

Ecological site R032XY176WY **Very Shallow (VS) 5-9" Big Horn Basin Precipitation Zone**

Accessed: 05/13/2025

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.

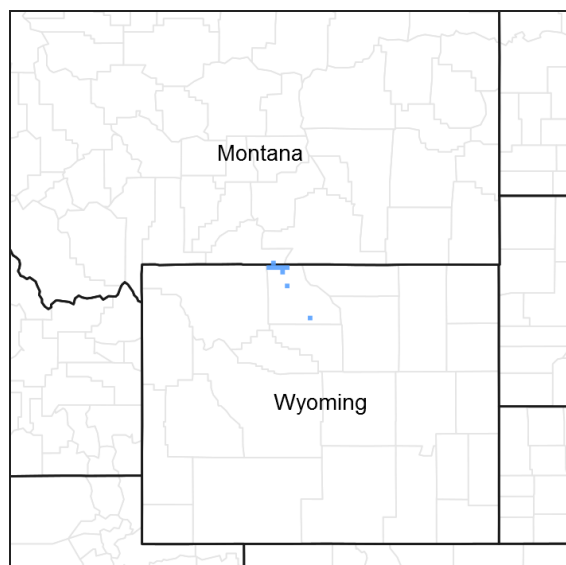


Figure 1. Mapped extent

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

R032XY162WY	Shallow Loamy (SwLy) 5-9" Big Horn Basin Precipitation Zone
R032XY166WY	Shallow Sandy (SwSy) 5-9" Big Horn Basin Precipitation Zone

Similar sites

R032XY376WY	Very Shallow (VS) 10-14" East Precipitation Zone Very Shallow 10-14" Foothills and Basins East P.Z., 032X376WY has higher production.
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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	1,128–1,829 m
Slope	0–60%
Ponding depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 5-9 inches per year. The normal precipitation pattern shows peaks in May and June and a secondary peak in September. This amounts to about 50% of the mean annual precipitation. Much of the moisture that falls in the latter part of the summer is lost by evaporation and much of the moisture that falls during the winter is lost by sublimation. Average snowfall is about 20 inches annually. 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, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

High winds are generally blocked from the basin by high mountains, but can occur in conjunction with an occasional thunderstorm.

Growth of native cool-season plants begins about April 1 and continues to about July 1. Cool weather and moisture in September may produce some green up of cool season plants that will continue to late October.

The following information is from the “Emblem” climate station:

Minimum Maximum 5 yrs. out of 10 between

Frost-free period (days): 98 171 May 13 – September 19

Freeze-free period (days): 120 184 May 1 – October 5

Mean Annual Precipitation (inches): 3.22 10.97

Mean annual precipitation: 7.42 inches

Mean annual air temperature: 45.01 F (31.2 F Avg. Min. to 58.7 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 “Basin”, “Deaver”, “Lovell and “Worland”.

Table 3. Representative climatic features

Frost-free period (average)	171 days
Freeze-free period (average)	184 days
Precipitation total (average)	229 mm

Influencing water features

Soil features

The soils of this site are very shallow (less than 8" 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. The soil characteristic having the most influence on the plant community is the very shallow depth to bedrock, which drastically limits the available moisture.

Table 4. Representative soil features

Surface texture	(1) Channery loam (2) Fine sandy loam (3) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Slow to moderately rapid
Soil depth	3–20 cm
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–20%
Available water capacity (0-101.6cm)	0.76–4.32 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

