USDA Natural Resources Conservation Service

Ecological site R043BY450WY
Sandy (Sy) 15-19” Northern Plains Precipitation Zone

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.

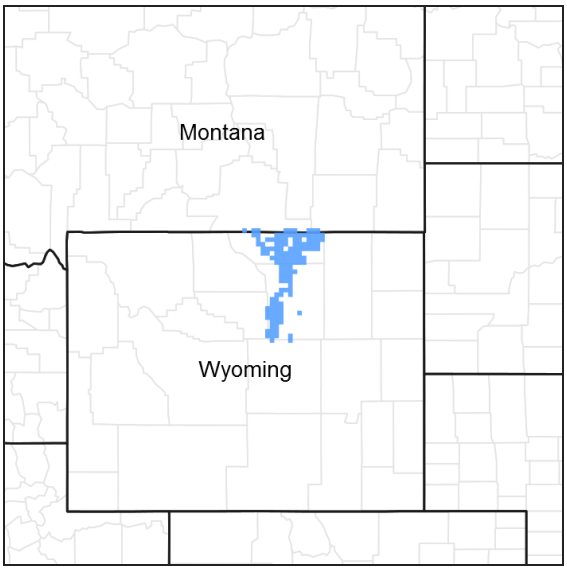


Figure 1. Mapped extent

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.

Associated sites

R043BY422WY	**Loamy (Ly) 15-19” Northern Plains Precipitation Zone**
R043BY466WY	**Shallow Sandy (SwSy) 15-19” Northern Plains Precipitation Zone**

Similar sites

R058BY150WY	**Sandy (Sy) 10-14” PZ** Sandy 10-14” 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 nearly level to 30% slopes.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Alluvial fan (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,128–2,286 m
Slope	0–30%
Ponding depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 15" to 19" per year. May is generally the wettest month. July, August and September are somewhat drier with daily amounts rarely exceeding one inch. Snowfall is quite heavy in the mountainous area. Annual snowfall averages close to 70 inches.

Sunshine is abundant in the latter part of the summer, the greatest amount being in July and August. Sunshine possibility during these two months averages 70 to 75% possibility with only a 65% possibility for June and September. Winter averages about 40% sunshine.

Because of the varied topography, the wind will vary considerably for different parts of the area. The wind is usually much lighter at the lower elevations and in the valleys as compared with the higher terrain. The average winter wind velocity is 8.5 mph, while the summer wind velocity averages 7.5 mph. Winds during storms and on ridges may exceed 45 mph.

Temperatures show a wide range between summer and winter, and between daily maximums and minimums. Summer nights are cool and temperatures drop into the forties at most places before sunrise. Summer daytime temperatures are usually in the seventies and occasionally reach eighty, but rarely reach the mid nineties. Winters are cold with daily lows below freezing most of the time. January has the coldest temperatures with a range of near 10 deg. F at night to the mid thirties in the afternoon. Temperatures of well below zero to –30 deg. F are not uncommon in the winter months.

The growing season for the cool season plants will generally start about April 15 to May 1 and continue to about October 10.

The following information is from the “Sheridan Airport” climate station:
Frost-free period (32 °F): 95-156 days; (5 yrs. out of 10, these days will occur between May 21 – September 19)
Freeze-free period 28 °F): 116-187 days; (5 yrs. out of 10, these days will occur between May 4 – September 29)
Mean annual precipitation: 14.7 inches
Mean annual air temperature: 45.0 °F (31.2 °F Avg. Min. – 58.8 °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: “Parkman 5 WNW”

Table 3. Representative climatic features

Frost-free period (average)	156 days
Freeze-free period (average)	187 days
Precipitation total (average)	483 mm

Influencing water features

Stream type: None

Soil features

The soils of this site are deep to moderately deep (greater than 20”to bedrock), well drained and rapidly permeable. The surface soil must be at least 3 to 6 “thick (depending on texture and permeability of the subsoil) and will include the following soil textures: fine sandy loam, sandy loam or loamy very fine sand. Coarser topsoils may be included if underlain by finer textured subsoils.

