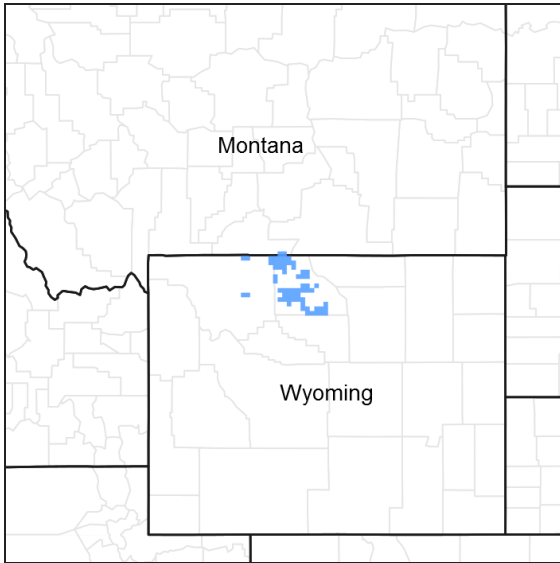


# Ecological site R032XY118WY Impervious Clay (IC) 5-9" Big Horn Basin Precipitation Zone

Accessed: 06/30/2024

## 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

R032XY104WY	<b>Clayey (Cy) 5-9" Big Horn Basin Precipitation Zone</b>
R032XY138WY	<b>Saline Lowland (SL) 5-9" Big Horn Basin Precipitation Zone</b>
R032XY144WY	<b>Saline Upland (SU) 5-9" Big Horn Basin Precipitation Zone</b>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

## Physiographic features

This site occurs on nearly level up to 30% slopes.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Ridge (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	3,700–6,000 ft
Slope	0–30%
Ponding depth	0 in
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)	9 in

## Influencing water features

### Soil features

The soils of this site are very shallow (less than 10”) to very deep, well to poorly drained soils formed in alluvium or alluvium over residuum. Layers of the soil most influential to the plant community varies from 3 to 6 inches thick. These soils have slow to very slow permeability. The topsoil, except for thin ineffectual layers, will be heavy clays and/or soils that develop large cracks when dry and are very sticky when wet. These sites typically have moderate saline and /or alkaline soils, but high amounts of soluble salt can occur. The soil characteristics having the most influence on plants are the very slow infiltration rate, which reduces the available moisture, and the amount of soluble salts.

**Table 4. Representative soil features**

Surface texture	(1) Clay (2) Silty clay (3) Sandy clay loam
Drainage class	Poorly drained to well drained
Permeability class	Slow to very slow
Soil depth	1–60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	0.56–6.3 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–18 mmhos/cm
Sodium adsorption ratio (0-40in)	0–30
Soil reaction (1:1 water) (0-40in)	7.9–11
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

Potential vegetation on this site is dominated by salt tolerant, drought resistant, mid cool-season perennial grasses and shrubs. The expected potential composition for this site is about 50% grasses, 10% forbs and 40% 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 Sandberg bluegrass and birdfoot sagebrush will increase. Plains pricklypear and weedy annuals will invade. Cool season grasses such as rhizomatous wheatgrass, bottlebrush squirreltail, and Indian ricegrass will decrease in frequency and production.

