHO3	<i>Lithospermum</i>	0–5	0–1
	clover	TRIFO	<i>Trifolium</i>	0–1	0–5

Table 22. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1				100–260	
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	75–200	2–10
	threetip sagebrush	ARTR4	<i>Artemisia tripartita</i>	50–150	2–8
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	0–50	0–4
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–25	0–3
	black sagebrush	ARNO4	<i>Artemisia nova</i>	0–25	0–3
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	0–25	0–2
Grass/Grasslike					
2				310–600	
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	150–400	10–30
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	150–400	10–30
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	75–200	5–18
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–50	0–5
Forb					
3				100–140	

Animal community

Listed below are production ranges for each community in the Loamy Calcareous ecological site within the 15 to 19 inch climatic subset. These values can be used to estimate stocking rates, however, community composition as listed in this ecological site description may not entirely match the current composition at a given site. Field visits to document actual plant composition and production should be conducted to calculate actual stocking rates at a location.

Communities and Production Ranges (in pounds per acre):

Reference State:

1.1 - 350 - 550 - 750

1.2 - 300 - 610 - 792

1.3 - 550 - 850 - 1,100

Disturbed:

2.1 - 350 - 550 - 750

Wildlife Interpretations:

Sagebrush steppe ecosystems in the Western United States cover nearly 165 million acres and provide vital habitat for over 170 different species of birds and mammals (NWF, 2022).

The sagebrush grasslands in the Lost River Mountain LRU provide critical winter range for mule deer, elk, pronghorn and moose. The LRU also encompasses critical habitat for greater sage grouse populations in the Lemhi, Lost River, and White Knob Mountain mountain ranges. Sage grouse priority planning areas have been identified by the Challis Sage Grouse Local Working Group in Grouse and Morse Creek, the Upper Pahsimeroi north of Sawmill Canyon, Mackay Bar, and Barton Flats (CSLWG, 2007). According to Idaho Fish and Game Management spatial layers developed in conjunction with the Bureau of Land Management, US Forest Service, and US Fish and Wildlife Service, greater sage grouse general habitat exists on the northern end of the White Knob Mountain range, northern end of the Pahsimeroi Mountain range, and portions of the eastern side of the Lemhi and White Knob Mountain ranges. More importantly to the species, significant areas designated important and priority habitat have been identified across the entirety of the White Knob, Lost River, and Lemhi mountain ranges.

The following are dominant plant species within this ecological site and their associated value to wildlife present in the LRU:

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) - Communities 1.3:

Mountain big sagebrush is considered to be highly palatable by most wildlife browsers (Rosenstrater, 2005). Sage grouse, ungulates, and rodents browse mountain big sagebrush primarily during the winter when it becomes one of the more palatable available forages. However, seasonal snow levels can exclude many browsing species. Several studies have shown that Mountain big sagebrush is preferred forage by elk, mule deer, and sage grouse when compared to the other big sagebrush species (Innes, 2017). Sage grouse are considered obligate species of mountain big sagebrush and other big sagebrush varieties. These species are generally preferred over the low sagebrush species; *Artemisia nova* and *Artemisia arbuscula* (Dalke et al., 1963).

Threetip sagebrush (*Artemisia tridentata* ssp. *tripartita*) - Community 2.1:

Threetip sagebrush is not a preferred browse species for most wild ungulates. It can be used to a minor extent by mule deer in both the winter and summer and as an emergency forage for other large ungulates (Tirmenstein, 1999.)

Bluebunch wheatgrass (*Pseudoeogenaria spicata*) - All states/communities:

Bluebunch wheatgrass is considered one of the most important forage species on Western rangelands for both livestock and wildlife (Sours, 1983). In Idaho, utilization of bluebunch wheatgrass by elk was medium-high, medium for mule deer, high for bighorn sheep, and

low for pronghorn (Zlatnik, 1999).

Idaho fescue (*Festuca idahoensis*) - Communities 1.2, 1.3, 2.1

When available, Idaho fescue can be a dominant component to many wild ungulate diets, including pronghorn, deer, elk, and bighorn sheep. In some instances depending on other available forage, the species can be considered as valuable but not preferred forage for ungulates. The species is a valuable component to the diet of the Northern pocket gopher and grizzly bear when it is found within their range.

Sandberg bluegrass (*Poa secunda*) - Communities 1.2, 1.3, 2.1

Sandberg bluegrass is one of the earliest grasses to green up during the spring and become available forage for wildlife; however becomes less utilized during the later summer months. The degree of use for elk and pronghorn is good to poor, and good to fair for mule deer, small mammals, small nongame birds, and upland game birds. Usage is fair to poor by waterfowl (Howard, 1997).

Black sagebrush (*Artemisia nova*): Communities 1.1, 1.2

Mule deer and pronghorn use black sagebrush habitats extensively. Use is especially heavy by mule deer in the early decades after fire disturbance (communities 1.3 and 3.1). This is most prevalent within the first three decades after the fire event (Fryer, 2009). Black sagebrush-dominated sites have been shown as great winter range for pronghorn (Kindschy et al., 1982) and winter distribution has been strongly associated with black sagebrush communities (Clary & Beale, 1983). Sage grouse are obligate species of black and other sagebrush varieties. Generally, big sagebrush communities are preferred by sage grouse; however, some black sagebrush sites on the Snake River Plains and in Nevada have shown to be preferred winter grounds for feeding and cover (Dalke et al., 1963).

