USDA Natural Resources Conservation Service

Ecological site R047XA630UT
Subalpine Stony Loam (snowfield sagebrush)

Last updated: 2/06/2025
Accessed: 03/05/2026

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.

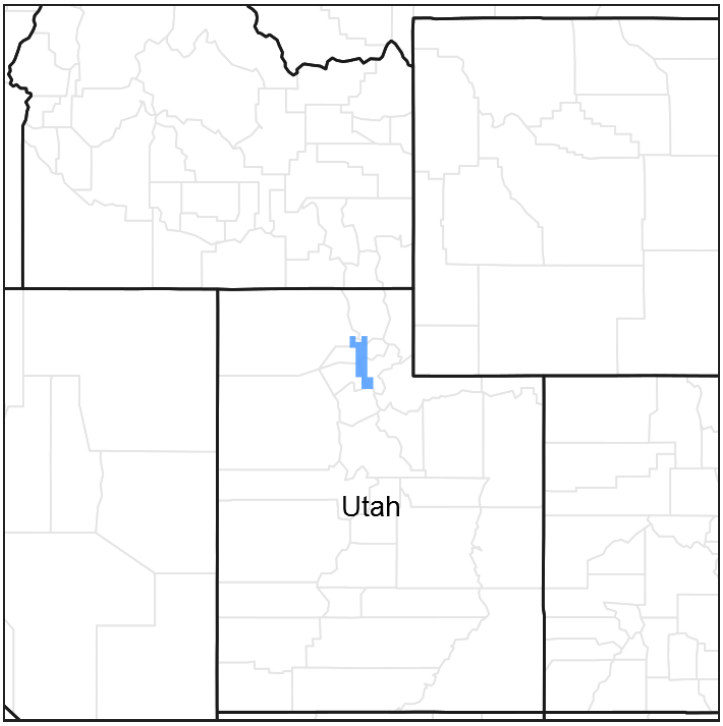


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 047X–Wasatch and Uinta Mountains

MLRA 47 occurs in Utah (86 percent), Wyoming (8 percent), Colorado (4 percent), and Idaho (2 percent). It encompasses approximately 23,825 square miles (61,740 square

kilometers). The northern half of this area is in the Middle Rocky Mountains Province of the Rocky Mountain System. The southern half is in the High Plateaus of the Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south, and the Uinta Mountains, which trend east and west. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. The Uinta Mountains have a broad, gently arching, elongated shape. Structurally, they consist of a broadly folded anticline that has an erosion-resistant quartzite core. The Wasatch and Uinta Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters).

The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifers. An ancient shoreline of historic Bonneville Lake is evident on the footslopes along the western edge of the area. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments, but Precambrian rocks are exposed in the Uinta Mountains. The Uinta Mountains are one of the few ranges in the United States that are oriented west to east. The southern Wasatch Mountains consist of Tertiary volcanic rocks occurring as extrusive lava and intrusive crystalline rocks.

The average precipitation is from 8 to 16 inches (203 to 406 mm) in the valleys and can range up to 73 inches (1854 mm) in the mountains. In the northern and western portions of the MLRA, peak precipitation occurs in the winter months. The southern and eastern portions have a greater incidence of high-intensity summer thunderstorms; hence, a significant amount of precipitation occurs during the summer months. The average annual temperature is 30 to 50 degrees Fahrenheit (-1 to 15 C). The freeze-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. Mesic temperature regimes come in on the lower elevations and south facing slopes in the southern portion of this MLRA. The soil moisture regime is typically xeric in the northern part of the MLRA, but grades to ustic in the extreme eastern and southern parts. The mineralogy is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

LRU notes

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

Classification relationships

Modal Soil: Spearhead Family GR-L, 15 to 17% — loamy-skeletal, mixed Pachic Cryoborolls

Ecological site concept

The soils of this site formed in colluvium derived from mixed sedimentary. They are moderately deep to deep, have moderate permeability, and are well-drained. Surface layers are thick and dark brown with gravelly or cobbly loam textures. Rock fragments are usually visible on the soil surface and make up greater than 35 percent of the soil volume. These soils are moderately acidic to neutral with pH ranging from 5.6 to 7.3. Available water-holding capacity ranges from 3.1 to 4.0 inches of water in the upper 40 inches of soil. The soil moisture regime is udic and the soil temperature regime is cryic.

