

Ecological site R012XY025ID

Shallow Subalpine

16+ PZ ARART/FEID

Last updated: 9/22/2020
Accessed: 08/31/2026

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

Land Resource Region: B (Northwestern Wheat and Range) MLRA: 12 (Lost River Valleys and Mountains) EPA EcoRegion: Level III (Middle Rockies)

LRU notes

012X—Lost River Valleys and Mountains Precipitation or Climate Zone: 16+” P.Z. <https://soils.usda.gov/survey/geography/mlra/index.html>

Classification relationships

Artemisia thermopola/ *Festuca idahoensis* HT in “Hironaka, M., M.A. Fosberg, A. H. Winward. 1983. Sagebrush- Grass Habitat Types of Southern Idaho. University of Idaho. Moscow, Idaho. Bulletin Number 35”.

Ecological site concept

Site does not receive additional water. Soils are: Not saline or saline-sodic. Shallow, with >35% (by volume) coarse fragments, skeletal within 20” of the soil surface. Not strongly or violently effervescent in the to 20” of the soil profile. textures usually range from loam to silt loam in surface mineral 4”. Slope is 30%. Clay content is = 35% in surface mineral 4”. Site does not have an argillic horizon with > 35% clay.

Associated sites

R012XY006ID	Windswept 8-16 PZ ARFR4/POSE
R012XY010ID	North Slope Loamy 12-16 PZ ARTR4/FEID
R012XY020ID	Clayey 13-16 PZ ARAR8/FEID
R012XY021ID	Loamy 16-22 PZ ARTRV/FEID
R012XY024ID	Subalpine Slope Loamy 20+ PZ ARTRS2/FEID

Similar sites

R012XY006ID	Windswept 8-16 PZ ARFR4/POSE
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia arbuscula ssp. thermopola</i>
Herbaceous	(1) <i>Festuca idahoensis</i>

Physiographic features

This site occurs on nearly level to very steep high elevation ridgetops and slopes which are exposed to high winds. Elevations range from 7500-9500 feet (2286-2895m).

Table 2. Representative physiographic features

Landforms	(1) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	2,290 – 2,900 m
Aspect	Aspect is not a significant factor

Climatic features

MLRA 12 is dominated by dramatic changes in elevation which, in turn, influence local weather patterns. The intermontane valleys have elevations as low as 3800 feet, while the adjacent mountains may reach more than 12,600 feet. The average annual precipitation for the entire MLRA, based on 10 long term climate stations located throughout the MLRA, is approximately 9.38 inches. However, the dry valleys may have averages as low as 6 inches, while the upper peaks may have averages that exceed 46 inches per year.

Temperatures vary considerably over the year. The average annual temperature is 42.25 degrees F. The average low is 27.4 degrees while the average high temperature is 57 degrees.

In the summer the sun shines 78% of the time, but drops to 40% in the winter. The prevailing wind is location-dependent, and generally flows parallel to the orientation of the dominant valleys. In the summer localized afternoon upslope winds and evening downslope winds are common. The average windspeed is greatest in the spring and early summer.

The frost free period ranges from 102 to 107 days while the freeze free period ranges from 134 to 139 days across the MLRA.

Table 3 Representative climatic features

Frost-free period (average)	110 days
Freeze-free period (average)	140 days

Precipitation total (average)	280 mm
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Influencing water features

This site is not influenced by adjacent wetlands, streams or run on.

Soil features

The soils on this site are very gravelly, stony or flaggy loams and silt loams less than 20 inches to bedrock. Infiltration and water movement is good to restrictive bedrock. The available water holding capacity (AWC) is very low.

Table 4. Representative soil features

Surface texture	(1) Flaggy silt loam
	(2) Stony loam
	(3) Very gravelly

Ecological dynamics

Ecological Dynamics of the Site:

The dominant visual aspect of this site is Hot Spring sagebrush in the overstory and Idaho fescue in the understory. Subdominant species include bluebunch wheatgrass, Sandberg bluegrass, Letterman’s needlegrass, Hoods phlox, and lupine. Composition by weight is approximately 40-50 percent grasses, forbs 20-30 percent and shrubs 25-35 percent.

Herbivory has historically occurred on the site at low levels of utilization. Herbivores include Rocky Mountain elk, mule deer, lagomorphs, and small rodents. Fire has historically occurred on this site every 80 to 100 years. Total annual production is 400 pounds per acre (448 Kg/ha) in a normal year. Production in a favorable year is 600 pounds per acre (672 Kg/ha). Production in an unfavorable year is 175 pounds per acre (196 Kg/ha). Structurally grasses are dominant, followed by shrubs being co-dominant with perennial forbs.

