USDA Natural Resources
Conservation Service

Ecological site R047XA454UT
Mountain Stony Clay (slender wheatgrass)

Last updated: 2/05/2025
Accessed: 05/12/2025

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.

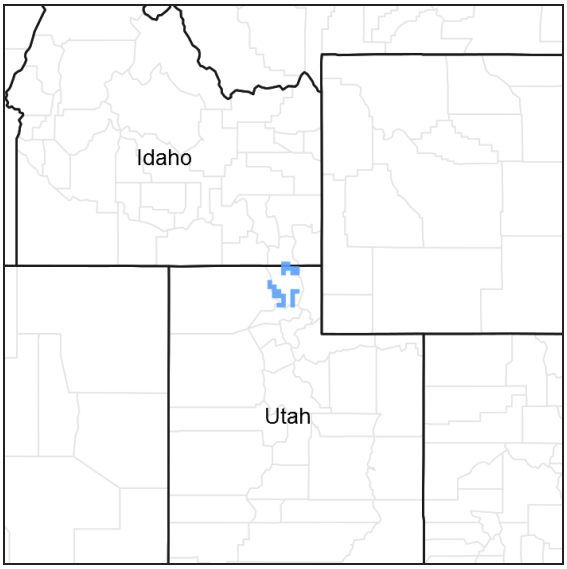


Figure 1. Mapped extent

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 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: Yeates Hollow ST-SiCL, 3-30% — clayey-skeletal, montmorillonitic, frigid Typic Argixerolls

Ecological site concept

The soils of this site formed in alluvium, colluvium, and residuum derived from sandstone and quartzite parent materials. The soil is deep and well drained with slow permeability in the upper 10 inches. The upper 12 to 20 inches of soil is a dark, clay loam or silty clay loam. Gravel or cobbles are present throughout the soil profile and a layer of clay accumulation is characteristic of the subsoil. The soil moisture regime is xeric and the soil temperature regime is frigid, but may occasionally be on the cool side of mesic. Available water capacity is about 3 to 4.2 inches. The soil pH is neutral to somewhat acidic.

Associated sites

R047XA430UT	**Mountain Loam (mountain big sagebrush)**
R047XA461UT	**Mountain Stony Loam (mountain big sagebrush)**

Similar sites

R047XA402UT	**Mountain Clay (slender wheatgrass)** This site has less than 35% rock fragments by volume throughout the soil profile. It has a higher shrub component and total annual production is lower at about 1750 lbs/acre on average.
R047XA504UT	**High Mountain Clay (slender wheatgrass)** This site typically occurs at higher elevations and always recieves greater annual precipitation. There are less than 35% rock fragments by volume throughout the soil profile. Total annual production is extremely reduced.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified

Herbaceous	(1) *Elymus trachycaulus* (2) *Pseudoroegneria spicata*

Physiographic features

This site occurs on gently sloping to steep mountain slopes and alluvial fans at elevations between 4500 and 8000 feet. Runoff is medium and the hazard of water erosion is moderate. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Fan
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,372–2,438 m
Slope	3–30%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by cold snowy winters and cool dry summers. Annual precipitation ranges from 13 to 19 inches, but typically averages about 18 inches. Distribution is 55 to 60 percent during the plant dormant period (October to March). Much of the precipitation comes as snow that acts as a reservoir for water until the growing season begins. This winter moisture is the most dependable supply of water for plant growth. Lower precipitation and high evapo-transpiration rates during July, August and September cause a reduction in plant growth of all plant species and dormancy in many of the grasses and forbs.

Table 3. Representative climatic features

Frost-free period (average)	73 days
Freeze-free period (average)	113 days
Precipitation total (average)	483 mm

Influencing water features

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

Wetland description

N/A

Soil features

The soils of this site formed in alluvium, colluvium, and residuum derived from sandstone and quartzite parent materials. The soil is deep and well drained with slow permeability in the upper 10 inches. The upper 12 to 20 inches of soil is a dark, clay loam or silty clay loam. Gravel or cobbles are present throughout the soil profile and a layer of clay accumulation is characteristic of the subsoil. The soil moisture regime is xeric and the soil temperature regime is frigid, but may occasionally be on the cool side of mesic. Available water capacity is about 3 to 4.2 inches. The soil pH is neutral to somewhat acidic.

