USDA Natural Resources
Conservation Service

Ecological site R034BY225UT
Semidesert Shallow Loam (Wyoming big sagebrush)

Last updated: 3/05/2022
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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): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau.

Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA.

The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small part of this area receives as much as 24 inches of annual precipitation.
Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days.

The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

Ecological site concept

Characteristic soils in this site are 8 to 20 inches deep over fractured bedrock and well-drained. They formed in alluvium, colluvium and residuum derived mainly from sandstone, and to a lesser extent shale, parent materials. Soils have an extremely channery sandy loam surface textured over clay loam. The bedrock is very fractured which allows the Wyoming big sagebrush roots to penetrate to moderate depths. The available water capacity is .5 to 1 inches. Average annual soil loss in potential is approximately 2 tons/acre. The average annual precipitation is 8 to 12 inches.

Associated sites

R034BY227UT	**Semidesert Shallow Loam (Black Sagebrush)** Semidesert Shallow Loam (Black sage)
R034BY233UT	**Semidesert Shallow Loam (Utah Juniper-Pinyon)** Semidesert shallow loam (Utah Juniper-Pinyon)

Similar sites

R034BY206UT	**Semidesert Gravelly Sandy Loam (Wyoming Big Sagebrush)** Semidesert Gravelly Sandy Loam (Wyoming Big Sagebrush)
R034BY205UT	**Semidesert Gravelly Loam (Wyoming Big Sagebrush)** Semidesert Gravelly Loam (Wyoming Big Sagebrush)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis*
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Achnatherum hymenoides*

Physiographic features

This site occurs on plateau backslopes and hillslopes. Slopes are mostly 4 to 25 percent, but can be as high as 90 percent. Elevations range from 5,100 to 6,500 feet on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Hillslope
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	5,100–6,500 ft
Slope	4–25%
Ponding depth	Not specified
Water table depth	Not specified
Aspect	Aspect is not a significant factor

Climatic features

Approximately 65% occurs as rain from March through September. On the average, November through February are the driest months and July through October are the wettest months. The mean annual air temperature is 10 degrees celsius and the soil temperatures are in the mesic regime. In average years, plants begin growth around March 30 and end growth around September 30.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	110-140 days
Precipitation total (characteristic range)	8-12 in

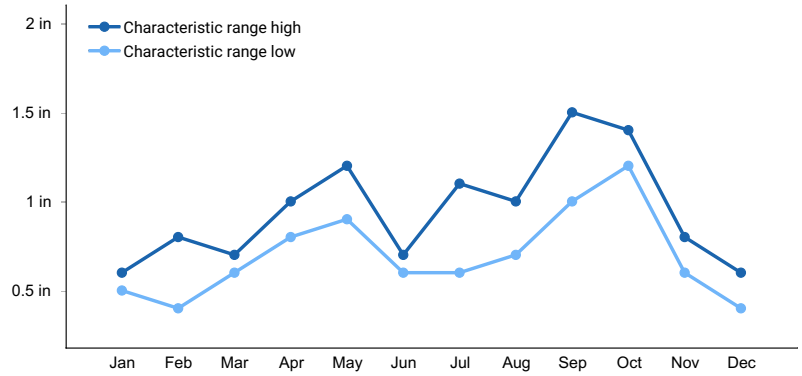

Figure 1. Monthly precipitation range

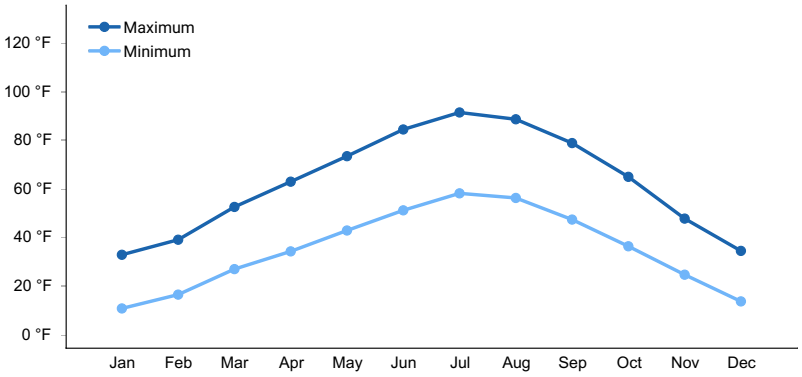

Figure 2. Monthly average minimum and maximum temperature

Influencing water features

None.

