Ecological site R061XY176WY
Very Shallow (VS) 15-19" Precipitation Zone, Black Hills

Accessed: 09/21/2024

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.

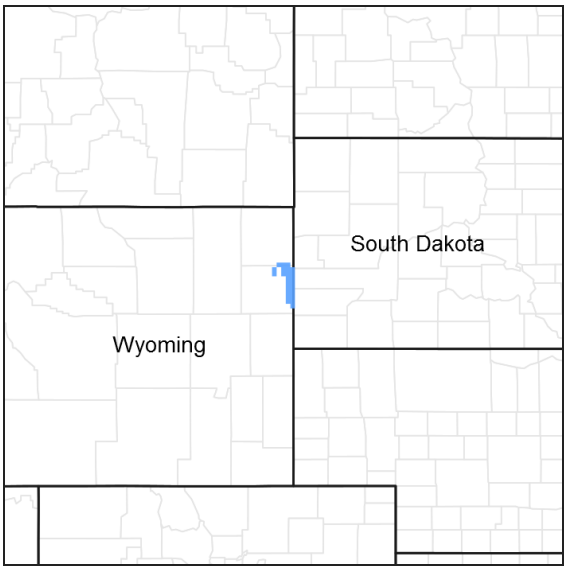


Figure 1. Mapped extent

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**
R061XW162WY	**Shallow Loamy-West (16-20" PZ)**

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

Representative Soil Features
The soils of this site are very shallow (less than 10”to bedrock) well-drained soils formed in residuum. These soils have rapid to slow permeability and can be of any texture. This site usually occurs on steep slopes, but may be on any slope. The bedrock will include all kinds except soft clay shales, igneous and some volcanic. 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) Clay loam (3) Clay
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Slow to very rapid
Soil depth	3–25 cm
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–20%
Available water capacity (0-101.6cm)	0.76–5.08 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)	0–25%

Ecological dynamics

Ecological Dynamics of the Site:

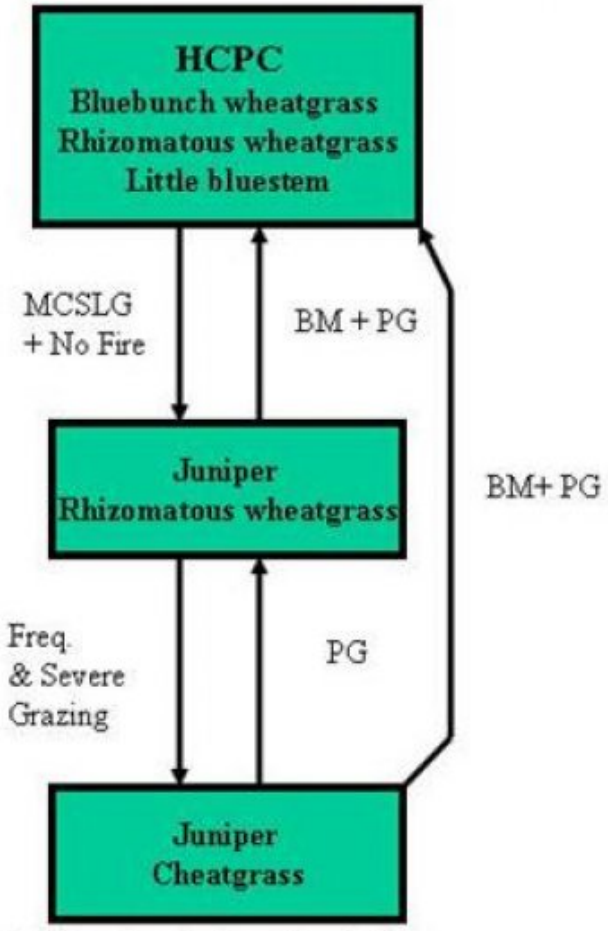
As this site deteriorates, species such as blue grama and Wyoming big sagebrush will increase. Plains pricklypear and cheatgrass invade. Cool season grasses such as bluebunch wheatgrass, little bluestem, spike fescue,and rhizomatous wheatgrasses will decrease in frequency and production.