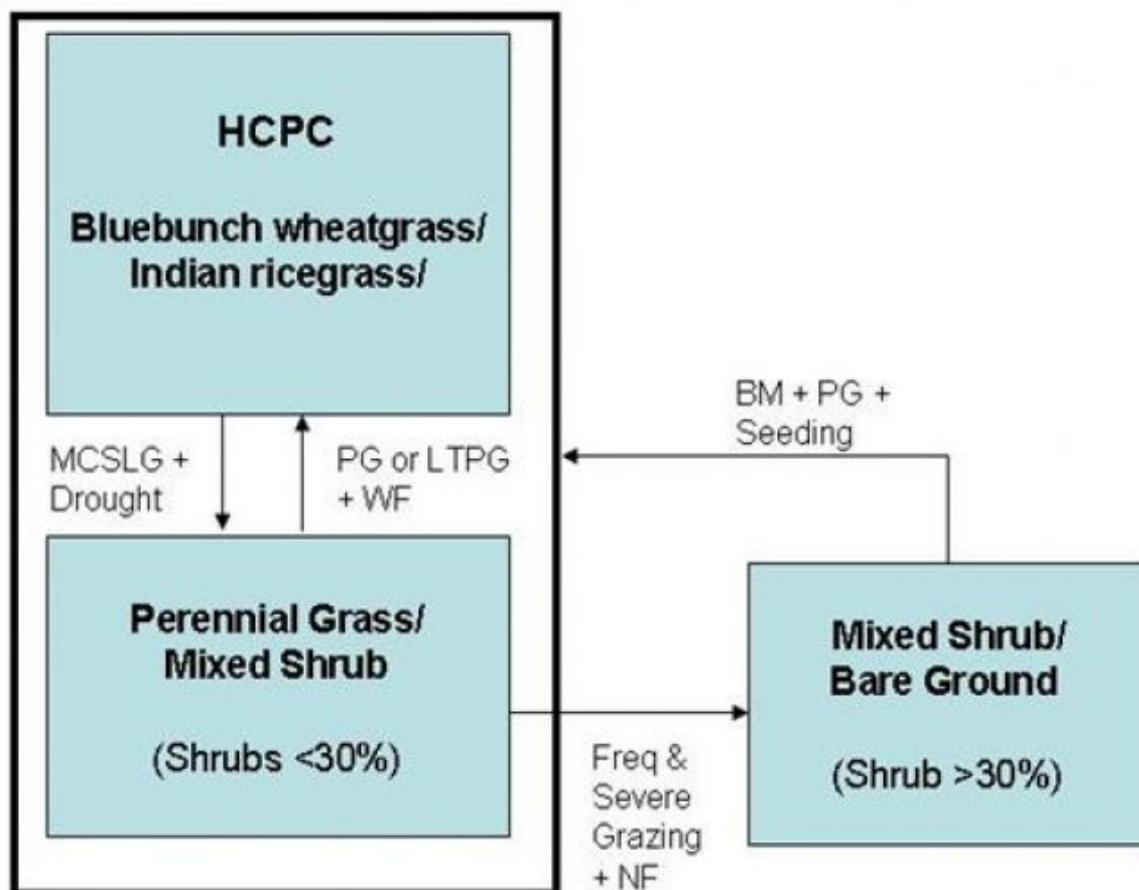
Potential vegetation on this site is dominated by a variety of mid cool-season perennial grasses. Other significant vegetation includes a variety of forbs and shrubs. The expected potential composition for this site is about 70% grasses, 10% forbs and 20% woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

As this site deteriorates, species such as short grasses and shrubs will increase. Plains pricklypear and weedy annuals will invade. Cool season grasses such as bluebunch wheatgrass 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-term 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)

WF - Wildfire

State 1
Bluebunch wheatgrass/Indian Ricegrass Plant Community

Community 1.1
Bluebunch wheatgrass/Indian Ricegrass Plant Community

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and droughty soils due to the limited water holding capacity. This plant community can be found on areas that are properly managed with grazing and/or prescribed burning, and on areas receiving occasional short periods of rest. Potential vegetation is about 70% grasses or grass-like plants, 10% forbs, and 20% woody plants. Cool season midgrasses dominate the state. The major grasses include bluebunch wheatgrass, Indian ricegrass, needleandthread, and rhizomatous wheatgrasses. Other grasses occurring on the state include bottlebrush squirreltail, Sandberg bluegrass, blue grama, and threadleaf sedge. A variety of shrubs and forbs can be present and plant diversity is high (see Plant Composition Table). The total annual production (air-dry weight) of this state is about 200 pounds per acre, but it can range from about 100 lbs. /acre in unfavorable years to about 300 lbs. /acre in above average years. The state is stable and well adapted to the Northern Intermountain Desertic Basins 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 will convert this plant community to the Perennial Grass/Mixed Shrub Plant Community. Prolonged drought will exacerbate this transition.