Associated sites

R047XA614UT	**Subalpine Loam (cranesbill)**

Similar sites

R047XA614UT	**Subalpine Loam (cranesbill)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. spiciformis*
Herbaceous	(1) *Elymus trachycaulus*

Physiographic features

This site occurs on mountain slopes, hill slopes and ridges at elevations between 7,500 to 9,500 feet. It is commonly found on east and southeast slopes, but may occur on other aspects. Slopes are moderately to very steep ranging from 30 to 70 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	2,286–2,896 m

Slope	30–70%
Aspect	E, SE

Climatic features

The climate of this site is characterized by cold, snowy winters and cool, dry summers.

Table 3. Representative climatic features

Frost-free period (characteristic range)	60-80 days
Freeze-free period (characteristic range)	70-90 days
Precipitation total (characteristic range)	889-1,219 mm
Frost-free period (average)	70 days
Freeze-free period (average)	80 days
Precipitation total (average)	1,016 mm

Influencing water features

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

Wetland description

N/A

Soil features

The soils of this site formed in colluvium derived from mixed sedimentary. They are moderately deep, have moderate permeability, and are well-drained. Surface layers are thick and dark brown with gravelly or cobbly loam textures. Rock fragments are usually visible on the soil surface and make up greater than 35 percent of the soil volume. These soils are moderately acidic to neutral with pH ranging from 5.6 to 7.3. Available water-holding capacity ranges from 3.1 to 4.0 inches of water in the upper 40 inches of soil. The soil moisture regime is udic and the soil temperature regime is cryic.