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



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
Bluebunch wheatgrass/Rhizomatous wheatgrass/Little bluestem

Community 1.1
Bluebunch wheatgrass/Rhizomatous wheatgrass/Little bluestem

Bluebunch wheatgrass/Rhizomatous wheatgrass/Little bluestem Plant Community The interpretive plant community for this site is the Historic Climax Plant Community (HCPC). This state evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is about 70% grasses or grass-like plants, 10% forbs, and 20% woody plants. The state is dominated by cool season midgrasses. The major grasses include bluebunch wheatgrass, rhizomatous wheatgrasses, needleandthread, and little bluestem. Other grasses occurring on the state include Sandberg bluegrass, spike fescue, big bluestem, prairie sandreed, blue grama, and sideoats grama. Wyoming big sagebrush, juniper and ponderosa pine may become dominant on some areas with absence of fire. Natural fire occurred frequently in this community and prevented big sagebrush, junipers and conifers from being the dominant landscape. The total annual production (air-dry weight) of this state is about 700 pounds per acre, but it can range from about 500 lbs/acre in unfavorable years to about 900 lbs/acre in above average years. The state is 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: • Moderate Continuous Season-Long Grazing and lack of fire, will convert this plant community to the Juniper/Rhizomatous wheatgrass Plant Community. • Frequent and severe grazing will convert the plant community to the Juniper/Cheatgrass 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
Juniper/Rhizomatous wheatgrass

Community 2.1
Juniper/Rhizomatous wheatgrass

Juniper/Rhizomatous wheatgrass Plant Community Historically, this plant community evolved under grazing by bison and a high fire frequency. Currently, it is found under moderate, season-long grazing by livestock in the absence of fire or brush control. Wyoming big sagebrush, junipers and conifers are significant components 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 rhizomatous wheatgrasses, plains muhly, and blue grama. Grasses of secondary importance include little bluestem, prairie junegrass, Sandberg bluegrass, and cheatgrass. Forbs, commonly found in this plant community, include Louisiana sagewort (cudweed), plains wallflower, hairy goldaster, prairie thermopsis, and scarlet globemallow. Wyoming big sagebrush, Juniper and conifer canopy ranges up to 20% to 30%. Fringed sagewort is commonly found. Plains pricklypear can also occur. When compared to the Historical Climax Plant Community, Wyoming big sagebrush, junipers, and ponderosa pine 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 overstory of Wyoming big sagebrush, juniper, conifers, 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 350 pounds per acre, but it can range from about 250 lbs/acre in unfavorable years to about 500 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 big sagebrush, junipers, conifers, and cheatgrass. The watershed is usually functioning. However, it can become at risk when canopy cover of big sagebrush, junipers, conifers, and bare ground increases. Transitional pathways leading to other plant communities are as follows: • Brush management (fire) followed by prescribed grazing will return this state to near Historic Climax Plant Community. • Frequent and severe grazing over the long-term will convert this

state to the Juniper/Cheatgrass Plant Community.

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
Juniper/Cheatgrass

Community 3.1
Juniper/Cheatgrass

Juniper/Cheatgrass Plant Community This vegetation state currently is found under heavy, season-long grazing by livestock in the absence of fire or brush control. Wyoming big sagebrush, junipers, and ponderosa pine are significant components of this plant community. Cool-season grasses have been reduced. Bare ground and cool-season annual plants dominate the understory. Perennial grasses are sparse, and include rhizomatous wheatgrasses, plains muhly, and blue grama. Grasses of secondary importance include little bluestem, prairie junegrass, and Sandberg bluegrass. Cheatgrass is the dominant grass. Forbs, commonly found in this plant community, include Louisiana sagewort (cudweed), plains wallflower, hairy goldaster, prairie thermopsis, and scarlet globemallow. Wyoming big sagebrush, Juniper and conifer canopy ranges up to 50%. Fringed sagewort is commonly found. Plains pricklypear can also occur. When compared to the Historical Climax Plant Community, sagebrush, junipers, and ponderosa pine 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. Bare ground has increased. The overstory of big sagebrush, juniper, and conifers reduce the grass understory and reduce the states ability to support livestock and wildlife. The total annual production (air-dry weight) of this state is about 275 pounds per acre, but it can range from about 250 lbs/acre in unfavorable years to about 300 lbs/acre in above average years. The state is unstable and is not protected from excessive erosion. The biotic integrity of this plant community is not intact. This state is at risk depending on how far a shift has occurred in plant composition toward big sagebrush, junipers, conifers, and cheatgrass. The watershed is not functioning. Transitional pathways leading to other plant communities are as follows: • Brush management (fire) and prescribed grazing will return this state to near Historic Climax Plant Community. • Prescribed grazing will return this state to the Juniper/Rhizomatous wheatgrass 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		