Soils where this site may be present:
Cache Valley Area Soil Survey(UT603)- Hiibner soil (HeC, HeD, HeE,HfE); Yeates Hollow soil(YLE2)

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone (2) Colluvium–sandstone (3) Residuum–sandstone (4) Alluvium–quartzite (5) Colluvium–quartzite (6) Residuum–quartzite
Surface texture	(1) Cobbly silty clay loam (2) Gravelly clay loam (3) Cobbly clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow
Soil depth	102–152 cm
Surface fragment cover <=3"	13–18%
Surface fragment cover >3"	14–24%
Available water capacity (0-101.6cm)	7.37–10.67 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	13–15%
Subsurface fragment volume >3" (Depth not specified)	32–33%

Ecological dynamics

It is impossible to determine in any quantitative detail the Historic Climax Plant Community (HCPC) for this ecological site because of the lack of direct historical documentation preceding all human influence. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area (Galatowitsch 1990). However, up to the 1870s the Shoshone Indians, prevalent in northern Utah and neighboring states, grazed horses and set fires to alter the vegetation for their needs (Parson 1996). In the 1860s, Europeans brought cattle and horses to the area grazing large numbers of them on unfenced parcels year-long (Parson 1996). Itinerant and local flocks of sheep followed, largely replacing cattle as the browse component increased.

Below is a State and Transition Model diagram that illustrates the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the

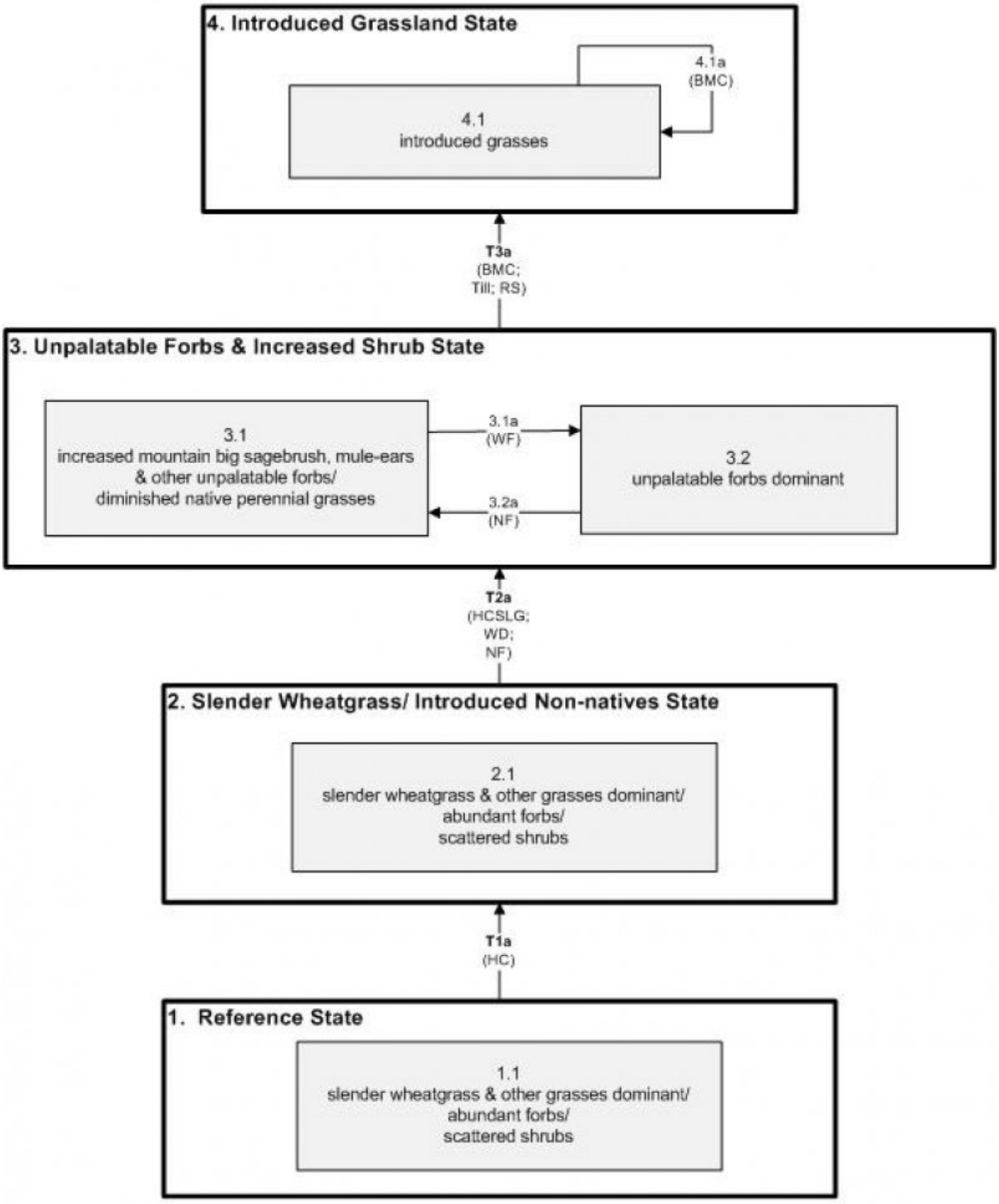
naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion.