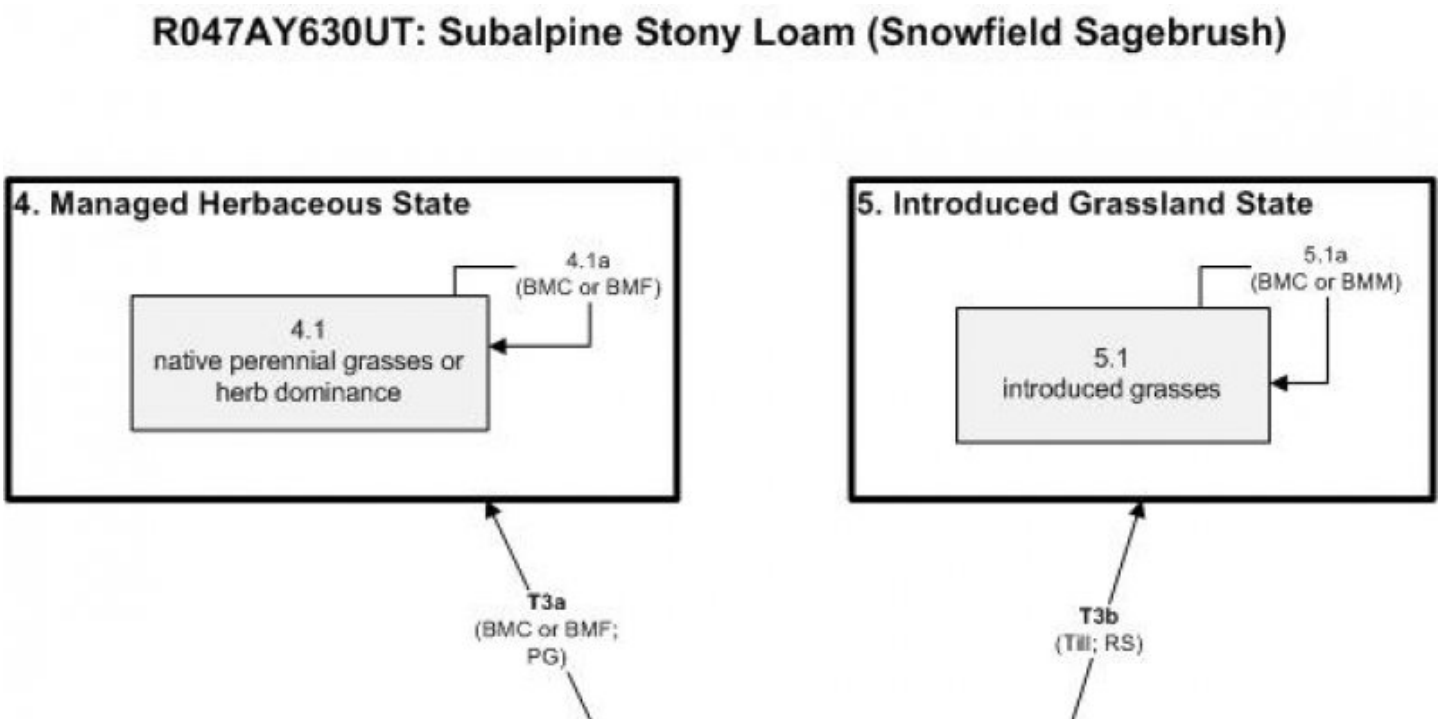
Table 4. Representative soil features

Parent material	(1) Colluvium–limestone, sandstone, and shale
Surface texture	(1) Gravelly loam (2) Cobbly loam
Family particle size	(1) Loamy-skeletal

Drainage class	Well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	51–102 cm
Soil depth	51–102 cm
Surface fragment cover <=3"	10–20%
Surface fragment cover >3"	5–20%
Available water capacity (0-101.6cm)	7.87–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	30–35%
Subsurface fragment volume >3" (Depth not specified)	7–11%