Soil features

Characteristic soils in this site are 8 to 20 inches deep over fractured bedrock and well-drained. They formed in alluvium, colluvium and residuum derived mainly from sandstone, and to a lesser extent shale, parent materials. Soils have an extremely channery sandy loam surface textured over clay loam. The bedrock is very fractured which allows the Wyoming big sagebrush roots to penetrate to moderate depths. The available water capacity is .5 to 1 inches. Average annual soil loss in potential is approximately 2 tons/acre. The average annual precipitation is 8 to 12 inches.

Modal Soil: Walknolls CNV-L — loamy-skeletal, mixed, calc., mesic Lithic Ustic Torriorthents

Table 4. Representative soil features

Parent material	(1) Slope alluvium–sandstone and shale (2) Colluvium–sandstone and shale (3) Residuum–sandstone and siltstone
Surface texture	(1) Very channery, extremely channery loam
Family particle size	(1) Loamy-skeletal

Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	5–20 in
Soil depth	5–20 in
Surface fragment cover <=3"	37–49%
Surface fragment cover >3"	5–13%
Available water capacity (Depth not specified)	0.5–1 in
Calcium carbonate equivalent (Depth not specified)	3–10%
Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–10
Soil reaction (1:1 water) (Depth not specified)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	46–50%
Subsurface fragment volume >3" (Depth not specified)	11–12%

Ecological dynamics

As ecological condition deteriorates due to overgrazing, Indian ricegrass, bluebunch wheatgrass, bluegrass and bud sagebrush decrease, while Wyoming big sagebrush, galleta and broom snakeweed increase. Fire is not an important factor in this ecosystem. Cheatgrass and other weeds are most likely to invade this site.