When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more details.

The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, or new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range and Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

State and transition model

R047AY454UT: Mountain Stony Clay (Slender Wheatgrass)



BMC	Brush Management (chemical)	RS	Re-seeding
HC	Historic Change	Till	Tillage
HCSLG	Heavy Continuous Season Long Grazing	WD	Wildlife Damage (pocket gophers)
NF	No Fire	WF	Wildfire

Figure 4. STM

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 least modified plant community would have been dominated primarily by grasses including slender wheatgrass (*Elymus trachycaulus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and basin wildrye (*Leymus cinereus*) (1.1). An abundance of forbs would have included mule-ears (*Wyethia amplexicaulis*), common yarrow (*Achillea millefolium*), western mountain aster (*Symphyotrichum spathulatum* var. spathulatum). A scattering of mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana), antelope bitterbrush (*Purshia tridentata*), and other mountain browse species would have been present as well. 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.

Community 1.1
slender wheatgrass and other grasses dominant/ abundant forbs/ scattered shrubs

This plant community would have been dominated mostly by grasses, mainly slender wheatgrass, along with an abundance of forbs and some scattered shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1373	1687	1922
Forb	392	482	549
Shrub/Vine	196	241	275
Total	**1961**	**2410**	**2746**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	9-11%
Grass/grasslike foliar cover	49-51%
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	–	–	49-51%	–
>0.6 <= 1.4	–	9-11%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 2
Slender wheatgrass / Introduced non-natives state

State 2 is a description of the ecological site following Euro-American settlement, which has been influenced by the introduction of several non-native plants and animals, possible extinctions of native species, and a different climate.

Community 2.1
slender wheatgrass and other grasses dominant/ abundant forbs/ scattered shrubs

This plant community is dominated mostly by grasses, mainly slender wheatgrass, along with an abundance of forbs and some scattered shrubs. A small component of introduced non-native species such as cheatgrass and medusahead, and unpalatable forbs such as curlycup gumweed, ragweed, and tarweed may also be present.

State 3
Unpalatable forbs & increased shrubs state

In the absence of fire, but with continued heavy impacts from livestock grazing, the native grasses will markedly decrease, allowing the shrubs mainly, mountain big sagebrush, and the unpalatable species like mule-ears, to take over the site.

Community 3.1
increased mountain big sagebrush, mule-ears and other unpalatable forbs/ diminished native perennial grasses

This plant community is characterized by an increase in mountain big sagebrush, mule-ears, and several other unpalatable forb species. The native perennial bunchgrasses are greatly diminished. Invasive grasses such as cheatgrass or medusahead may be present.

Community 3.2
unpalatable forbs dominate

Several unpalatable forb species such as mule-ears, tarweed (*Madia glomerata* and *Madia gracilis*) , ragweed (Ambrosia spp.), and curlycup gumweed (*Grindelia squarrosa*) will dramatically increase after heavy utilization by pocket gophers and following wildfire events. Invasive grasses such as cheatgrass or medusahead may be present.

Pathway 3.1a
Community 3.1 to 3.2

Wildfire will temporarily remove the shrub component allowing the unpalatable forbs to increase.

Pathway 3.2a

Community 3.2 to 3.1

Lack of fire will allow the mountain big sagebrush to slowing re-establish. Unpalatable forbs will continue to dominate the understory.

State 4
Introduced grassland state

This is a crested wheatgrass or intermediate wheatgrass dominated state.

Community 4.1
Introduced grasses

This community is characterized by introduced grasses, such as crested wheatgrass and intermediate wheatgrass. Periodic brush management using chemical means may be necessary to keep shrubs from reestablishing.

Transition T1A
State 1 to 2

The simultaneous introduction of exotic species, both plants and animals, possible extinctions of native flora and fauna, and climate change 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.

Transition T2A
State 2 to 3

During the period between 1860 and 1950, these sites experienced heavy continuous livestock use throughout the growing season of grasses. Additionally, periodic outbreaks of pocket gophers and a suspended fire regime, combined with the grazing impacts, together caused a transition into the Unpalatable Forbs & Increased Shrub State. Key indicators of the approach to this transition include a loss of perennial grass understory, an increase in the shrub component relative to grasses, and an increase in Wyethia and introduced forbs. Sustained heavy grazing and fire exclusion will trigger this transition. A restoration pathway is impracticable due to the lack of native perennial grass seed source and soil loss.