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam (2) Sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	51–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–15.49 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%
Subsurface fragment volume >3" (Depth not specified)	0%

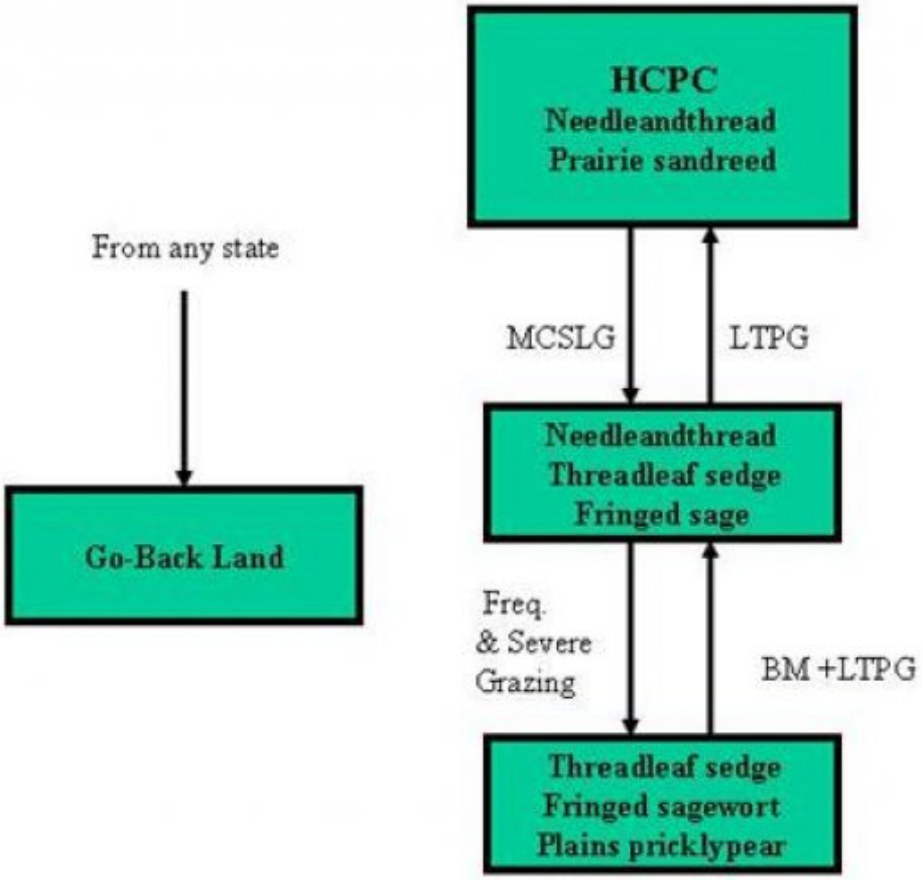
Ecological dynamics

As this site deteriorates from improper grazing management, species such as threadleaf sedge, needleandthread, fringed sagewort and silver sagebrush will increase. Species such as cheatgrass will invade. Mid grasses such as prairie sandreed and Indian ricegrass 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.

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
Needleandthread, Prairie Sandreed Plant Community

Community 1.1
Needleandthread, Prairie Sandreed Plant Community

The interpretive plant community for this site is the Historic Climax Plant Community. This site evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is about 85% grasses or grass-like plants, 10% forbs, and 5% woody plants. The state is a mix of warm and cool season midgrasses. The major grasses include needleandthread, prairie sandreed, sand bluestem, little bluestem, and Indian ricegrass. Other grasses occurring on the state include rhizomatous wheatgrass, Sandberg bluegrass, blue grama, and threadleaf sedge. Silver sagebrush is a conspicuous element of this state, occurs in a mosaic pattern, and makes up 5% of the annual production. Annual production ranges from 1500 to 3000 pounds depending on climatic conditions. The state is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allow for high drought resistance. This is a healthy and sustainable plant community (site/soil stability, watershed function, and biologic integrity). This plant community is extremely stable and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. 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, improper grazing will convert the plant community to the Needleandthread, Threadleaf sedge, Fringed sagewort Vegetation State. • Long-term, heavy, improper grazing will convert the plant community to the Threadleaf sedge, Fringed sagewort, Cactus Vegetation State. • When cropped annually and then abandoned without reseeding, the state is converted to the Go-back Land Vegetation State.