State and transition model

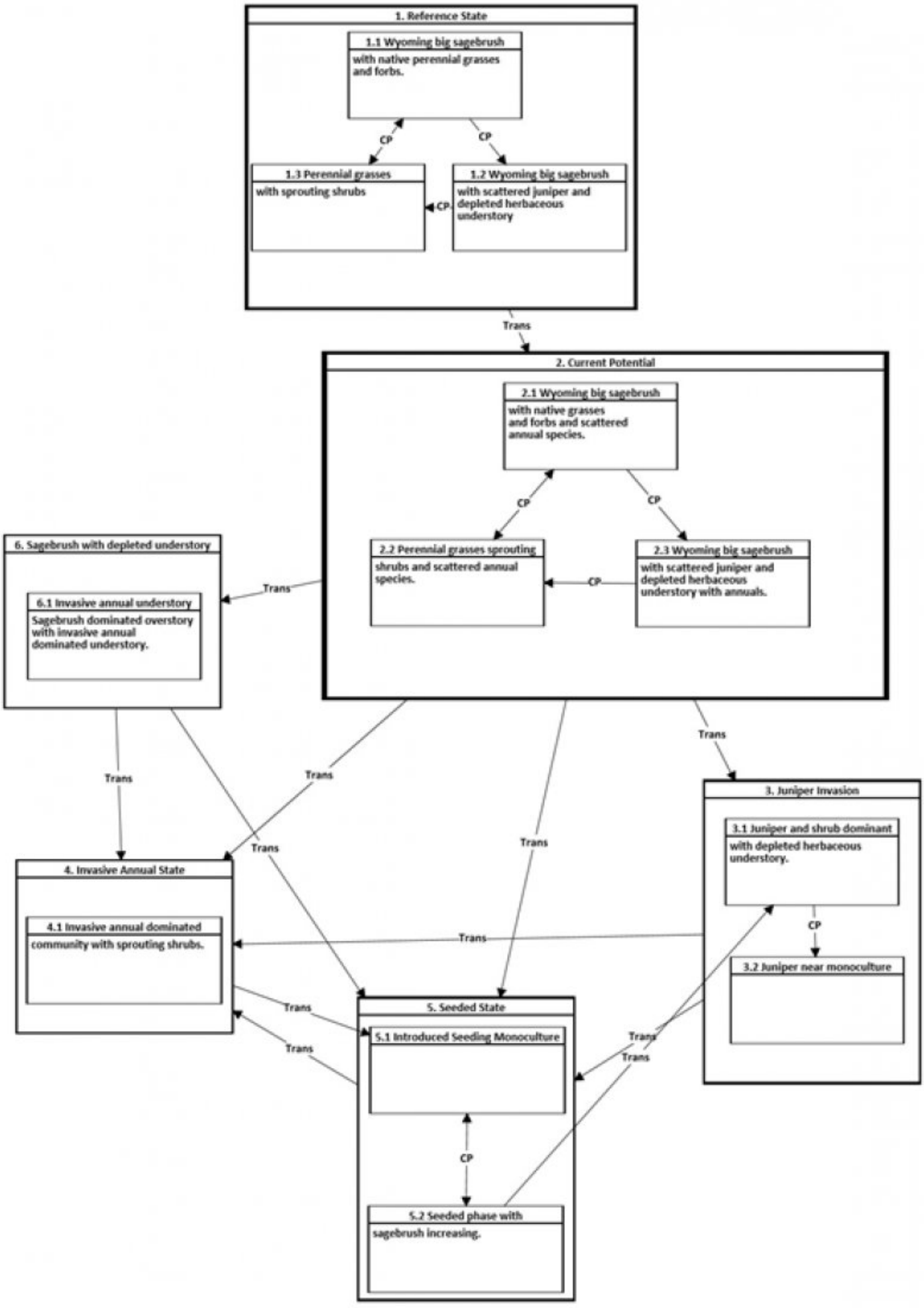
1. Reference State
1.1 Wyoming big sagebrush
with native perennial grasses and forbs.
CP
CP
1.3 Perennial grasses
with sprouting shrubs
CP
1.2 Wyoming big sagebrush
with scattered juniper and depleted herbaceous understory
Trans
2. Current Potential
2.1 Wyoming big sagebrush
with native grasses and forbs and scattered annual species.
CP
CP
2.2 Perennial grasses sprouting
shrubs and scattered annual species.
CP
2.3 Wyoming big sagebrush
with scattered juniper and depleted herbaceous understory with annuals.
6. Sagebrush with depleted understory
Trans
6.1 Invasive annual understory
Sagebrush dominated overstory with invasive annual dominated understory.
Trans
Trans
Trans
Trans
Trans
3. Juniper Invasion
3.1 Juniper and shrub dominant
with depleted herbaceous understory.
CP
3.2 Juniper near monoculture
4. Invasive Annual State
4.1 Invasive annual dominated
community with sprouting shrubs.
Trans
Trans
Trans
5. Seeded State
5.1 Introduced Seeding Monoculture
CP
5.2 Seeded phase with
sagebrush increasing.
Trans
Trans

Figure 3. STM

T 1-2	Introduction of exotic species.
T 2-3	Poor grazing management and/or lengthened fire return interval.
T 2-4	Poor grazing management and/or drought with increased fire return interval.
T 2-5	Disturbance such as fire or brush management followed by a rangeland seeding.
T 2-6	Improper grazing and/or lack of fire.
T 3-4	Poor grazing management and/or drought and a shortened fire return interval.
T 3-5	Disturbance such as brush management or fire and range seeding.
T 4-5.1	Seeding of introduced species with prescribed grazing.
T 5.2-3.1	Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or lengthened fire frequency.
T 5-4	Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency allows the understory vegetation on the site to become dominated by invasive annuals.
T 6-4	Fire without a rangeland seeding.
T 6-5	Brush management and/or fire followed by rangeland seeding with primarily introduced species.
CP 1.1-1.2	Increased time since disturbance/fire.
CP 1.1-1.3	Fire.
CP 1.2-1.3	Fire.
CP 1.3-1.1	Time after fire with prescribed grazing.
CP 2.1-2.2	Fire, brush management or heavy browse use.
CP 2.1-2.3	Poor grazing management and/or drought.
CP 2.2-2.1	Time after fire with prescribed grazing.
CP 2.3-2.2	Fire, brush management or heavy browse use.
CP 3.1-3.2	Continued poor grazing management and/or drought and lengthened fire return interval.
CP 5.1-5.2	Overgrazing and/or drought.
CP 5.2-5.1	Prescribed grazing with brush management or fire.