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				157–275	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	157–275	–
2				118–196	
	little bluestem	SCSC	*Schizachyrium scoparium*	118–196	–
3				39–78	
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	39–78	–
4				39–78	
	spike fescue	LEKI2	*Leucopoa kingii*	39–78	–

5				39–78	
	sideoats grama	BOCU	*Bouteloua curtipendula*	39–78	–
6				39–157	
	Grass, perennial	2GP	*Grass, perennial*	0–39	–
	big bluestem	ANGE	*Andropogon gerardii*	0–39	–
	sand bluestem	ANHA	*Andropogon hallii*	0–39	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–39	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–39	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–39	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–39	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0–39	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	0–39	–
	needle and thread	HECO26	*Hesperostipa comata*	0–39	–
	green needlegrass	NAVI4	*Nassella viridula*	0–39	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–39	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–39	–
Forb					
7				39–118	
	Forb, perennial	2FP	*Forb, perennial*	0–39	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–39	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–39	–
	fleabane	ERIGE2	*Erigeron*	0–39	–
	buckwheat	ERIOG	*Eriogonum*	0–39	–
	nailwort	PARON	*Paronychia*	0–39	–
	stonecrop	SEDUM	*Sedum*	0–39	–
Shrub/Vine					
8				8–39	
	big sagebrush	ARTR2	*Artemisia tridentata*	8–39	–
9				39–78	
	ponderosa pine	PIPO	*Pinus ponderosa*	39–78	–
10				0–39	
	hawthorn	CRATA	*Crataegus*	0–39	–
11				0–39	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–39	–
12				0–39	
	skunkbush sumac	RHTR	*Rhus trilobata*	0–39	–
13				0–39	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–39	–

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.

Juniper/Rhizomatous wheatgrass: This plant community may be useful for the same large grazers that would use the Historic Climax Plant Community. However, the plant community composition is less diverse, and thus, less apt to meet the seasonal needs of these animals. It may provide some foraging opportunities for sage grouse when it occurs proximal to sagebrush states. The juniper provides good thermal cover and bird nesting habitat.

Juniper/Cheatgrass: This plant community may be useful for the same large grazers that would use the Historic Climax Plant Community. However, the plant community composition is less diverse, and production is low and less apt to meet the seasonal needs of these animals. It may provide some foraging opportunities for sage grouse when it occurs proximal to sagebrush states. The juniper provides good thermal cover and bird nesting habitat.

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 (Lbs/acre)	Carrying Capacity* (AUM/ac)
Historic Climax Plant Community	700-900	.2
Juniper/rhizomatous wheatgrass	250-500	.15
Juniper/Cheatgrass	250-300	.05

* - 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 highly variable and is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from slow to very rapid. Runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. 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 may be present, but should be small. Water flow patterns should be barely distinguishable. 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 variety 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:** Due to the wide slope range associated with this site, the number and extent of rills will vary from none on slope < 9% to common on slopes > 25%

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2. **Presence of water flow patterns:** Due to the wide slope range associated with this site, water flow patterns vary from barely observable on slopes of < 9% from broken and irregular in appearance to continuous on slopes > 25%

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3. **Number and height of erosional pedestals or terracettes:** Not evident on slopes < 9% present on slopes > 9%

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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 is 35-45%

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

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement on slopes < 9%. Litter movement does occur on slopes > 9%

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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):** 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.

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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

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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 varies with soil texture from slow to very rapid.

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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):** 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/Trees > Forbs > Short stature Grasses/Grasslikes

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

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14. **Average percent litter cover (%) and depth (in):** Average litter cover is 15-20% with depths of 0.10 to 0.25 inches

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 700 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, Wyoming big sagebrush, Cheatgrass, Junipers, Ponderosa pine, Fringed sagewort, Prickly pear, and Species found on Noxious Weed List

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17. **Perennial plant reproductive capability:** May be limited due to effective moisture and seed to soil contact

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