USDA Natural Resources Conservation Service

Ecological site R061XY162WY
Shallow Loamy-West (16-20" PZ)

Accessed: 05/05/2024

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.

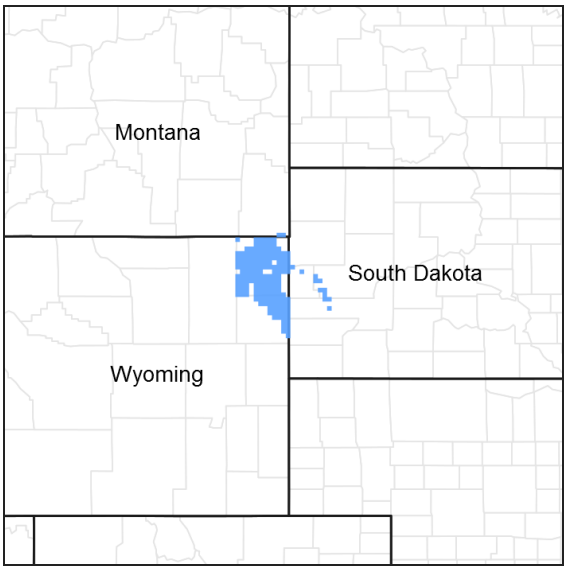


Figure 1. Mapped extent

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.

Associated sites

R061XY158WY	**Shallow Clayey (SwCy) 15-19" Precipitation Zone, Black Hills**

Similar sites

R058BY262WY	**Shallow Loamy (SwLy) 15-17” PZ** Shallow Loamy 15-17" Northern Plains P.Z. has lower production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on steep slopes and ridge tops, but may occur on all slopes.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	1,067–1,524 m
Slope	0–60%
Ponding depth	0 cm
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 15-19 inches per year. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This is predominantly due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

Strong winds are less frequent than over other areas of Wyoming. Occasional storms, however, can bring brief periods of high winds with gusts exceeding 50 mph.

Growth of native cool season plants begins about April 1 and continues to about July 1. Native warm season plants begin about May 15 and continue to about August 15. Fall green-up may occur in September and last through October.

The following information is from the “Devils Tower 2” climate station:

Mean annual precipitation: 17.66 inches
Mean annual air temperature: 44.4 F (28.6 F Avg. Min. to 60.1 F Avg. Max.)
For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/ website. Other climate station(s) representative of this precipitation zone include ”Hulett” and “Sundance”.

Table 3. Representative climatic features

Frost-free period (average)	93 days
Freeze-free period (average)	125 days
Precipitation total (average)	508 mm

Influencing water features

Stream Type: None

Soil features

The soils of this site are shallow (less than 20”to bedrock) well-drained soils formed in alluvium over residuum or residuum. These soils have moderate permeability and may occur on all slopes. The bedrock may be any kind which is virtually impenetrable to plant roots, except igneous. The surface soil will have one or more of the following textures: very fine sandy loam, loam, silt loam, sandy clay loam, silty clay loam, and clay loam. Thin ineffectual layers of other textures are disregarded. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	25–51 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–20%
Available water capacity (0-101.6cm)	2.79–10.67 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Ecological Dynamics of the Site:

As this site deteriorates, species such as blue grama and big sagebrush will increase. Grasses such as bluebunch wheatgrass, little bluestem, sideoats grama and rhizomatous wheatgrasses will decrease in frequency and production.