The Historic Climax Plant Community (HCPC) moves through many phases depending on the natural and man-made forces that impact the community over time. State 1, described later, indicates some of these phases. The HCPC is Phase A. This plant community is dominated by Idaho fescue, Hoods phlox and Hot Spring sagebrush. The plant species composition of Phase A is listed later under “HCPC Plant Species Composition”.

Note: Very little is known about the ecology of Hot Spring sagebrush (*Artemisia arbuscula* ssp. *thermopola*). It has an earlier phenology than *A. arbuscula* and is limited in its distribution to relatively high elevation sites, usually within forest settings. (Hironaka,1983). It is probably the result of hybridization between *A. arbuscula* and *A. tripartita* (Beetle, 1960). This species has retained more of the characteristics of *A. arbuscula*, being short in stature and occupying shallow, poorly drained soils. The attribute obtained from *A. tripartita* is the deeply cleft leaves. Likewise, little is known about the influence of improper grazing management or fire on this site.

FUNCTION:

The suitability of this site for grazing by cattle is limited due steep slopes. This site can be most effectively grazed by sheep in the summer. This site has limited value for wildlife due to lack of cover and distance to water. Due to the surface stones on this site, it is fairly resistant to disturbances that can potentially degrade the site. The soils on this site are in hydrologic group D. When ground cover is at or near potential, the erosion hazard is slight to moderate.

This site has good values for aesthetics and recreational hiking. The site is located on elevated areas with views of the valleys and canyons below.

Impacts on the Plant Community.

Influence of fire:

This site historically had a very low fire frequency, approximately every 80-100 years. Most of the shrubs evolved in the absence of fire, therefore they may be severely damaged or killed when burned. Additional data is needed about the fire ecology of Hot Spring sagebrush. Utah juniper can invade the site if a seed source is in the vicinity.

Influence of improper grazing management:

Little is known about the impact of improper grazing management on Hot Spring sagebrush. If this site is accessible by livestock and improper grazing management occurs, Idaho fescue will decline and be replaced by Letterman's needlegrass, bottlebrush squirreltail, and Sandberg bluegrass.

Weather influences:

Above normal precipitation in April, May, and June can dramatically increase total annual production. These weather patterns can also increase viable seed production of desirable species to provide for recruitment. Sandberg bluegrass has the ability to withstand short-term drought by becoming dormant during an abnormally dry spring. However, extended periods of drought impact this site due to the shallowness of the soil and its' low available water holding capacity. Extended drought reduces vigor of the perennial grasses and palatable shrubs. Extreme drought may cause plant mortality.

Influence of insects and disease:

An outbreak of a particular insect or disease is usually influenced by weather but no specific data is available for this site.

Influence of noxious and invasive plants:

Annual and perennial invasive species compete with desirable plants for moisture and nutrients. The result is reduced production and change in composition of the understory.

Influence of wildlife:

Relatively low numbers of wildlife use this site and have little impact on it. Rocky Mountain elk and mule deer are the dominant large herbivores using the site. They use the site in the spring, summer, and fall.

Watershed:

Decreased infiltration and increased runoff occurs when Hot Spring sagebrush is removed with frequent fires, particularly the year following the fire event. The increased runoff also increases sheet and rill erosion. The long-term effect is a transition to a different state. This site has a low erosion hazard but a high run-off potential.

Influence of Utah juniper invasion:

In plant communities that are invaded by Utah juniper, the species has a competitive advantage for the following reasons:

- Utah juniper is very drought tolerant.
- It has the ability to extract soil moisture from a wide range of soil depths.
- Utah juniper has high evapo-transpiration rates.
- The species intercepts rain and snow before it reaches the soil surface.
- It has the ability to grow as long as there is soil moisture and the temperature is above freezing.
- Utah juniper has a relatively rapid growth rate and is long-lived. It can readily over-top shade intolerant species which leads to mortality.
- Nutrient cycling is reduced.
- As the canopy closes, Utah juniper gains control of energy capture

As Utah juniper extracts water, other plants are unable to acquire sufficient water and nutrients to sustain growth and reproduction, thus reducing cover and biomass in the interspaces. After the canopy closes, there is sufficient soil moisture available for shallow-rooted, shade tolerant species to persist directly under the tree.

The following hydrological impacts occur on sites invaded by Utah juniper:

- Infiltration in the interspaces is reduced.
- Run-off increases resulting in increased sheet and rill erosion with elevated sediment loads.
- Soil temperatures increase in the interspaces which results in accelerated drying of the soil surface.
- Increased bare ground in the interspaces.
- Soil moisture storage is reduced.