Ecological dynamics

State and transition model



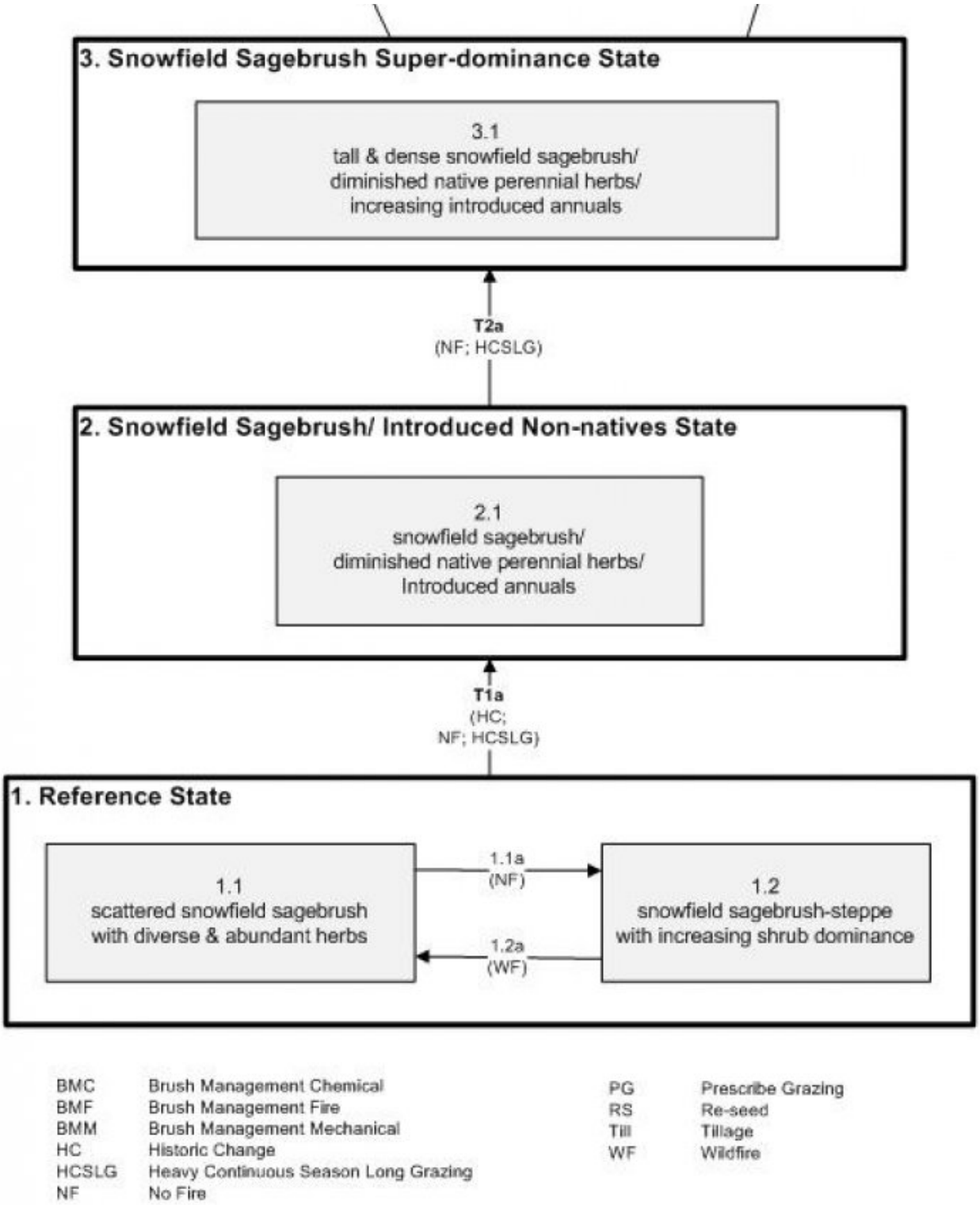


Figure 2. State and Transition Model

State 1
Reference State

The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity with rangeland relict areas where they exist. The dominant shrub would have been snowfield sagebrush (Artemisia spiciformis) (Shultz 2006). A lush perennial understory would have been composed of grasses including slender wheatgrass (*Elymus trachycaulus*), spike fescue (*Leucopoa kingii*), Columbia needlegrass (*Achnatherum*

nelsonii), and nodding brome (*Bromus anomalus*). Forbs would have included sticky purple geranium (*Geranium viscosissimum*), Fendler's meadow-rue (*Thalictrum fendleri*), Nevada pea (*Lathyrus lanszwertii*), and sulphur-flower buckwheat (*Eriogonum umbellatum* var. umbellatum) among many others. A more complete list of species by lifeform for the Reference State is available in accompanying tables in the "Plant Community Composition by Weight and Percentage" section of this document. The time elapsed since last wildfire would have been the driving factor behind the relative abundance of shrubs relative to the associated understory. Following a recent wildfire (1.2a), an herbaceous dominant phase would have been found (1.1). As the time since last fire increased (1.1a), the shrub component would have increased (1.2).

Community 1.1
Reference State

Community Phase 1.1: scattered snowfield sagebrush with diverse & abundant herbs This plant community would have been a sagebrush-steppe where the herbaceous component would have been slightly greater than the shrub component. The dominant herbaceous species would have included slender wheatgrass, spike fescue, Columbia needlegrass, nodding brome, sticky purple geranium, Fendler's meadow-rue, Nevada pea, and sulphur-flower buckwheat, along with a scattering of snowfield sagebrush. Community Pathway 1.1a: As the length of time elapsed since the last fire lengthened the shrubs would have increased relative to the herbs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	532	813	1037
Shrub/Vine	319	488	622
Forb	213	325	415
Total	**1064**	**1626**	**2074**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	29-31%
Forb foliar cover	9-11%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%

Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	–	29-31%	9-11%
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
snowfield sagebrush-steppe with diverse with increasing shrub dominance

Community Phase 1.2: snowfield sagebrush-steppe with diverse with increasing shrub dominance This phase would have been characterized by a greater proportion of snowfield sagebrush relative to the herbs. Community Pathway 1.2a: Wildfire would temporarily reduce the shrub dominance allowing the native perennial grasses and forbs to dominate.