The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

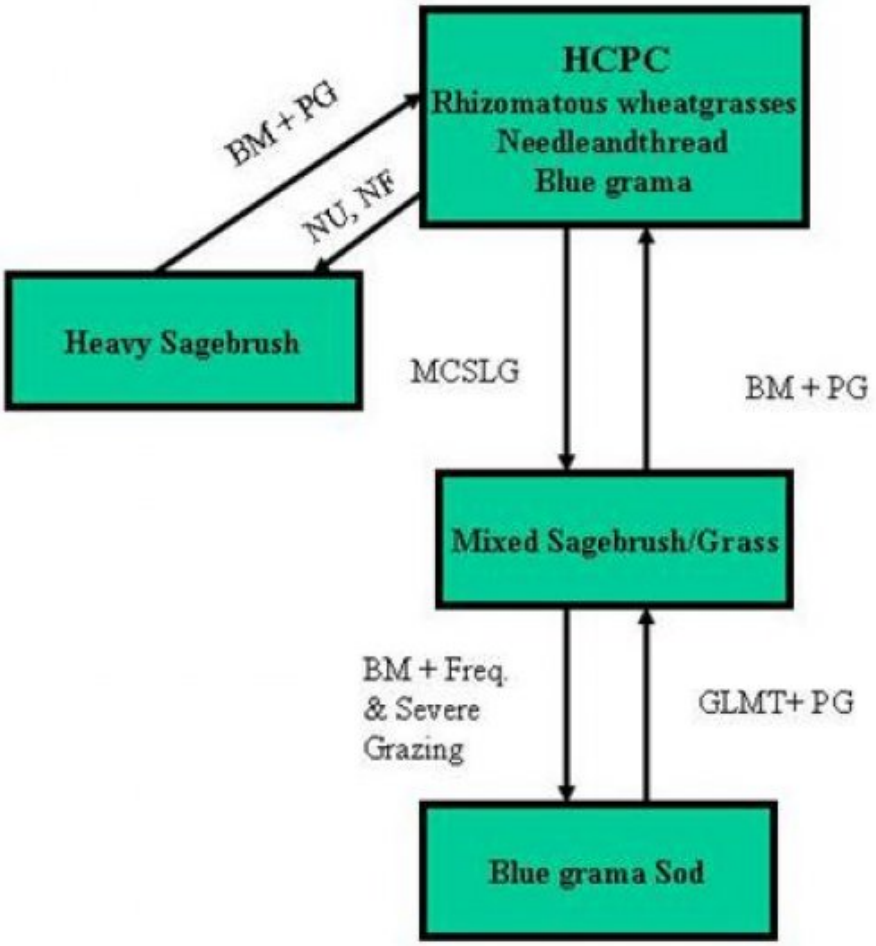
The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in more detail in the plant community narratives following the diagram.

Plant Community Narratives
Following are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they probably are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more data is collected, some of these plant communities may be revised or removed, and 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, 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 any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

State and transition model

Site Type: Rangeland
MLRA: 61 – Black Hills Foot Slopes

Shallow Loamy 15-19" P.Z
R061XY162WY



BM - Brush Management (fire, chemical, mechanical)
Freq. & Severe Grazing - Frequent and Severe Utilization of the Cool-season Mid-grasses during the Growing Season
GLMT - Grazing Land Mechanical Treatment
LTPG - Long-tem Prescribed Grazing
MCSLG - Moderate, Continuous Season-long Grazing
NU, NF - No Use and No Fire
PG - Prescribed Grazing (proper stocking rates with adequate recovery periods during the growing season)
VLTPG - Very Long-term Prescribed Grazing (could possibly take generations)
Na - found adjacent to a saline site

State 1
Rhizmatous wheatgrasses/Needleandthread/Blue grama

Community 1.1
Rhizmatous wheatgrasses/Needleandthread/Blue grama

Rhizomatous Wheatgrasses, Needleandthread, Blue Grama Plant Community The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is about 80% grasses or grass-like plants, 10% forbs, and 10% woody plants. The state is dominated by cool season midgrasses. The major grasses include little bluestem, bluebunch wheatgrass, needleandthread, sideoats grama, and western wheatgrass. Other grasses occurring on the state include Sandberg bluegrass, blue grama, plains muhly, spikefescue and prairie junegrass. Big sagebrush is a conspicuous element of this state and occurs in a mosaic pattern. Big sagebrush may become dominant on some areas with absence of fire. Natural fire occurred frequently in this community and prevented big sagebrush from being the dominant landscape. Wildfires are actively controlled in recent times so chemical control using herbicides has replaced the historic role of fire on this state. Recently controlled burning has regained some popularity. The total annual production (air-dry weight) of this state is about 1400 pounds per acre, but it can range from about 900 lbs/acre in unfavorable years to about 1800 lbs/acre in above average years. The state is extremely stable and well adapted to the Black Hills Foot Slopes climatic conditions. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity). Transitions or pathways leading to other plant communities are as follows: • Protection from grazing and fire will convert this plant community to the Heavy Sagebrush Plant Community. • Moderate, continuous season-long grazing will convert the plant community to the Mixed Sagebrush/Grass Plant Community. • Frequent and severe grazing and brush management will convert the plant community to the Blue Grama Plant Community.