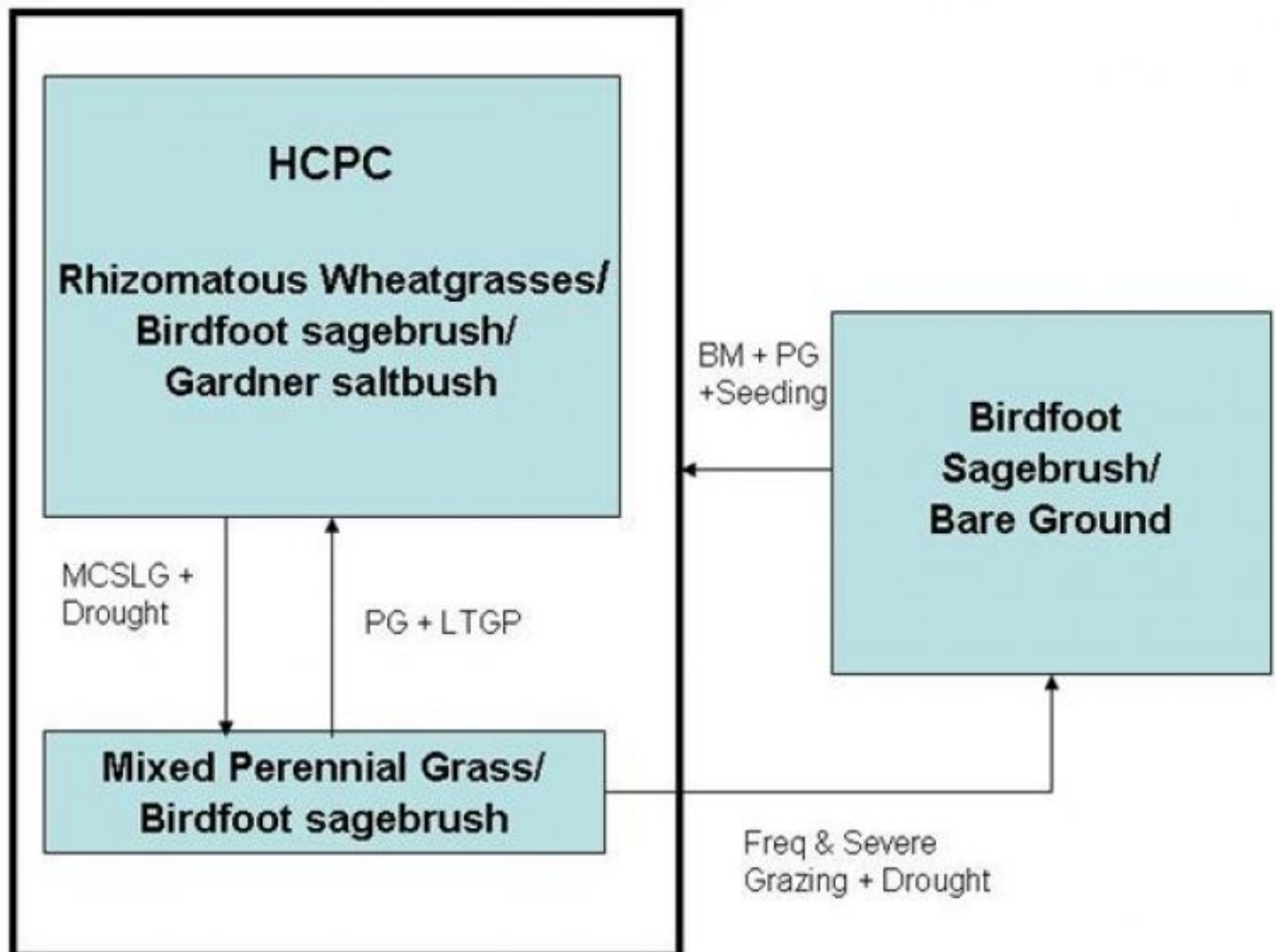
The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical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

Site Type: Rangeland  
MLRA: 32 – Northern Intermountain Desertic Basins

Impervious Clay 5-9 P.Z. BH  
032XY118WY



**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

### Rhizomatous Wheatgrasses/Birdfoot Sagebrush/Gardner Saltbush Plant Community

#### Community 1.1

##### Rhizomatous Wheatgrasses/Birdfoot Sagebrush/Gardner Saltbush Plant Community

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and very droughty soils due to the very slow infiltration rate. Potential vegetation is dominated by salt tolerant, drought resistant, mid cool-season perennial grasses and shrubs. The expected potential composition for this site is about 50% grasses, 10% forbs and 40% woody plants. The major grasses include rhizomatous wheatgrasses, bottlebrush squirreltail, and Indian ricegrass. A variety of forbs and half-shrubs also occur, as shown in the preceding table. Birdfoot sagebrush and Gardner saltbush comprise almost half of the total annual production. Winterfat is a common component found on this site. A variety of forbs also occurs in this state 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. This state is extremely stable and well adapted to the Northern Great Plains 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 state to a Mixed Perennial Grass/Birdfoot Sagebrush Plant Community. Prolonged Drought will exacerbate this transition.

Figure 3. 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

### Mixed Perennial Grass/Birdfoot Sagebrush Plant Community

#### Community 2.1

##### Mixed Perennial Grass/Birdfoot Sagebrush Plant Community

This plant community is the result of moderate continuous season long grazing and is exacerbated by prolong drought conditions. Birdfoot sagebrush composes a significant percentage of the annual production of plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, and miscellaneous forbs. Dominant grasses include rhizomatous wheatgrasses, and bottlebrush squirreltail and Sandberg bluegrass. Forbs commonly found in this plant community include wild onion, scarlet globemallow, fringed sagewort, hairy goldaster, wild parsley, and phlox. Birdfoot Sagebrush can make up to 50% of the annual production. Plains pricklypear cactus can also occur. When compared to the Historic Climax Plant Community, birdfoot sagebrush has increased. Production of cool-season grasses, particularly Indian ricegrass, has been reduced, as have shrubs such as winterfat and Gardner saltbush. This diverse plant community provides support for domestic livestock and wildlife such as antelope. The total annual production (air-dry weight) of this state is about 150 pounds per acre, but it can range from about 50 lbs./acre in unfavorable years to about 225 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. Transitions or 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 prescribed method of use. Brush management is not usually necessary at the time these grazing systems are implemented. • Frequent and severe grazing, will convert the plant community to the Birdfoot Sagebrush/Bare Ground Vegetative State. The probability of this occurring is high on areas where birdfoot sagebrush is not adversely impacted by heavy browsing and prolong drought has occurred.

