USDA Natural Resources
Conservation Service

Ecological site R047XC456UT
Mountain Stony Loam (antelope bitterbrush)

Last updated: 2/11/2025
Accessed: 05/21/2025

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.

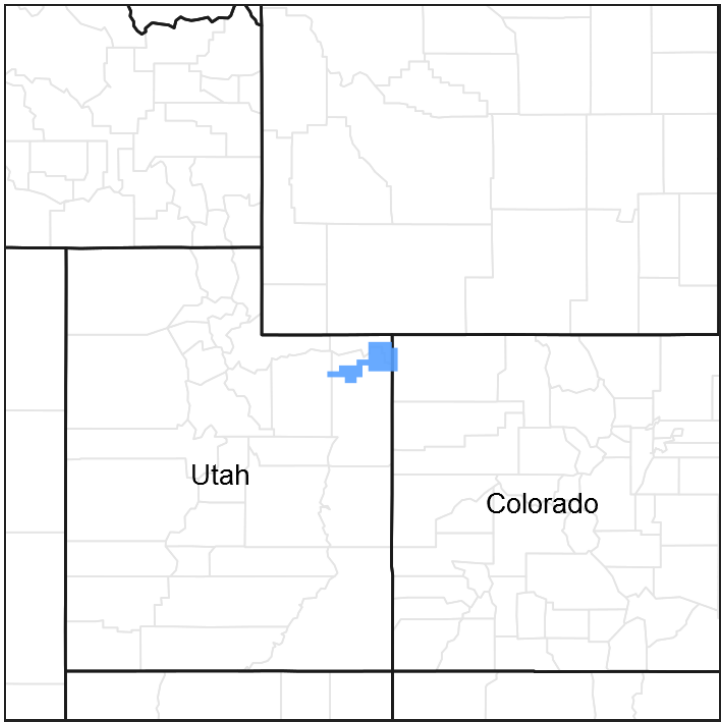


Figure 1. Mapped extent

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 minerology is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

LRU notes

E47C is the Uinta Mountains portion of MLRA 47 that run east and west which includes the Uinta Wilderness and The Flaming Gorge National Recreation Area and towns such as Evanston, Wyoming, Hanna and Tabiona, Utah. Structurally these mountains consist of a broadly folded anticline that has an erosion resistance quartzite core. The Duchesne River and many other tributaries to the Green River run through this range, as well as the headwaters of the Bear River.

Ecological site concept

The soils of this site formed in alluvium derived from sandstone and quartzite with some locations derived from dolomitic limestone. The soil is well drained and has cobbles on the soil surface. The permeability is moderate and available water capacity is between 2.4 to 3.1 inches of water in the upper 40 inches of soil. The pH is between 6.6 and 7.8 with some locations up to a pH of 8.4. The soil temperature regime is frigid and the soil moisture regime is ustic.

Associated sites

R047XC430UT	**Mountain Loam (mountain big sagebrush)**
R047XC446UT	**Mountain Shallow Loam (mountain big sagebrush)**
R047XC460UT	**Mountain Stony Loam (shrub)**
R047XC475UT	**Mountain Windswept Ridge (black sagebrush)**

Similar sites

R047XC460UT	**Mountain Stony Loam (shrub)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Purshia tridentata*
Herbaceous	(1) *Hesperostipa comata*

Physiographic features

This site occurs on mountain slopes and fan remnants. It is found at elevations between 6800 to 7600 feet with some locations occurring on Clyl soil up to 9000 feet. The slope ranges from 4 to 25 percent with locations occurring on Clyl soils with slopes up to 40 percent. This site has medium to high runoff potential.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Fan remnant
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	2,073–2,316 m

Slope	4–25%
Aspect	Aspect is not a significant factor

Climatic features

The climate is cold and snowy in the winter and cool and moist in the summer. Approximately, 55 percent of the moisture comes as rain from May through September. On the average, October through January are the driest months and March, April, May and August are the wettest months. The soil moisture regime is ustic and soil temperatures are in the frigid regime.

Table 3. Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	
Precipitation total (average)	508 mm

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands. However, it may be located upslope from these water features.

Wetland description

N/A

Soil features

The soils of this site formed in alluvium derived from sandstone and quartzite with some locations derived from dolomitic limestone. The soil is well drained and has cobbles on the soil surface. The permeability is moderate and available water capacity is between 2.4 to 3.1 inches of water in the upper 40 inches of soil. The pH is between 6.6 and 7.8 with some locations up to a pH of 8.4. The soil temperature regime is frigid and the soil moisture regime is ustic.