Transition T3A
State 3 to 4

Brush management with the use of chemicals (e.g. 2, 4-D) followed by tillage and re-seeding can be carried out to create a monoculture of the introduced species, such as intermediate wheatgrass, smooth brome, and orchard grass. The key indicator of the approach to this transition is the loss of forage, and it is triggered by a management decision.

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**			141–235	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	71–118	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	71–118	–
3	**Sub-Dominant Shrubs**			165–212	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	71–118	–
	little sagebrush	ARAR8	*Artemisia arbuscula*	24	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus*	24	–

	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	24	
	slender buckwheat	ERMI4	*Eriogonum microthecum*	24	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	24	–
Grass/Grasslike					
0	**Dominant Grasses**			1059–1530	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	706–824	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	235–353	–
	basin wildrye	LECI4	*Leymus cinereus*	118–235	–
1	**Sub-Dominant Grasses**			447–1106	
	Grass, annual	2GA	*Grass, annual*	118–235	–
	Grass, perennial	2GP	*Grass, perennial*	118–235	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	24–71	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	24–71	–
	California brome	BRCA5	*Bromus carinatus*	24–71	–
	Geyer's sedge	CAGE2	*Carex geyeri*	24–71	–
	elliptic spikerush	ELEL4	*Eleocharis elliptica*	24–71	–
	sheep fescue	FEOV	*Festuca ovina*	24–71	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	24–71	–
	oniongrass	MEBU	*Melica bulbosa*	24–71	–
	Sandberg bluegrass	POSE	*Poa secunda*	24–71	–
Forb					
0	**Dominant Forbs**			188–353	
	mule-ears	WYAM	*Wyethia amplexicaulis*	118–235	–
	common yarrow	ACMI2	*Achillea millefolium*	71–118	–
2	**Sub-Dominant Forbs**			400–965	
	Forb, annual	2FA	*Forb, annual*	118–235	–
	Forb, perennial	2FP	*Forb, perennial*	118–235	–
	silverleaf milkvetch	ASAR4	*Astragalus argophyllus*	24–71	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	24–71	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	24–71	–
	Nevada pea	LALA3	*Lathyrus lanszwertii*	24–71	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	24–71	–
	tall ragwort	SESE2	*Senecio serra*	24–71	–

Animal community

This site provides good grazing during summer and fall for cattle, sheep, and horses.
This site is valuable winter range for big game. Wildlife using this site include mule deer, elk, coyote, rabbit, and ground squirrel.

Hydrological functions

The soil series are in hydrologic group c and the curve number is 74 when the vegetation is in good condition.

Recreational uses

This site has good aesthetic appeal and natural beauty. It is often adjacent to low-lying areas that are used for camping and picnicking, but the site itself is not suitable for these activities. Hiking and horseback riding are potential summer recreation activities, while snowmobiling, snowshoeing, and skiing are potential winter recreation activities. Hunting is fair to good for snowshoe hare, deer, elk, and upland game birds.

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

Kendra Moseley, 2/05/2025

Rangeland health reference sheet

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

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Date	11/21/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rare to few. Some minor rill development may occur on steeper slopes (>10%) 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):** 20-25% bare ground. Soil surface is typically covered by up to 50% coarse fragments. Bare ground spaces should not be greater than 2 to 3 feet in diameter and should not normally 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 > 10% 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 gravelly clay loam.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Hiibner) Soil surface 0-3 inches. Texture is a gravelly clay loam; color is dark grayish brown (10YR 3/2); structure is weak thin platy parting to weak fine granular. Mollic epipedon ranges from 11 to 20 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:** The clay content within the soil profile may limit infiltration during all but the most gentle storms and snowmelt periods. 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 increases in clay content (argillic horizon), 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) > Sprouting shrubs (bitterbrush, mountain snowberry), > Perennial bunchgrasses (bluebunch wheatgrass, basin wildrye) > Perennial Forbs (northern mulesears).

    Sub-dominant:

    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):** 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 few dead and decadent plants present.

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.

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 2200 - 2400#/acre on an average year, but could range from 1800 to 2400#/acre during periods of prolonged drought or above average precipitation.

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, leafy spurge, morningglory, Russian thistle, alyssum, dock & mustard species. Mulesears commonly increases to domininace on this site.

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.