Figure 4. Plant community growth curve (percent production by month). WY1301, 15-19NP Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	45	35	10	0	5	0	0	0

State 2
Needleandthread, Threadleaf Sedge, Fringed Sage Plant Community

Community 2.1
Needleandthread, Threadleaf Sedge, Fringed Sage Plant Community

This plant community is the result of moderate improper grazing. The understory of grass includes needleandthread, threadleaf sedge, and prairie junegrass. Fringed sagewort has increased. When compared to the Historic Climax Plant Community, prairie sandreed and Indian ricegrass have decreased. Threadleaf sedge and needleandthread have increased. This community is well suited to grazing by both domestic livestock and wildlife, during the spring summer and fall. Total annual production is from 600 to 1500 pounds. The communities' soil, biotic integrity and watershed is intact, although more than normal runoff may occur due to the sod forming vegetation. Transitional pathways leading to other plant communities are as follows: • Prescribed grazing over a long-term will return this state to near Historic Climax Plant Community condition. The sod forming nature of threadleaf sedge and needleandthread will make the transition to Historic Climax Plant Community difficult. • Heavy long-term improper use will convert this state to the Threadleaf sedge, Fringed sagewort, Plains Pricklypear Vegetation State.

Figure 5. Plant community growth curve (percent production by month). WY1301, 15-19NP Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	45	35	10	0	5	0	0	0

State 3
Threadleaf Sedge, Fringed Sagewort, Plains Pricklypear Plant Community

Community 3.1
Threadleaf Sedge, Fringed Sagewort, Plains Pricklypear Plant Community

This plant community is the result of long-term, heavy, continuous, improper grazing. It is dominated by a sod of threadleaf sedge and needleandthread. Fringed sagewort has increased. Plains Pricklypear can become dense enough so that livestock cannot graze forage growing within the cactus clumps. When the historic climax community is replaced by sod forming communities, grass production is reduced. Production on this state is approximately 500 to 1000 pounds depending on climatic conditions. The soil is generally well protected on this state. The biotic integrity may be reduced due to low vegetative production. The sod formed by these grasses is resistant to water infiltration. While the site is protected by this sod, off-site areas are affected by excessive runoff which may cause gully erosion. This sod is resistant to change and may require practices such as long-term proper grazing use to return to a mid grass community. Transitional pathways leading to other plant communities are as follows: Long-term prescribed grazing with fringed sagewort control will return this plant community to the needleandthread, threadleaf sedge, fringed sage plant community.

Figure 6. Plant community growth curve (percent production by month). WY1301, 15-19NP Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	45	35	10	0	5	0	0	0

State 4
Go-back Land Plant Community

Community 4.1
Go-back Land Plant Community

This plant community occurs on land that has been cropped annually in the past and then abandoned without reseeding. Natural succession has resulted in a plant community dominated by varying combinations of red threeawn, cheatgrass, needleandthread, Sandberg bluegrass, and some blue grama. Forage production is low since grasses such as red threeawn and cheatgrass are not used efficiently by livestock. Annual production ranges from 800-1200 pounds. The potential for accelerated erosion can be highly variable depending on amount of bare ground present. Biological diversity is low. Transitions or pathways leading to other plant communities are as follows: • Prescribed grazing may increase desirable native cool season grass production. It may be difficult to return to near Historic Climax Plant Community condition, in a timely manner, because of past soil loss. • Where there is a lack of perennial grass, reseeding to tame or native species may be necessary to return these lands to production in the form of pastureland. Where there is a lack of perennial grasses, reseeding to tame or native species may be necessary to return these lands to production in the form of pastureland. These pastures are normally seeded to crested wheatgrass, pubescent wheatgrass, or Russian wildrye. They require considerable investment to establish and have a variable life expectancy. They do produce up to 50% more than native range, but their value as forage is somewhat limited due to the single species usually seeded. In some cases, the single species or certain groups of species (e.g., wheatgrasses) may be more vulnerable to infestation by associated insects and/or diseases (e.g., black grass bugs).