Other species of note that rely on black sagebrush communities include great basin pocket mice, Ord's kangaroo rats, sage thrashers, and a large variety of insect pollinator species (Fryer, 2009).

Little sagebrush (*Artemisia arbuscula longiloba*): Communities 1.1, 1.2

In early spring and winter, little sagebrush is often a preferred forage species for mule deer (Blaisdell et al., 1982). In the Great Basin, little sagebrush-dominated sites are heavily utilized by pronghorn during the summer (Kindschy et al., 1982). Little sagebrush, among other varieties, is an important forage source for sage grouse throughout the year (Steinberg, 2002).

Hydrological functions

Annual precipitation is the primary limiting factor of total plant production on this ecological site. Soils associated with this site are primarily associated with hydrologic group B. Runoff potential ranges from moderate to rapid and soil permeability is moderate. Water transmission through the soil is unimpeded.

Higher infiltration rates and lower runoff rates tend to coincide with ground cover percentage. Reduced infiltration and increased runoff have the greatest potential when ground cover is less than 50 percent.

Recreational uses

This ecological site provides hunting opportunities for upland game birds and large game animals including pronghorn, mule deer, elk, and moose. Many trails and campsites exist within the LRU and are maintained by public land management agencies.

The diverse plants that exist in this LRU and on this ecological site have an aesthetic value that appeals to recreationists.

Inventory data references

Site IDs and data collection intensity for each site used in the development of this ecological site description are listed below. Tier III data sets include five rangeland inventory protocols: Line point intercept, canopy/basal gap, production, continuous line intercept for overstory canopy, and soil stability. Tier II datasets include line point intercept and at least one other survey. Tier I datasets include an ocular macroplot survey that involved a site plant census, canopy cover estimates, production by species estimates, and total site production estimates.

Reference State:

Community 1.1:

Tier III - 2018ID7031001, 2021ID7033195, 2021ID7033198

Community 1.2:

Tier III - 2019ID7034040

Tier I - 2020ID7031183

Community 1.3

Tier III - 2020ID7032192, 2020ID7033120, 2020ID7032181

Tier I - 2020ID7032254

Community 2.1:

Tier III - 2020ID7031113

Tier I - 2020ID7032253

Other references

Blaisdell, James P.; Murray, Robert B.; McArthur, E. Durant. 1982. Managing Intermountain rangelands--sagebrush-grass ranges. Gen. Tech. Rep. INT-134. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 41 p.

Challis Sage-grouse Local Working Group (CSLWG). 2007. Challis Sage-grouse Conservation Plan.

Clary, Warren P.; Beale, Donald M. 1983. Pronghorn reactions to winter sheep grazing, plant communities, and topography in the Great Basin. *Journal of Range Management*. 36(6): 749-752.

Dalke, Paul D.; Pyrah, Duane B.; Stanton, Don C.; Crawford, John E.; Schlatterer, Edward F. 1963. Ecology, productivity, and management of sage grouse in Idaho. *Journal of Wildlife Management*. 27(4): 810-841.

Davies, K. Boyd, C. Bates, J. Eighty Years of Grazing by Cattle Modifies Sagebrush and Bunchgrass Structure. 2018. *Rangeland Ecology & Management*, 71(3):27

Fryer, Janet L. 2009. *Artemisia nova*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available:
<https://www.fs.usda.gov/database/feis/plants/shrub/artnov/all.html>

Fryer, Janet L. 1997. *Amelanchier alnifolia*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).

Howard, Janet L. 1997. *Poa secunda*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available:
<https://www.fs.usda.gov/database/feis/plants/graminoid/poasec/all.html>

Innes, Robin J. 2017. *Artemisia tridentata* subsp. *vaseyana*, mountain big sagebrush. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: <https://www.fs.usda.gov/database/feis/plants/shrub/arttriv/all.html>

Kindschy, Robert R.; Sundstrom, Charles; Yoakum, James D. 1982. Wildlife habitats in managed rangelands--the Great Basin of southeastern Oregon: pronghorns. Gen. Tech. Rep. PNW-145. Portland, OR: U.S. Department of Agriculture, Forest Service. 18 p.

Knick, S.T.; Holmes, A.L.; Miller, Richard F. 2005. The role of fire in structuring sagebrush habitats and bird communities. Pages 63-75 In: Saab, Victoria A.; Powell, Hugh D. W. (eds.). *Fire and Avian Ecology in North America*. Studies in Avian Biology No. 30. Camarillo, CA: Cooper Ornithological Society.

McArthur and Stevens. 2009. Composite Shrubs. In: S.B. Monsen, R. Stevens, and N.L. Shaw [compilers]. *Restoring western ranges and wildlands*. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMRS GTR-136-vol-2. p. 493-537.