Soils associated with this site:
Soil Survey Area: Soil component (map unit)

Dinosaur National Monument, Colorado and Utah (CO686, UT6520: Clyl (255); Flynncove (256, 258, 266)
Uintah Area (UT047): Clyl (54); Flynncove (56, 58, 59, 70, 72, 134, 161, 195, 196)
Duchesne Area (UT013): Flynncove (BJC); Jonstar (BJC)

Modal Soil: Flynncove CB-L, 4 to 25% — loamy-skeletal, mixed Aridic Argiborolls

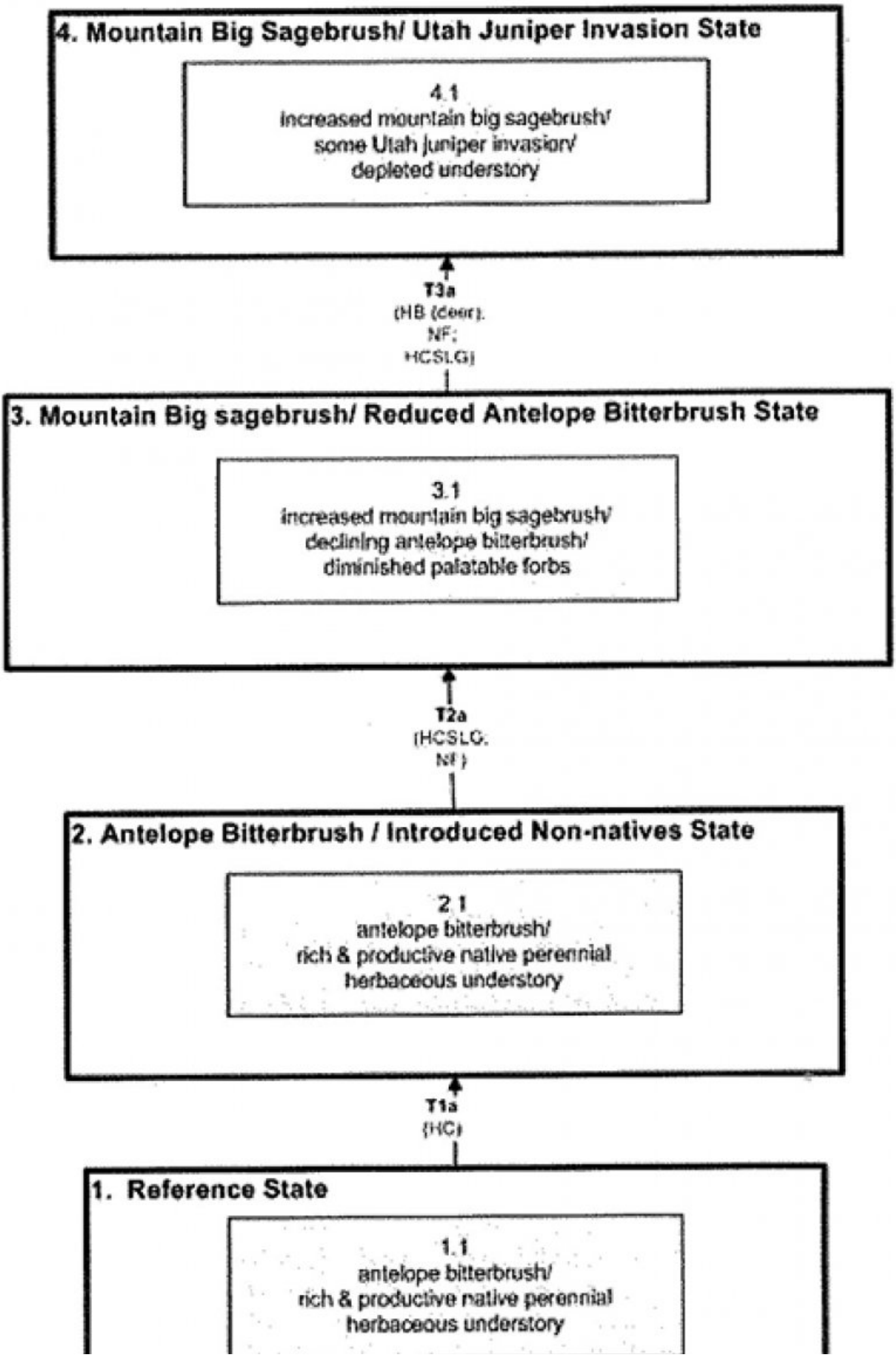
Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone (2) Alluvium–quartzite (3) Alluvium–limestone
Surface texture	(1) Cobbly loam (2) Channery silt loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderate
Soil depth	102–152 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–15%
Available water capacity (Depth not specified)	6.1–7.87 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–29%
Subsurface fragment volume >3" (Depth not specified)	0–36%

Ecological dynamics

As this site deteriorates due to grazing pressure, needleandthread, bluegrass, sheep fescue, palatable forbs, and bitterbrush decrease, while big sagebrush, western wheatgrass, letterman needlegrass, lupine and aster may increase. Fire will kill big sagebrush and often decrease bitterbrush, while western wheatgrass, lupine and low rabbitbrush increase.