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 3 Birdfoot Sagebrush/Bare Ground Plant Community

#### Community 3.1 Birdfoot Sagebrush/Bare Ground Plant Community

This plant community is the result of frequent and severe grazing and is exacerbated by prolonged periods of drought. Birdfoot sagebrush dominates this plant community, as the annual production is in excess of 50%. The preferred cool season grasses have been eliminated or greatly reduced. The dominant grass is Sandberg bluegrass. Weedy annual species such as cheatgrass, halogeton, and Russian thistle will occupy the site if a seed source is available. Cactus has increased. Plant diversity is poor. The interspaces between plants have expanded significantly leaving mostly bare ground. When compared to the historic climax plant community the perennial cool-season grasses are absent and birdfoot sage and annuals dominate. The total annual production (air-dry weight) of this state is about 50 pounds per acre, but it can range from about 25 lbs/acre in unfavorable years to about 100 lbs./acre in above average years. This plant community is resistant to change as the stand becomes more decadent. Continued frequent and severe grazing or the removal of grazing does not seem to affect the plant composition or structure of the plant community. Plant diversity is greatly altered and the herbaceous component is not intact. Recruitment of perennial grasses is not occurring and the replacement potential is absent. The biotic integrity is missing. 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 are noticeable in the interspaces and gullies are being establishing where rills have concentrated down slope. The watershed may or may not be functional. Transitional pathways leading to other plant communities are as follows: • Brush Management with prescribed grazing where there are some remnants of perennial grasses may return this state to near Historic Climax Plant Community. If perennial cool-season grasses are not available on site, seeding is recommended.

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			

### Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1				30–50	
	squirreltail	ELELE	<i>Elymus elymoides ssp. elymoides</i>	30–50	–
2				10–30	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	10–30	–
3				10–30	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	10–30	–
4				0–10	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–10	–
5				0–10	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–10	–
<b>Forb</b>					
6				0–20	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–10	–
	woodyaster	XYLOR	<i>Xylorhiza</i>	0–10	–
<b>Shrub/Vine</b>					
7				40–80	
	birdfoot sagebrush	ARPE6	<i>Artemisia pedatifida</i>	40–80	–
8				0–20	
	bud sagebrush	PICRO	<i>Picrothamnus</i>	0–20	–
9				0–20	
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	0–20	–
10				0–10	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–10	–
11				0–10	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–10	–

## Animal community

### Animal Community – Wildlife Interpretations

Historic Climax Plant Community: The composition of grasses and shrubs in this plant community favors feeders, such as antelope. Because of the low growing shrub component this is not suitable for thermal and escape cover for deer, but may be preferred by antelope or other wildlife. 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. Prairie dogs and other small mammals prefer these areas as tall, dense stands of vegetation impede recognition and escape from predators.

Mixed Perennial Grass/Birdfoot Sagebrush: This plant community exhibits a low level of plant species diversity but is an important winter range for antelope. 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. Prairie dogs and other small mammals prefer these areas as tall, dense stands of vegetation impede recognition and escape from predators.

Birdfoot Sagebrush/Bare Ground: This plant community has a low level of diversity. Due to the dominance of annual weeds and grasses, feed for large mammals is limited. Areas of bare ground may provide leks for birds such as sage grouse or habitat for Prairie dogs and other small mammals.

## 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

Mixed Perennial Grass/Birdfoot Sagebrush 50-225 .06

Birdfoot Sagebrush/Bare Ground 25-100 .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 dominated by soils in hydrologic group C and D. Infiltration ranges from slow to very slow. Runoff potential for this site varies from high to very 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. 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 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

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.

Author(s)/participant(s)	Ray Gullion
Contact for lead author	ray.gullion@wy.usda.gov
Date	02/19/2008
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%. Erosional pedestals will be present with terracettes present at debris dams 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 50-70%, occurring in small openings throughout the site.

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

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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 occurs on slopes < 9%. Litter movement does occur on slopes > 25%.

- 
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 30% or greater of soil surface and maintains soil surface integrity. Soil Stability class is anticipated to be 5 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:** Sparse plant canopy, slow infiltration rates, and the high amount of bare ground contribute to very slow to slow infiltration rates, the amount of bare ground, and steepness of slopes results in a naturally high runoff rate on slopes > 25%, even in HCPC.
- 
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.
- 
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: Shrubs > Mid stature Grasses > Forbs = short stature grasses
- 
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):**
- 
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 200lbs/ac
- 
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:** Birdfoot sagebrush, Sandberg bluegrass, Woody aster, Annuals, Exotics, and Species found on

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