State 2
Snowfield Sagebrush/ Introduced Non-natives State

State 2 is very similar to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions of some native species, and a different climate. State 2 is a description of the ecological site shortly following Euro-American settlement. This state can be regarded as the current potential. The primary shrub is snowfield sagebrush. The native perennial herbs are slightly reduced due to impacts from heavy seasonal grazing, but the species would likely still include those present in the Reference State (State 1). A small component of non-native introduced annuals are now also present including Douglas' knotweed (*Polygonum douglasii*),

mountain tarweed (*Madia glomerata*), and Kentucky bluegrass (*Poa pratensis*). The resiliency of this State is maintained by a healthy, productive, and diverse plant community that can provide native seed sources and promotes soil stability, water infiltration, and soil moisture retention. The maintenance this State will be encouraged by a reduction in livestock grazing pressure. Conversely, continued heavy livestock grazing during the growing season will negatively impact the resiliency of this State.

Community 2.1
Snowfield Sagebrush/ Introduced Non-natives State

Community Phase 2.1: snowfield sagebrush/ diminished native perennial herbs/ introduced annuals The primary plant community in State 2 is a snowfield sagebrush-dominated site with a slightly diminished native perennial herbaceous understory. Species include slender wheatgrass, spike fescue, Columbia needlegrass, nodding brome, sticky purple geranium, Fendler's meadow-rue, Nevada pea, and sulphur-flower buckwheat; however several introduced annual species occur as well.

State 3
Snowfield Sagebrush Super-dominance State

Snowfield sagebrush has grown denser and taller in areas that have received nearly a century-long period of heavy livestock grazing during growing season of herbs and where fire has been suppressed (T2a). Introduced annuals such as common dandelion (*Taraxacum officinale*), mountain tarweed, and Douglas' knotweed have become abundant in the understory. The stability of this less desirable State is maintained by the lack of a healthy, productive and diverse herb component capable of providing native seed source and soil moisture retention. Heavy growth-season livestock grazing will negatively impact the resiliency of this State.

Community 3.1
Snowfield Sagebrush Super-dominance State

Community Phase 3.1: tall & dense snowfield sagebrush/ diminished native perennial herbs/ Increasing introduced annuals This plant community is characterized snowfield sagebrush dominance. The native perennial herbs have nearly been grazed out while several grazing-tolerant annual species have been introduced.

State 4
Managed Herbaceous State

This state is dominated by native perennial herbs, either pure grasses or mixed forbs and grasses (4.1). If shrubs are removed by chemical means, the forb component will also be removed leaving only the native perennial grasses. If prescribed fire is used to remove shrubs, this will provide an equal opportunity for both grasses and forbs to respond. If keeping the shrubs back is desirable, then re-treatment using fire or chemicals may be

necessary (4.1a). The resiliency of this State will be maintained by reductions in livestock grazing. Accelerated soil erosion will reduce the resiliency of this State.

Community 4.1
Managed Herbaceous State

Community Phase 4.1: native perennial grasses or herb dominance This plant community is dominated by purely grasses or a mixture of native perennial forbs and grasses following brush removal by either chemical or prescribed fire, respectively. Community Pathway 4.1a: Re-treatment of brush by either chemical means or prescribed fire may be necessary to maintain this herbaceous State.

State 5
Introduced Grassland State

This State is dominated by introduced grasses such as ‘Sherman’ big bluegrass (a variety of Poa ampla), smooth brome, or orchardgrass.

Community 5.1
Introduced Grassland State

Community Phase 5.1: introduced grasses Introduced grasses are dominant in this plant community. Community Pathway 5.1a: Re-treatment of brush by either chemical or mechanical means will be required to maintain a grass-dominated State.

Transition T1a
State 1 to 2

T1a: from State 1 to State 2 (Reference State to Snowfield Sagebrush/ Introduced Non-natives State) The simultaneous introduction of exotic species, both plants and animals, possible extinctions of native flora and fauna, and climate change has caused State 1 to transition to State 2. Reversal of such historic changes (i.e. a return pathway) back to State 1 is not practical, but because this plant community is particularly resilient, it may be possible to achieve a plant community that is almost identical to the Reference State.