Figure 4. STM

State 1
Reference State

Community 1.1
Reference State

The dominant aspect of the plant community is Wyoming big sagebrush. The composition by air-dry weight is approximately 30 percent perennial grasses, 5 percent forbs and 65 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	178	243	308
Grass/Grasslike	83	113	143
Forb	14	19	24
Total	**275**	**375**	**475**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	39-41%
Grass/grasslike foliar cover	14-16%

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 (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	4-6%
>1 <= 2	–	–	14-16%	–
>2 <= 4.5	–	39-41%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

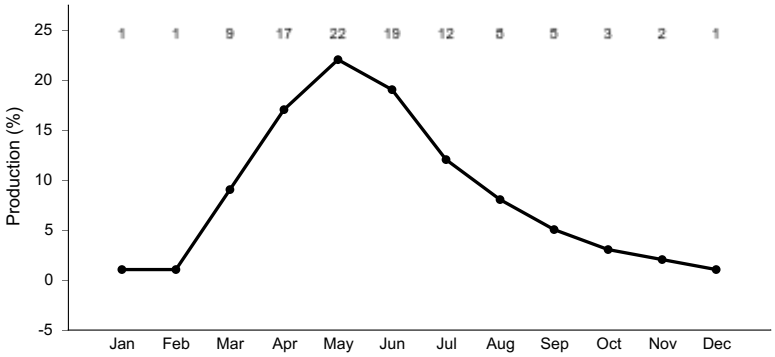

Figure 6. Plant community growth curve (percent production by month). UT0002, Current Potential. Community Phase 2.1.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			150–240	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	140–180	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	20–40	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–20	–
3	**Sub-Dominant Shrubs**			50–136	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	20–40	–
	black sagebrush	ARNO4	*Artemisia nova*	4–12	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	4–12	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	4–12	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	4–12	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	4–12	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	4–12	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	4–12	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	4–12	–
Grass/Grasslike					
0	**Dominant Grasses**			60–180	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	20–40	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	20–40	–
	squirreltail	ELEL5	*Elymus elymoides*	4–20	–
	needle and thread	HECO26	*Hesperostipa comata*	4–20	–
	James' galleta	PLJA	*Pleuraphis jamesii*	4–20	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	4–20	–
	Sandberg bluegrass	POSE	*Poa secunda*	4–20	–
1	**Sub-Dominant Grasses**			0–40	
	Grass, perennial	2GP	*Grass, perennial*	0–20	–
	Grass, annual	2GA	*Grass, annual*	0–20	–
Forb					
2	**Sub-Dominant Forbs**			50–120	
	Forb, annual	2FA	*Forb, annual*	20–40	–
	Forb, perennial	2FP	*Forb, perennial*	20–40	–
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	4–8	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	4–8	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	4–8	–
	rayless tansyaster	MAGR2	*Machaeranthera grindelioides*	4–8	–
	cleftleaf wildheliotrope	PHCRC	*Phacelia crenulata var. corrugata*	4–8	–
	spiny phlox	PHHO	*Phlox hoodii*	4–8	–
	longleaf phlox	PHLO2	*Phlox longifolia*	4–8	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	4–8	–

Animal community

This site provides proper grazing for sheep and cattle during fall, winter, and spring.

This site provides food and cover for wildlife. Wildlife using this site include jackrabbit, snake, lizard, hawk, coyote, and mule deer.

Hydrological functions

The soil is in hydrologic group d. The runoff curve numbers are 80 through 89 depending on the condition of the watershed.

Recreational uses

This site has moderate recreational opportunities and often has scenic vistas.