Figure 4. Plant community growth curve (percent production by month). WY1601, 15-19BL Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			5	20	40	15	5	10	5		

State 2
Heavy Sagebrush

Community 2.1
Heavy Sagebrush

Heavy Sagebrush Plant Community This plant community is the result of protection from grazing and fire. Big sagebrush dominates this plant community with canopy cover often exceeding 50%. The understory of grass includes rhizomatous wheatgrasses, bluebunch wheatgrass, little bluestem, Sandberg bluegrass, and prairie junegrass. With complete protection from grazing and fire, the state will become dominated by big sagebrush. The big sagebrush canopy protects the cool season grasses, but this protection makes them unavailable for grazing. Big sagebrush is long-lived and will persist for a long period. This plant community can provide valuable winter feed for both livestock (especially sheep) and wildlife (such as mule deer and antelope). The total annual production (air-dry weight) of this state is about 1000 pounds per acre, but it can range from about 800 lbs/acre in unfavorable years to about 1200 lbs/acre in above average years. The soil resources of this state are protected from erosion. The watershed is functioning. The biotic community is intact except that grass production is lowered. Transitional pathways leading to other plant communities are as follows: • Brush control followed by deferment for 1 to 2 years and prescribed grazing management thereafter will return this state to near Historic Climax Plant Community. Care should be taken when planning brush control to exclude critical winter ranges.

Figure 5. Plant community growth curve (percent production by month). WY1601, 15-19BL Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			5	20	40	15	5	10	5		

State 3
Mixed Sagebrush/Grass

Community 3.1
Mixed Sagebrush/Grass

Mixed Sagebrush/Grass Plant Community Historically, this plant community evolved under grazing by bison and a low fire frequency. Currently, it is found under moderate, season-long grazing by livestock in the absence of fire or brush control. Wyoming big sagebrush is a significant component of this plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant grasses include bluebunch wheatgrass, rhizomatous wheatgrasses, little bluestem, sideoats grama, and blue grama. Grasses of secondary importance include prairie junegrass, and Sandberg bluegrass. Forbs, commonly found in this plant community, include Louisiana sagewort (cudweed), plains wallflower, hairy goldaster, slimflower scurfpea, and scarlet globemallow. Big sagebrush canopy ranges from 20% to 30%. Fringed sagewort is commonly found. Plains pricklypear and winterfat can also occur. When compared to the Historical Climax Plant Community, big sagebrush and blue grama have increased. Bluebunch wheatgrass has decreased, often occurring only where protected from grazing by the sagebrush canopy. Production of cool-season grasses has also been reduced. Cheatgrass (downy brome) has invaded the state. The overstory of big sagebrush and understory of grass and forbs provide a diverse plant community that will support domestic livestock and wildlife such as mule deer and antelope. The total annual production (air-dry weight) of this state is about 1000 pounds per acre, but it can range from about 800 lbs./acre in unfavorable years to about 1200 lbs./acre in above average years. The state is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact. However, it can be at risk depending on how far a shift has occurred in plant composition toward blue grama, sagebrush, and/or cheatgrass. The watershed is usually functioning. However, it can become at risk when canopy cover of sagebrush, blue grama sod, and/or bare ground increases. Transitional pathways leading to other plant communities are as follows: • Brush management followed by 1 or 2 years deferment and prescribed grazing use will return this state to near Historic Climax Plant Community. • Frequent and severe grazing and brush management will convert this state to the Blue grama sod Plant Community.

Figure 6. Plant community growth curve (percent production by month). WY1601, 15-19BL Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			5	20	40	15	5	10	5		

State 4
Blue grama Sod

Community 4.1
Blue grama Sod

Blue Grama Sod Plant Community This plant community is the result of long-term, heavy, continuous, season-long grazing. A dense sod of blue grama and threadleaf sedge dominates and covers up to 90% of the soil surface. When the historic climax community is replaced by warm season dominated communities, grass production is reduced. The total annual production (air-dry weight) of this state is about 800 pounds per acre, but it can range from about 600 lbs/acre in unfavorable years to about 1000 lbs/acre in above average years. The sod formed by these grasses is resistant to water infiltration. While this sod protects the state, off-site areas are affected by excessive runoff that may cause gully erosion. This sod is resistant to change and may require practices such as grazing land mechanical treatment to return to a cool season grass community. Transitional pathways leading to other plant communities are as follows: Transitional pathways leading to other plant communities are as follows: • Grazing Land Mechanical Treatment (chiseling, etc.) followed by prescribed grazing will return this plant community to near Historic Climax Plant Community.

Figure 7. Plant community growth curve (percent production by month). WY1601, 15-19BL Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			5	20	40	15	5	10	5		