Figure 7. Plant community growth curve (percent production by month). WY1301, 15-19NP Upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	45	35	10	0	5	0	0	0

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				247–740	

	sand bluestem	ANHA	*Andropogon hallii*	247–740	–
2				247–740	
	prairie sandreed	CALO	*Calamovilfa longifolia*	247–740	–
3				247–616	
	needle and thread	HECO26	*Hesperostipa comata*	247–616	–
4				123–247	
	green needlegrass	NAVI4	*Nassella viridula*	123–247	–
5				123–247	
	western wheatgrass	PASM	*Pascopyrum smithii*	123–247	–
6				123–247	
	little bluestem	SCSC	*Schizachyrium scoparium*	123–247	–
7				123–247	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	123–247	–
8				123–370	
	Grass, perennial	2GP	*Grass, perennial*	0–123	–
	Richardson's needlegrass	ACRI8	*Achnatherum richardsonii*	0–123	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–123	–
	Pumpelly's brome	BRINP5	*Bromus inermis ssp. pumpellianus var. pumpellianus*	0–123	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–123	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–123	–
	onespike danthonia	DAUN	*Danthonia unispicata*	0–123	–
	blue wildrye	ELGL	*Elymus glaucus*	0–123	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–123	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–123	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–123	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–123	–
Forb					
9				123–247	
	Forb, perennial	2FP	*Forb, perennial*	0–123	–
	yarrow	ACHIL	*Achillea*	0–123	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–123	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–123	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–123	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–123	–
	field chickweed	CEAR4	*Cerastium arvense*	0–123	–
	prairie clover	DALEA	*Dalea*	0–123	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–123	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–123	–
	dotted blazing star	LIPU	*Liatris punctata*	0–123	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–123	–
	beardtongue	PENST	*Penstemon*	0–123	–
	phlox	PHLOX	*Phlox*	0–123	

	phlox	PHLOX	*Phlox*	0–123	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–123	–
	American vetch	VIAM	*Vicia americana*	0–123	–
Tree					
10				0–123	
	big sagebrush	ARTR2	*Artemisia tridentata*	0–123	–
11				0–123	
	silver sagebrush	ARCA13	*Artemisia cana*	0–123	–
Shrub/Vine					
12				0–123	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–123	–

Animal community

Animal Community – Wildlife Interpretations
Needleandthread, Prairie Sandreed (HCPC): 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.

Needleandthread, Threadleaf Sedge, Fringed Sage Plant Community:
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 woody cover. Good grasshopper habitat equals good foraging for birds.

Threadleaf Sedge, Fringed Sage, Plains Pricklypear Plant Community:
This plant community may be useful for the same large grazers that would use the Historic Climax Plant Community. Production is low and 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 woody cover.

Go-back Land Plant Communities: 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 Western Wheatgrass/Cheatgrass Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management.

Introduced Pasture: These communities are highly variable depending on the species planted. Refer to Forage Suitability Groups for more information.

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*
(lb./ac) (AUM/ac)

Needleandthread, Prairie Sandreed 1500-3000 .6
Needleandthread, Threadleaf Sedge, Fringed Sage 600-1500 .35
Threadleaf Sedge,Fringed Sage, Plains Pricklypear 500-1000 .25
Go-back Land 800-1200 .35

* - 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, with localized areas in hydrologic group C. Infiltration potential for this site varies from moderately rapid to rapid depending on soil hydrologic group and ground cover. Runoff varies from low to moderate. 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. 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

Inventory Data References (narrative)
Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel was 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.

Inventory Data References
Data Source Number of Records Sample Period State County
SCS-RANGE-417 1971-1994 WY
Ocular estimates 1990-1999 WY

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)	Glen Mitchell, E. Bainter
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

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

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

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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 15-25% occurring in small areas throughout site

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present

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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. Plant litter remains in place and is not moved by erosional forces.

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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 75% 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. Healthy deep rooted native grasses enhance infiltration and reduce runoff. Infiltration is Moderately Rapid to 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 Warm Season Grasses > Mid Stature Cool Season Grasses > Short stature Grasses/Grasslike > Shrubs = Forbs

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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 30-40% with depths of 0.25 to 1.0 inches

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2200 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:** Threadleaf sedge, Fringed sagewort, Prickly Pear, Silver sagebrush, Cheatgrass, 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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