Figure 4. Plant community growth curve (percent production by month).
WY0501, 5-9BH Upland sites. Monthly percentages of total annual growth for all upland sites with dominantly C3 Cool season plants..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			15	50	20	5		10			

State 2
Perennial Grass/Mixed Shrub Plant Community

Community 2.1
Perennial Grass/Mixed Shrub Plant Community

Historically, this plant community evolved under grazing and a low fire frequency. Currently, it is found under moderate, season-long grazing by livestock and will be exacerbated by prolonged drought conditions. In addition, the fire regime for this site has been modified and extended periods without fire is now common. This plant community is still dominated by cool-season grasses, while short warm-season grasses and miscellaneous forbs account for the balance of the understory. A variety of shrubs makes up the overstory. Dominant grasses include bluebunch wheatgrass, needleandthread, and rhizomatous wheatgrasses. Grasses of secondary importance include Sandberg bluegrass, blue grama and threadleaf sedge. Forbs commonly found in this plant community include biscuitroots, western yarrow, nailwort, buckwheats and scarlet globemallow. Wyoming big sagebrush, skunkbush sumac and yucca account for 20% to 30% of the total production. Rocky Mountain juniper and black sagebrush can be present but usually occur only at the upper end of the precipitation zone. Plains pricklypear can also occur. When compared to the Historical Climax Plant Community, Wyoming big sagebrush and skunkbush sumac have increased. Indian ricegrass and bluebunch wheatgrass have decreased as the production of cool-season grasses has been reduced. Indian ricegrass may occur in only trace amounts under the sagebrush canopy or within the patches of pricklypear. Blue grama and threadleaf sedge have increased. The total annual production (air-dry weight) of this state is about 110 pounds per acre, but it can range from about 50 lbs. /acre in unfavorable years to about 200 lbs. /acre in above average years. This plant community is resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. The herbaceous component is mostly intact and plant vigor and replacement capabilities are sufficient. Water flow patterns and litter movement may be occurring but only on steeper slopes. Incidence of pedestalling is minimal. Soils are mostly stable and the surface shows minimum soil loss. The watershed is functioning and the biotic community is intact. Transitional pathways leading to other plant communities are as follows: • Prescribed grazing or possibly long-term prescribed grazing, will convert this plant community to the HCPC. The probability of this occurring is high especially if rotational grazing along with short deferred grazing is implemented as part of the prescribed method of use. In addition, the removal of fire suppression will allow a somewhat natural fire regime to

reoccur to more easily transition between this plant community and the HCPC. A prescribed fire treatment can be useful to hasten this transition, if desired. The wide gaps between plants, however, may create a problem in carrying a fire and may require a lengthy period of non use and a high precipitation year. • Frequent and severe grazing over the long-term will convert this plant community to the Mixed Shrub/Bare Ground Plant Community.

Figure 5. Plant community growth curve (percent production by month). WY0501, 5-9BH Upland sites. Monthly percentages of total annual growth for all upland sites with dominantly C3 Cool season plants..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			15	50	20	5		10			