Miller, M., Belnap, J., Beatty, S., Reynolds, R. (2006). Performance of *Bromus tectorum* L. in Relation to Soil Properties, Water Additions, and Chemical Amendments in Calcareous Soils of Southeastern Utah, USA. Canyonlands Research. 288. 10.1007/s11104-006-0058-4.

National Wildlife Federation (NWF). 2022. Sagebrush Steppe. Retrieved from: <https://www.nwf.org/Educational-Resources/Wildlife-Guide/Threats-to-Wildlife/Climate-Change/Habitats/Sagebrush-Steppe>.

Sours, John M. 1983. Characteristics and uses of important grasses for arid western rangelands. In: Monsen, Stephen B.; Shaw, Nancy, compilers. Managing Intermountain rangelands--improvement of range and wildlife habitats: Proceedings of a symposia; 1981 September 15-17; Twin Falls, ID; 1982 June 22-24; Elko, NV. Gen. Tech. Rep. INT-157. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station: 90-94.

Steinberg, Peter D. 2002. *Artemisia arbuscula*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <https://www.fs.usda.gov/database/feis/plants/shrub/artarb/all.html>

Tilley, D. and L. St. John [2]. 2012. Plant Guide for low sagebrush (*Artemisia arbuscula*). USDA-Natural Resources Conservation Service, Aberdeen Plant Materials Center. Aberdeen, Idaho 83210.

<https://www.fs.usda.gov/database/feis/plants/shrub/chrvs/all.html>
USNVC [United States National Vegetation Classification]. 2021. United States National Vegetation Classification Database, V2.031. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org]

Tirmenstein, D. 1999. *Artemisia tripartita*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).

Tirmenstein, D. 1999. *Artemisia tridentata* subsp. tridentata. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).

Tirmenstein, D. 1999. *Chrysothamnus viscidiflorus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).

Zlatnik, Elena. 1999. *Pseudoroegneria spicata*, bluebunch wheatgrass. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available:

<https://www.fs.usda.gov/database/feis/plants/graminoid/psespi/all.html> [2022, October 25].

Zouhar, Kristin L. 2000. *Festuca idahoensis*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).

Zouhar, Kris. 2003. *Bromus tectorum*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).

Contributors

Zachary Van Abbema
Carla Rebernak
Grant Petersen
Kirt Walstad
Marji Patz
Karen Clause

Acknowledgments

Carla Rebernak
Katelyn Palmer
Nicholas Kozlowski

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)	Zachary Van Abbema
Contact for lead author	Zachary Van Abbema zachary.vanabbema@usda.gov
Date	10/11/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are not present in the reference condition.

2. **Presence of water flow patterns:** Water flow patterns are uncommon in the reference condition. When present, they usually occur on steeper slopes (greater than 15 percent) and are inconspicuous, disconnected, and very short in length.

3. **Number and height of erosional pedestals or terracettes:** Pedestals and/or terracettes: Pedestals are not evident in the reference condition.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is between two to 10 percent. This refers to exposed mineral soil not covered by litter, rock, basal cover, plant cover, standing dead, lichen and/or moss.

5. **Number of gullies and erosion associated with gullies:** Gullies are not present in the reference condition.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind-scoured, or depositional areas are not evident in the reference condition.

7. **Amount of litter movement (describe size and distance expected to travel):** Movement of fine herbaceous litter may occur within less than a foot from where it originated.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Surface Stable with Stability Ratings of 4-6 (both under canopy and bare). Abiotic crusts and or root mats may be present.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is granular with the A horizon ranging from 0 to 50cm thick, averaging 17 cm thick. Predominant A horizon colors are 10YR 3/3 and 10YR 3/2.
-

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plants are evenly distributed across the ecological site and the shrubs and bunchgrasses present improved infiltration as well as protect against runoff.
-

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Not present.
-

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: little sagebrush > bluebunch wheatgrass

Sub-dominant: black sagebrush and mountain big sagebrush > remaining grasses

Other: Indian paintbrush = spiny phlox = pink pussytoes = stemless mock goldenweed

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mortality in herbaceous species is not evident. Species with bunch growth forms may have some natural mortality in centers. Sagebrush species will become decadent in the absence of historical fire return intervals.
-

14. **Average percent litter cover (%) and depth (in):** Total ground litter cover varies but can range from 20 to 50 percent averaging 65 percent. Depth is usually shallow at less than 1/8 inch.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production ranges from 350 to 1,000 lbs/acre, averaging 625 lbs/per acre. Production varies based on effective precipitation and the natural variability of soil properties for this ecological site. Total production is slightly higher for perennial grass species but tends to be slightly higher for shrubs than grasses.
-

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:** Potential invasive species include cheatgrass, spotted knapweed, toadflax, and crested wheatgrass. Native species such as yellow rabbitbrush or significant populations of Sandberg bluegrass or rhizomatous wheatgrasses can indicate a departure from the reference state.
-

17. **Perennial plant reproductive capability:** All functional groups have the potential to reproduce in most years. Bluebunch wheatgrass may not reproduce during extended periods of drought.
-