As bare ground and interconnectiveness of bare ground increases, flow rates are accelerated (reduction of flow sinuosity) and run-off out of the area increases.

Degradation of these systems can result in the formation of a feedback cycle in which greater Utah juniper cover and density results in

greater plant and soil disturbance between the canopies.

In summary, a closed Utah juniper community takes control of the following ecological processes: hydrology, energy capture, and nutrient cycling. The changes are primarily driven by the hydrological processes. The development of a closed Utah juniper canopy always results in a transition across the threshold to a different state. Generally, when Utah juniper canopy cover nears 20%, the plant community is approaching the threshold.

Plant Community and Sequence:

Transition pathways between common vegetation states and phases:

State 1.

Phase A to B. Usually results from improper grazing management and absence of fire. A Utah juniper seed source is present.

Phase A to C. Results from one or more fires.

Phase A to D. Results from improper grazing management and absence of fire. No Utah juniper seed source is present.

Phase B to A. Results from prescribed grazing management, prescribed burning, or fire.

Phase C to A. Develops with prescribed grazing management and no fire.

Phase D to A. Develops from prescribed grazing management , no fire or brush management.

Phase B to C. Results from prescribed burning or fire.

Phase D to C. Results from prescribed burning or fire.

State 1 Phase C to State 2, Phase B. Develops through improper grazing management and frequent fire. This site has crossed the threshold. It is usually uneconomical to return this community to State1 through accelerated practices.

State 1 Phase D to State 2 Phase A. Develops through improper grazing management with no fire. This site has crossed the threshold. It is usually uneconomical to return this community to State1 through accelerated practices.

State 1 Phase B to State 3. Results from improper grazing management and lack of fire. This site has crossed the threshold. It is usually uneconomical to return this community to State1 through accelerated practices.

State 2 Phase A to State 2 Phase B. Results from improper grazing management and frequent fire. This site has crossed the threshold. It is usually uneconomical to return this community to State1 through accelerated practices.

State 2 Phase B to State 2 Phase A. Results from no fire. This site has crossed the threshold. It is usually uneconomical to return this community to State1 through accelerated practices.

State 2 to unknown site. Excessive soil loss and changes in the hydrologic cycle caused by improper grazing management and/or frequent fire cause this state to cross the threshold and retrogress to a new site with reduced potential. It is usually uneconomical to return this community to State1 through accelerated practices.

State 3 to unknown site. Continued lack of fire and improper grazing management cause this state to cross the threshold and retrogress to a new site with reduced potential due to significant soil loss and changes in hydrology. It is usually uneconomical to return this community to State1 through accelerated practices.

Practice Limitations.

Severe limitations exist for brush management and seeding due to steep slopes and shallow, stony soils and the limited extent of the site.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 6.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 7.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 8.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Animal community