Wood products

None

Inventory data references

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Contributors

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Approval

Kirt Walstad, 3/05/2022

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	04/20/2012
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** A few rills present. Some increase in rill development may occur on steeper slopes or on areas located below exposed bedrock, or other water shedding areas, where increased runoff may occur. Rills should be < 1 inch deep, fairly short (< 10 feet) and somewhat widely spaced (8-10 feet)on slopes < 10%. On steeper slopes, rills will be 10 to 15+ feet long and spaced 6 to 8 feet apart. More active rill development may be observed following major thunderstorm or spring runoff events but should heal during the next growing season. The expression of rills may be less defined where coarse fragments (i.e., gravels and/or channers) dominate the soil surface.

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2. **Presence of water flow patterns:** A very few sinuous flow patterns wind around perennial plants and surface rock. Evidence of flow patterns is expected to increase somewhat with slopes greater than 10%. Water flow patterns are long (15-20 feet), narrow (< 1 foot wide), and spaced widely (10-20 yards) on gentle slopes (<15%) and more closely (<10 yards) on steeper slopes (>15%).

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3. **Number and height of erosional pedestals or terracettes:** Small pedestals (1/8 to 1/4 inch) may form at the base of plants that occur on the edge of water flow patterns, but should not show any exposed roots. Terracettes are fairly common, forming behind debris dams of small to medium sized litter (up to 1 inch in diameter) in water flow patterns. These debris dams may accumulate smaller litter (leaves, grass and forb stems) and sediment.

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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%. (Soil surface is typically covered by 35 to 90% surface fragments). Most bare ground is associated with water flow patterns, rills, and gullies. Poorly developed biological soil crusts that are interpreted as functioning as bare ground should be recorded as bare ground. Base ground spaces should not be greater than 2 to 3 feet and should mostly not be connected.

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5. **Number of gullies and erosion associated with gullies:** None on slopes < 10%. Rare on steeper slopes and on areas below exposed bedrock. There they do occur, their length often extends from the exposed bedrock to where the gully reaches a stream or other area where water and sediment accumulate. Gullies may show slightly more indication of erosion as slope increases, or as the site occurs adjacent to steep sites/watershed with concentrated flow patterns.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None to very slight. Perennial vegetation helps break the wind and reduces the potential for wind erosion. Coarse fragments on the soil surface help armor it and reduce the potential for wind erosion.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with minor 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 an erosion rating of 4 or 5 under the plant canopies, and a rating of 3 to 4 in the interspaces. The average should be a 4. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Walknolls) Soil surface horizon is typically 0 to 4 inches deep. Texture is a channery sandy loam, structure is typically moderate fine granular. Color is pale brown (10YR 6/3). A ochric epipedon ranges to a depth of 4 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:** Surface coarse fragments combined with perennial vegetation produce 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 soil from splash erosion and encourages a higher rate of infiltration. Plant spatial distribution should 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 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 (i.e., drought, insect damage, etc.) which reduce ground cover and increase bare ground, runoff is expected to increase and associated 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. Interbedded hard sandstone occurs at 12 inches.

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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: Non-sprouting shrubs (Wyoming big sagebrush, shadscale) > Perennial bunchgrasses (Indian ricegrass, bluebunch wheatgrass) > Perennial forbs (scarlet globemallow).

    Sub-dominant: Sprouting shrubs (green rabbitbrush, winterfat) > Perennial bunchgrasses (bottlebrush squirreltail)> Rhizomatous grasses (James galleta) > Forbs (longleaf phlox, cushion wild buckwheat) > Biological soil crusts.

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state. Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover. 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 30 to 40+ 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 natural functional community phases within the reference state.

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. There may be partial mortality on individual bunchgrasses and shrubs during drought periods and complete mortality of individual plants during severe drought periods. 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.

14. **Average percent litter cover (%) and depth (in):** Litter cover will be heavier around perennial plants. Most litter will be herbaceous and depths of 1/4 to 3/4 inch would be considered normal. Perennial vegetation should be well distributed on the site. Litter cover may increase to 25% on some years due to increased production of plants.

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 350 - 400#/acre on an average year, but could range from 250 to 500#/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:** Few invasive species are capable of dominating this site. When invasion does occur, annual bromes such as cheatgrass, and various non-native annual forbs including alyssum and various mustard species are the most likely to invade.

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. 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.