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				157–392	
	little bluestem	SCSC	*Schizachyrium scoparium*	157–392	–
2				157–392	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	157–392	–
3				157–235	
	needle and thread	HECO26	*Hesperostipa comata*	157–235	–
4				78–235	
	western wheatgrass	PASM	*Pascopyrum smithii*	78–235	–
5				78–157	
	spike fescue	LEKI2	*Leucopoa kingii*	78–157	–
6				78–157	
	sideoats grama	BOCU	*Bouteloua curtipendula*	78–157	–
7				78–314	
	Grass, perennial	2GP	*Grass, perennial*	0–78	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–78	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–78	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–78	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0–78	–
	onespike danthonia	DAUN	*Danthonia unispicata*	0–78	–
	blue wildrye	ELGL	*Elymus glaucus*	0–78	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–78	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–78	–
	fowl bluegrass	POPA2	*Poa palustris*	0–78	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–78	–
Forb					
8				78–235	
	Forb, perennial	2FP	*Forb, perennial*	0–78	–
	bastard toadflax	COMAN	*Comandra*	0–78	–
	prairie clover	DALEA	*Dalea*	0–78	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	0–78	–
	fleabane	ERIGE2	*Erigeron*	0–78	–
	desertparsley	LOMAT	*Lomatium*	0–78	–
	lupine	LUPIN	*Lupinus*	0–78	–
	bluebells	MERTE	*Mertensia*	0–78	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–78	–
	beardtongue	PENST	*Penstemon*	0–78	–
	stonecrop	SEDUM	*Sedum*	0–78	–

	mountain goldenbanner	THMOM3	*Thermopsis montana var. montana*	0–78	–
	American vetch	VIAM	*Vicia americana*	0–78	–
Shrub/Vine					
9				0–78	
	big sagebrush	ARTR2	*Artemisia tridentata*	0–78	–
10				0–78	
	skunkbush sumac	RHTR	*Rhus trilobata*	0–78	–
11				0–78	
	winterfat	KRASC	*Krascheninnikovia*	0–78	–
12				0–78	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–78	–

Animal community

Animal Community – Wildlife Interpretations
Historic Climax Plant Community: The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, and antelope. Suitable thermal and escape cover for deer may be limited due to the low quantities of woody plants. However, topographical variations could provide some escape cover. When found adjacent to sagebrush dominated states, this plant community may provide brood rearing/foraging areas for sage grouse, as well as lek sites. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Many grassland obligate small mammals would occur here.

Heavy Sagebrush: This plant community can provide important winter foraging for elk, mule deer and antelope, as sagebrush can approach 15% protein and 40-60% digestibility during that time. This community can provide nesting and brood rearing habitat for sage grouse.

Mixed Sagebrush/Grass: The combination of an overstory of sagebrush and an understory of grasses and forbs provide a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer's sparrows' nest in big sagebrush plants, and hosts of other nesting birds utilize stands in the 20-30% cover range.

Blue Grama Sod: These communities provide limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Mixed Sagebrush/Grass Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management.

Animal Community – Grazing Interpretations

The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor.

Plant Community Production Carrying Capacity*
(Lbs/acre) (AUM/ac)
Historic Climax Plant Community 900-1800 .35
Heavy Sagebrush 800-1200 .25

Mixed Sagebrush/Grass 800-1200 .25
Blue Grama Sod 600-1000 .15

* - Continuous, season-long grazing by cattle under average growing conditions.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from moderate to moderately rapid. Runoff potential for this site varies from moderate to high depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information).

Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses such as bluebunch wheatgrass. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1-2% of the soil surface.

Recreational uses

This site provides hunting opportunities for upland game species. The wide varieties of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

none noted

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 sources used as references include: USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

Contributors

G. Mitchell

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.

Author(s)/participant(s)	
Contact for lead author	
Date	04/01/2005
Approved by	E. Bainter
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present

2. **Presence of water flow patterns:** Barely observable

3. **Number and height of erosional pedestals or terracettes:** Essentially non-existent

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 45-55% occurring in small areas throughout site

5. **Number of gullies and erosion associated with gullies:** Active gullies should be restricted to areas of concentrated water flow patterns on steeper slopes

6. **Extent of wind scoured, blowouts and/or depositional areas:** Small scoured sites may be observed

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is little to none based on topography and water flow patterns

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Plant cover and litter is at 55% or greater of soil surface and maintains soil surface integrity. Soil Stability class is anticipated to be 4 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use Soil Series description for depth and color of A-horizon

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Grass canopy and basal cover should reduce raindrop impact and slow overland flow providing increased time for infiltration to occur. Infiltration is moderate.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer or soil surface crusting should be present.

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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:

    Sub-dominant:

    Other:

    Additional: Mid stature Cool Season Grasses > Mid Stature Warm Season Grasses > Shrubs = Forbs = Short Grasses/Grasslikes

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very Low

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14. **Average percent litter cover (%) and depth (in):** Average litter cover is 20-30% with depths of 0.25 to 0.5 inches

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1400 lbs/ac

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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:** Blue grama, Big sagebrush, Fringed sagewort, Prickly Pear, and Species found on Noxious Weed List

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17. **Perennial plant reproductive capability:** All species are capable of reproducing

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