Wildlife Interpretations. Animal Community – Wildlife Interpretations This rangeland ecological site provides habitat for select native wildlife species that can tolerate cold sites, high in elevation, with a sparse plant community. Large herbivore use of the reference plant community is dominated by mule deer and elk. The site provides important seasonal habitat for resident and migratory animals including western toad, sagebrush lizard, shrews, bats, jackrabbits, ground squirrels, mice, coyote, red fox, badger, sage-grouse, Ferruginous hawk, prairie falcon, horned lark, and western meadowlark. In isolated areas encroachment of noxious and invasive plant species (cheatgrass and leafy spurge) can replace native plant species which provide critical feed, brood-rearing, and nesting cover for a variety of native wildlife. Water is limited, being provided only by seasonal runoff, artificial water catchments, and spring sites. State 1 Phase 1.1 – Hot Spring Sagebrush/ Idaho Fescue/ Bluebunch Wheatgrass Plant Community (HCPC): This plant community provides a diversity of grasses, forbs, and shrubs used by native insect communities that assist in pollination. The reptile and amphibian community is represented by leopard lizard, short horned lizard, sagebrush lizard, and western skink. Amphibians may be associated with springs and isolated water bodies adjacent to this plant community. Spring developments that capture all available water would preclude the use of these sites by amphibians. Birds that may be resident or migratory include mountain bluebird, lazuli bunting, vesper sparrow, grasshopper sparrow, and lesser goldfinch. Brood-rearing habitat for sage grouse is provided by this diverse plant community. The plant community provides spring and fall forage for large mammals including mule deer and elk. A diverse small mammal population may include golden-mantled ground squirrels, chipmunks, and pikas (when adjacent to talus slopes at high elevations). State 1 Phase 1.2- Hot Spring Sagebrush/ Utah Juniper/ Sandberg Bluegrass Plant Community: This plant community is the result of improper grazing management and no fire. An increase in canopy cover of sagebrush and junipers contributes to a sparse herbaceous understory. A reduced herbaceous understory results in lower diversity and numbers of insects. The reptile community will be similar to the State 1 Phase 1.1 community represented by leopard lizard, short horned lizard, sagebrush lizard, and western skink. The reduced diversity of insects and understory cover may reduce the quality of food and cover for reptile populations. As juniper increases, habitat cover for Brewer's sparrow, sage thrasher, and sage sparrow may increase. Remaining hot spring sagebrush provides brood-rearing habitat for sage-grouse but as juniper encroaches the quality of this habitat is severely reduced or eliminated. The plant community supports limited seasonal habitat for mule deer and elk. As juniper encroaches the site will provide thermal cover and young of year cover for large mammals. A small mammal population including golden-mantled ground squirrels, chipmunks, yellow-bellied marmots, and pikas may utilize this site. State 1 Phase 1.3 – Bottlebrush Squirreltail/ Bluebunch Wheatgrass/ Root Sprouting Shrubs Plant Community: This phase has developed due to fire. The plant community, dominated by herbaceous vegetation with little or no sagebrush provides less vertical structure for animals. Insect diversity would be reduced with the loss of sagebrush, but a native forb plant community similar to State 1 Phase 1.1 would still support select pollinators. Encroachment of gray horsebrush would add fall pollinator habitat to the site. As horsebrush matures it would help replace the loss of sagebrush cover. Until horsebrush is established, diversity and populations of reptiles would be limited or excluded. This plant community provides limited brood-rearing habitat for sage-grouse if the site is adjacent to sagebrush cover. The dominant herbaceous vegetation improves habitat for grassland avian species (horned lark and western meadowlark). Small mammal diversity and populations would be reduced due to loss of cover and increase in hunting success by predators. State 1 Phase 1.4- Hot Spring Sagebrush/ Sandberg Bluegrass Plant Community: This phase has developed due to improper grazing management and no fire. The animal community would be similar to State 1 Phase 1.1. The reduced vigor and canopy cover of forbs would lower the quality of habitat for pollinators. The reptile community includes leopard lizard, short horned lizard, sagebrush lizard, and western skink. The reduced diversity of insects and understory cover may reduce the quality of food and cover for reptile populations. The quality of brood-rearing habitat for sage-grouse would be lowered as herbaceous understory is depleted. The plant community provides limited seasonal habitat for mule deer and elk. A small mammal population including golden-mantled ground squirrels, chipmunks, yellow-bellied marmots, and pikas may utilize this site. State 2 Phase 1.1 - Hot Spring Sagebrush/ Sandberg Bluegrass/ Annuals Plant Community: This plant community is the result of continued improper grazing management and no fire. The

reduced forb and shrub components in the plant community would support a very limited population of pollinators. Most reptilian species identified in State 1 Phase 1.1 are present but the quality of habitat is severely reduced, resulting in small populations and an increase in hunting success by coyotes, fox, and raptors. This plant community provides limited brood-rearing habitat for sage-grouse due to the loss of herbaceous cover. Birds of prey including hawks and falcons may range throughout these areas looking for prey species. Large mammals may utilize the herbaceous vegetation in the early part of the year when the invasive annuals (cheatgrass) are more palatable. At other times of the year large mammals would not regularly utilize these areas due to poor food and cover conditions. Small mammal populations and diversity would be reduced due to poor quality cover, food, and an increase in hunting success by predators. State 2 Phase 1.2 - Sandberg Bluegrass/ Cheatgrass / Annuals/ Gray Horsebrush Plant Community: This plant community is the result of continued improper grazing management and fire. The plant community, dominated by herbaceous vegetation with little or no sagebrush provides less vertical structure for animals. Insect diversity would be reduced with the loss of sagebrush but a native forb plant community similar to State 1 Phase 1.1 would still support select pollinators. Encroachment of gray horsebrush would add fall pollinator habitat to the site. As horsebrush matures it would help replace the loss of sagebrush cover. Until horsebrush is established, diversity and populations of reptiles would be limited or excluded. The site may provide brood-rearing habitat for sage-grouse when adjacent to sagebrush cover. Birds of prey including hawks and falcons may range throughout these areas looking for prey species. Hunting success by raptors may increase. Large mammals may utilize the herbaceous vegetation in the early part of the year when the invasive annuals (cheatgrass) are more palatable. At other times of the year large mammals would not regularly utilize these areas due to poor food and cover conditions. Small mammal populations and diversity would be reduced due to poor quality cover, food, and an increase in hunting success by predators. State 3 – Utah Juniper/ Annuals/ Sandberg Bluegrass: This state has developed due to improper grazing management and no fire. The loss of native forbs and understory vegetation will reduce insect diversity on the site. The lack of flowering plants reduces pollinator diversity including butterflies and moths. The loss of understory will lower the quality of habitat for reptilian species identified in State 1 Phase 1.1. This plant community does not provide the habitat requirements for sage-grouse. Birds using this site as resident or migratory habitat include Juniper titmouse, western bluebird, and Virginia's warbler. The Juniper titmouse relies heavily on juniper seeds for winter food. Hunting success by raptors may decrease due to a heavy overstory of juniper. The plant community supports limited seasonal habitat for mule deer and elk in spring and fall. As juniper encroaches, the site will provide additional thermal cover for large mammals. Grazing Interpretations. The suitability of this site for grazing by cattle is limited due steep slopes. This site can be most effectively grazed by sheep in the summer. Estimated initial stocking rate will be determined with the landowner or decision-maker. They will be based on the inventory which includes species, composition, similarity index, production, past use history, season of use, and seasonal preference. Calculations used to determine estimated initial stocking rate will be based on forage preference ratings.