State and transition model


4. Mountain Big Sagebrush/ Utah Juniper Invasion State
4.1
increased mountain big sagebrush/
some Utah juniper invasion/
depleted understory
T3a
(HB (deer),
NF;
HCSLG)
3. Mountain Big sagebrush/ Reduced Antelope Bitterbrush State
3.1
increased mountain big sagebrush/
declining antelope bitterbrush/
diminished palatable forbs
T2a
(HCSLG,
NF)
2. Antelope Bitterbrush / Introduced Non-natives State
2.1
antelope bitterbrush/
rich & productive native perennial
herbaceous understory
T1a
(HC)
1. Reference State
1.1
antelope bitterbrush/
rich & productive native perennial
herbaceous understory

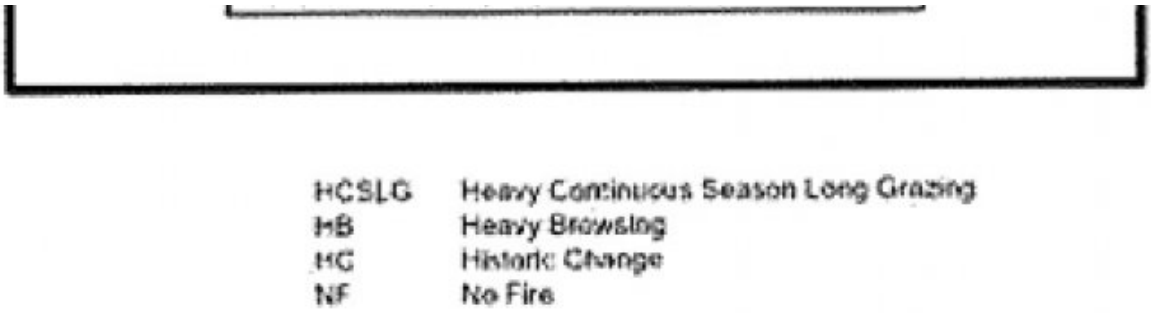


Figure 2. STM

State 1
Reference State

Community 1.1
Reference Plant Community

The general view of this site is antelope bitterbrush and mountain big sagebrush. The composition by air-dry weight of the potential plant community is approximately 40 percent perennial grasses, 10 percent forbs, and 50 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	532	757	925
Grass/Grasslike	426	605	740
Forb	106	151	185
Total	**1064**	**1513**	**1850**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	39-41%
Grass/grasslike foliar cover	29-31%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%

Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	29-31%	–
>0.6 <= 1.4	–	39-41%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			471–706	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	235–314	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	157–235	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	78–157	–
3	**Sub-Dominant Shrubs**			267–471	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	78–157	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	47–78	–
	yellow rabbitbrush	CHVIL4	*Chrysothamnus viscidiflorus ssp. lanceolatus*	47–78	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	47–78	–
	mountain	SYOR2	*Symphoricarpos oreophilus*	47–78	

	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	47–78	–
Grass/Grasslike					
0	**Dominant Grasses**			314–549	
	needle and thread	HECO26	*Hesperostipa comata*	157–235	–
	Sandberg bluegrass	POSE	*Poa secunda*	78–157	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	78–157	–
1	**Sub-Dominant Grasses**			314–785	
	Grass, annual	2GA	*Grass, annual*	78–157	–
	Grass, perennial	2GP	*Grass, perennial*	78–157	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	16–47	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	16–47	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	16–47	–
	Geyer's sedge	CAGE2	*Carex geyeri*	16–47	–
	squirreltail	ELEL5	*Elymus elymoides*	16–47	–
	western fescue	FEOC	*Festuca occidentalis*	16–47	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	16–47	–
	oniongrass	MEBU	*Melica bulbosa*	16–47	–
	western wheatgrass	PASM	*Pascopyrum smithii*	16–47	–
Forb					
0	**Dominant Forbs**			94–157	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	47–78	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	47–78	–
2	**Sub-Dominant Forbs**			251–471	
	Forb, annual	2FA	*Forb, annual*	47–78	–
	Forb, perennial	2FP	*Forb, perennial*	47–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	16–31	–
	silverleaf milkvetch	ASAR4	*Astragalus argophyllus*	16–31	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	16–31	–
	sego lily	CANU3	*Calochortus nuttallii*	16–31	–