Transition T2a
State 2 to 3

T2a: from State 2 to State 3 (Snowfield Sagebrush/ Introduced Non-natives State to Snowfield Sagebrush Super-dominance State) Prolonged lack of fire and heavy continuous season-long grazing (which occurred at many sites particularly between the 1860s and the 1950s), creates a shrub-dominated site where introduced annuals begin to replace the native herbaceous species. The approach to this transition is indicated by an increase in size, age class, and density of sagebrush and by a reduction in the understory.

The trigger causing this transition is heavy growing season livestock grazing. If seed sources for desirable native species are still present, it may be possible to avoid or reverse this transition with a reduction in growing season livestock grazing.

Transition T3a
State 3 to 4

T3a: from State 3 to State 4 (Snowfield Sagebrush Super-dominance State to Managed Herbaceous State Depending on the desired outcome and provided adequate native perennial species are still present, a the establishment of a native herbaceous community is possible through brush removal using either chemical means (i.e. 2,4-D) or prescribed fire, followed by a period of grazing deferment for at least one year, and moderate grazing thereafter.

Transition T3b
State 3 to 5

T3b: from State 3 to State 5 (Snowfield Sagebrush Super-dominance State to Introduced Grassland State On sites with lowered productivity and reduced native species, some have opted to till and re-seed with an introduced species such as orchardgrass (*Dactylis glomerata*), or Kentucky bluegrass (*Poa pratensis*) to increase forage production potential. Smooth brome (*Bromus inermis*) may have also been seeded to control soil erosion.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrub**			420–504	
	big sagebrush	ARTRS2	*Artemisia tridentata ssp. spiciformis*	420–504	–
3	**Sub-Dominant Shrubs**			50–84	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	50–84	–
Grass/Grasslike					
0	**Dominant Grasses**			471–757	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	252–336	–
	spike fescue	LEKI2	*Leucopoa kingii*	84–168	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	84–168	–
1	**Sub-Dominant Grasses**			235–538	

	Grass, annual	2GA	*Grass, annual*	84–168	–
	Grass, perennial	2GP	*Grass, perennial*	84–168	–
	nodding brome	BRAN	*Bromus anomalus*	17–50	–
	Geyer's sedge	CAGE2	*Carex geyeri*	17–50	–
	oniongrass	MEBU	*Melica bulbosa*	17–50	–
	nodding bluegrass	PORE	*Poa reflexa*	17–50	–
Forb					
0	**Dominant Forbs**			50–84	
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	50–84	–
2	**Sub-Dominant Forbs**			454–857	
	Forb, annual	2FA	*Forb, annual*	168–252	–
	Forb, perennial	2FP	*Forb, perennial*	168–252	–
	common yarrow	ACMI2	*Achillea millefolium*	17–50	–
	aspen fleabane	ERSP4	*Erigeron speciosus*	17–50	–
	sulphur-flower buckwheat	ERUMU2	*Eriogonum umbellatum var. umbellatum*	17–50	–
	common sneezeweed	HEAU	*Helenium autumnale*	17–50	–
	Nevada pea	LALA3	*Lathyrus lanszwertii*	17–50	–
	spearleaf stonecrop	SELA	*Sedum lanceolatum*	17–50	–
	Fendler's meadow-rue	THFE	*Thalictrum fendleri*	17–50	–

Animal community

This site is grazed by cattle and sheep during the summer and fall.
This site provides food for many species of wildlife. It rates high for rangeland and open land, but low for wetland and woodland. The vegetation provides access by coyote, badger, mule deer, elk, and blue grouse.

Hydrological functions

The soil series in this site are in hydrologic groups b and c and the hydrologic curve numbers are 61 and 74 when the vegetation is in good condition.

Recreational uses

This site has high values for aesthetics and natural beauty. The diversity of forbs blooming gives it a high value.