State 3
Mixed Shrub/Bare Ground Plant Community

Community 3.1
Mixed Shrub/Bare Ground Plant Community

This vegetation state currently is found under heavy, season-long grazing by livestock in the absence of fire. Wyoming big sagebrush, skunkbush sumac and yucca are significant components of this plant community. Rocky Mountain juniper and black sagebrush can be present but usually occur only at the upper end of the precipitation zone. Cool-season grasses have been reduced. Bare ground, short grasses, and annual plants dominate the understory. The dominant grasses are threadleaf sedge and blue grama. Weedy annual species such as cheatgrass and Russian thistle may occupy the site if a seed source is available. Cactus and sageworts often increase. Noxious weeds such as Russian knapweed may invade the site if a seed source is available. The interspaces between plants have expanded significantly leaving the amount of bare ground more prevalent. As compared with the Perennial Grass/Mixed Shrub Plant Communities, the reduction in the annual production is not significant, as the shrub production off sets the decline in the herbaceous production. The total annual production (air-dry weight) of this state is about 75 pounds per acre, but it can range from about 25 lbs. /acre in unfavorable years to about 200 lbs. /acre in above average years. This plant community is resistant to change. These areas are actually more resistant to fire as less fine fuels are available and the bare ground between the shrubs has increased. Continued frequent and severe grazing or the removal of grazing does not seem to affect the composition or structure of the plant community. Plant diversity is moderate to poor. The plant vigor is diminished and replacement capabilities are limited due to the reduced number of cool-season grasses. Plant litter is noticeably less when compared to the HCPC. Soil erosion is accelerated because of increased bare ground. Water flow patterns and pedestalling are obvious. Infiltration is reduced and runoff is increased. Rill channels may be noticeable in the interspaces and gullies may be establishing where rills have concentrated down slope. 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. Seeding native perennials may be necessary to hasten establishment of these species.

Figure 6. Plant community growth curve (percent production by month). WY0501, 5-9BH Upland sites. Monthly percentages of total annual growth for all upland sites with dominantly C3 Cool season plants..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			15	50	20	5		10			

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				78–112	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	78–112	–
2				11–22	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	11–22	–
3				11–22	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	11–22	–
4				11–22	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	11–22	–
5				0–22	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–11	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–11	–
	sedge	CAREX	<i>Carex</i>	0–11	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	0–11	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–11	–
Forb					
6				0–22	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–11	–
	yarrow	ACHIL	<i>Achillea</i>	0–11	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–11	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–11	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	0–11	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–11	–
	aster	EUCEP2	<i>Eucephalus</i>	0–11	–
	desertparsley	LOMAT	<i>Lomatium</i>	0–11	–
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0–11	–
	nailwort	PARON	<i>Paronychia</i>	0–11	–
	stonecrop	SEDUM	<i>Sedum</i>	0–11	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–11	–
	stemless four-nerve daisy	TEACA2	<i>Tetrandeureis acaulis</i> var. <i>acaulis</i>	0–11	–
Shrub/Vine					
7				22–45	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–11	–
	black sagebrush	ARNO4	<i>Artemisia nova</i>	0–11	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–11	–
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0–11	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–11	–
	yucca	YUCCA	<i>Yucca</i>	0–11	–

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.

Perennial Grass/Mixed Shrub: The combination of a shrub overstory and an understory of grasses and forbs provide a very diverse plant community for wildlife. This diversity provides important 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.

Mixed Shrub/Bare Ground: This plant community can provide winter foraging for mule deer and antelope. Due to the sparseness of the vegetation, this community does not provide escape and thermal cover for large ungulates or nesting habitat for sage grouse.

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)

Historic Climax Plant Community 100-300 .08

Perennial Grass/Mixed Shrub 50-200 .05

Mixed Shrub/Bare Ground 25-200 .02

* - 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. 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 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 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 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.

Inventory Data References

Data Source Number of Records Sample Period State County
SCS-RANGE-417 19 1965-1986 WY Park & others

Contributors

Ray Gullion

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	05/02/2008
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% and 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%
-
4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 50-60%
-
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
-
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%
-
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 40% 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 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: Mid stature Bunch Grasses >> Shrubs/Trees > Mid stature Rhizomatous Grasses = Forbs > Short stature Grasses/Grasslikes
- Sub-dominant:
- Other:
- Additional:
-

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
-

14. **Average percent litter cover (%) and depth (in):** Average litter cover is 10-20% with depths of 0.1 to 0.2 inches
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 175 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:** Short grasses/grasslikes, Badlands mules-ear, Rabbitbrushes, Sagebrushes, Junipers, Unpalatable forbs, Annuals, Exotics, 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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