	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	16–31	–
	rock goldenrod	PEPU7	*Petradoria pumila*	16–31	–
	longleaf phlox	PHLO2	*Phlox longifolia*	16–31	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	16–31	–
	American vetch	VIAM	*Vicia americana*	16–31	–

Animal community

This site provides grazing for cattle and sheep in late spring, summer, and fall.

The factors include location of water and the condition of the plant community. Topography on this site is broken and provides good diversity of cover and food. Wildlife using this site include sage grouse, rabbit, coyote, mule deer and elk.

Hydrological functions

The soil series are in hydrologic groups D, C, and B. The hydrologic curve numbers are 80, 74 and 61, respectively, when the vegetation is in good condition.

Recreational uses

This site offers color and aesthetic appeal in spring, summer and fall. Recreation activities include hiking and hunting.

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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Approval

Sarah Quistberg, 2/11/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	11/13/2012
Approved by	Sarah Quistberg
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rare to Slight. Slight rill development may occur in exposed areas, on steeper slopes (> 20%) and/or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Where rills are present, they should be fairly short (4-8 feet), < 1 inch deep and somewhat widely spaced (5-10 feet). Minor rill development may be observed on all slopes following major thunderstorm or spring runoff events but should heal during the next growing season.

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2. **Presence of water flow patterns:** Slight. Some minor evidence of water flow patterns may be found winding around perennial plant bases. They show little evidence of current erosion. They are expected to be short (3-6 feet), stable, sinuous and normally not connected. There may be very minor evidence of deposition. Evidence of water flow may increase somewhat on slopes > 20%.

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3. **Number and height of erosional pedestals or terracettes:** Perennial vegetation shows little evidence of erosional pedestalling (1 to 2% of individual plants). Plant roots are covered and most 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):** Bare ground ranges from 25% - 30%. Soil surface may be covered by 15 to 35% coarse fragments. Bare ground openings should not be greater than 1 foot in diameter and should normally not be connected.

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5. **Number of gullies and erosion associated with gullies:** None to Rare at site level. Scattered landscape level gully channels, however, are a normal component of basin/range environments. Where landscape gullies are present, they should be stable, partially vegetated on their sides and bottoms, with no evidence of head-cutting. Some slight increase in disturbance may be evident following significant weather events or when gullies convey considerable runoff from higher elevation rocky or naturally eroding areas.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None. No evidence of wind generated soil movement is present. Wind caused blowouts and deposition are not present.

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.

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 textures are typically loams, very fine sandy loams and silt loams.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Clyl) Soil surface 0-2 inches. Texture is a channery silt loam; color is dark brown (7.5YR 3/2); and structure is weak very fine granular. Mollic epipedon ranges to 9 inches. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation produces sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface and cryptogamic crusting, where present, also protect the soil surface from splash erosion and encourage higher infiltration. Bare spaces are expected to be small and irregular in shape and usually not connected. Vegetative structure and distribution are usually adequate to capture snow and ensure that snowmelt occurs in a controlled manner, allowing maximum time for infiltration, and reducing runoff and erosion in all but the most extreme storm events. When perennial grasses and shrubs decrease due to natural events such as long-term drought, insect damage, etc., runoff is likely to increase and infiltration be reduced.

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: Sprouting shrubs (bitterbrush, Utah serviceberry) > Non-sprouting shrub (mountain big sagebrush) = > Perennial bunchgrasses (needle-and-thread, bluebunch wheatgrass) > Rhizomatous Grasses (western wheatgrass).

    Sub-dominant: Perennial bunchgrasses & grasslikes (Nevada bluegrass, Geyer sedge) > Sprouting shrubs (green rabbitbrush, mountain snowberry) > Perennial forbs (arrowleaf balsamroot).

    Other: A wide variety of other perennial grasses and both perennial and annual forbs can be expected to occur in the plant community.

    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. 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 different functional community phases within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** 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 1300 - 1400 #/acre on an average year but could range from 900 - 1700 #/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, alyssum, mustard species, Canada thistle, black medic, Utah juniper, Gamble oak.

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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 is expected to be present during average and above average growing years.