Wood products

None

Inventory data references

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

Other references

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Contributors

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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	11/29/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rare to very few. Some very minor rill development may occur on steeper slopes (>20%) or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Any rills present should be <1 inch deep, fairly short (<6 feet long) and somewhat widely spaced (8-10 feet). Minor rill development may be observed following major thunderstorm or spring runoff events, but they should heal during the next growing season.

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2. **Presence of water flow patterns:** Slight. Some very minor evidence of water flow patterns may be found around perennial plant bases. They show little evidence of current erosion. They are expected to be somewhat short (3-6 feet), stable, sinuous and not connected. There may also be very minor evidence of deposition. Evidence of water flow may increase somewhat with slope.

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3. **Number and height of erosional pedestals or terracettes:** None to Slight. Perennial vegetation shows little evidence of erosional pedestalling (2 to 3% of individual plants). Plant roots are covered and litter remains in place around plant crowns. Terracettes should be absent or, if present, stable. A slight increase in both pedestal and terracette development may occur with increasing slope.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 25-35% bare ground. Soil surface is typically covered by 25 to 35% coarse fragments. Bare ground spaces should not be greater than 2 to 3 feet in diameter and should not be connected.

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5. **Number of gullies and erosion associated with gullies:** None to Very Few. A few gullies may be present in landscape settings where they transport runoff from areas of greater water flow such as exposed bedrock. These gullies will be limited to slopes exceeding 20% slope and adjacent to sites where this runoff accumulation occurs. Any gullies present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. No evidence of wind generated soil movement is expected. No blowouts or depositional materials are present.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water movement. Minor litter removal may occur in flow channels with deposition occurring within 1 to 2 feet at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move. However, some litter movement is expected (up to 6 feet) with increases in slopes > 20% and/or increased runoff resulting from heavy thunderstorms.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 5 or 6 under the plant canopies, and a rating of 4 to 5 in the interspaces. The average rating should be a 5. Soil surface texture is typically a silty clay.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Nagitsy) Soil surface 0-7 inches. Texture is a gravelly loam; color is dark grayish brown (10 YR 4/2); structure is strong very fine and weak fine granular. Mollic epipedon extends to 34 inches. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation provides sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface and cryptogamic crusting, where present, protect soil surface from splash erosion and encourages a higher rate of infiltration. Good plant spatial distribution will slow runoff, allowing additional time for infiltration. Bare spaces are expected

to be small and irregular in shape and are usually not connected. Vegetative structure is usually adequate to capture snow and ensure that snowmelt occurs in a controlled manner, allowing time for good infiltration, reducing runoff and erosion. When perennial grasses and shrubs decrease due to natural events, including drought, insect damage, etc., which may reduce ground cover, runoff is expected to increase and infiltration be reduced.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Some soils may have natural textural variability within their profiles, including changes in clay content, these should not be mistaken for a compaction pan.

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

    Dominant: Rhizomatous grasses (slender wheatgrass) > Shrub (Subalpine big sagebrush), > Perennial bunchgrasses (Columbia needlegrass, King fescue) > Perennial Forbs (sticky purple germanium).

    Sub-dominant: Sprouting shrub (green rabbitbrush)

    Other: Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

    Additional: Natural disturbance regimes include fire, drought, and insects. Assumed fire cycle of 40 to 60+ years. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state. Following a disturbance such as fire, drought, rodents or insects that remove woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a period of time. If a disturbance has not occurred for an extended period of time, woody species may continue to increase. These conditions would reflect a functional community phase within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present under average to above average growing conditions with age class expression likely subdued during periods of extended drought. Slight decadence in the principle shrubs could

occur near the end of the fire cycle or during periods of extended drought, or insect infestations. In general, a mix of age classes should be expected with some dead and decadent plants present.

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14. **Average percent litter cover (%) and depth (in):** Litter cover will be heavier under plants. Most litter will be herbaceous and depths of 1 to 2 inches would be considered normal. Perennial vegetation should be well distributed on the site.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 1400 - 1500#/acre on an average year, but could range from 900 to 1900#/acre during periods of prolonged drought or above average precipitation.

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

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