Hydrological functions

The soils on this site are in hydrologic group D. When ground cover is at or near potential, the erosion hazard is slight to moderate

Recreational uses

This site has good values for aesthetics and recreational hiking. The site is located on elevated areas with a view of the valleys and canyons below.

Wood products

None

Other products

None

Inventory data references

Information presented here has been derived from NRCS clipping and other inventory data. Also, field knowledge of range-trained personnel was used. Those involved in developing this site description include: Dave Franzen, co-owner, Intermountain Rangeland Consultants, LLC Jacy Gibbs, co-owner, Intermountain Rangeland Consultants, LLC Jim Cornwell, Range Management Specialist, IASCD Joe May, State Rangeland Management Specialist, NRCS, Idaho Lee Brooks, Range Management Specialist, IASCD

Type locality

Location 1: Butte County, ID	
General legal description	Exposed ridges near Blizzard Mountain.

Other references

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Approval

Kendra Moseley, 9/22/2020

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.

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Date	03/28/2007
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills: rarely occur on this site due to the stony surface soils.

2. **Presence of water flow patterns:** Water-Flow Patterns: rarely occur on this site. When they do occur they are short and disrupted by cool season grasses, shrubs, and surface stones. They are not extensive.

3. **Number and height of erosional pedestals or terracettes:** Pedestals and/or Terracettes: are rare but can occur on the site especially where flow patterns are present and on slopes greater than 20%.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground: ranges from 25-35 percent but additional data is needed.

5. **Number of gullies and erosion associated with gullies:** Gullies: do not occur on this site.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind-Scoured, Blowouts, and/or Deposition Areas: This site is naturally scoured by wind. Surface stones and vegetation protect the soil from additional wind erosion.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter Movement. Fine litter in the interspaces typically moves up to three feet or further. Fine litter can be moved by both wind and water. Coarse litter generally does not move.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Surface Resistance to Erosion: values should range from 4 to 6 but needs to be tested.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil Surface Loss or Degradation: the A or A1 horizon is typically 1 to 7 inches thick. Structure is weak very fine to fine granular. Soil organic matter (SOM) ranges from 1 to 3 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant Community Composition and Distribution Relative to Infiltration: bunchgrasses and shrubs slow runoff and increase infiltration. Little to no snow accumulation occurs on the site due to winter winds and low growing vegetation.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compaction Layer: not present. Do not mistake an increase in clay content of the subsoil for a compaction layer.

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: Functional/Structural Groups: perennial bunchgrasses> forbs= shrubs.

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence** (include which functional groups are expected to show mortality or decadence):
Plant Mortality/Decadence: very little mortality or decadence is expected on this site. Mortality of shallow rooted grasses may occur due to extended periods of drought.
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14. **Average percent litter cover (%) and depth (in):** Litter Amount: additional data is needed but is expected to be low and at a shallow depth.
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15. **Expected annual annual-production** (this is TOTAL above-ground annual-production, not just forage annual-production):
Annual Production: is 400pounds per acre (448 Kg/ha) in a year with normal precipitation and temperatures. Perennial grasses produce 40-50 percent of the total production, forbs 20-30 percent and shrubs 25-35percent.
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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: Invasive Plants: include annual mustards and leafy spurge.
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17. **Perennial plant reproductive capability:** Reproductive Capability of Perennial Plants: all functional groups have the potential to reproduce in normal and favorable years.
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