USDA Natural Resources Conservation Service

Ecological site R032XY144WY
Saline Upland (SU) 5-9” Big Horn Basin Precipitation Zone

Accessed: 05/04/2024

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.

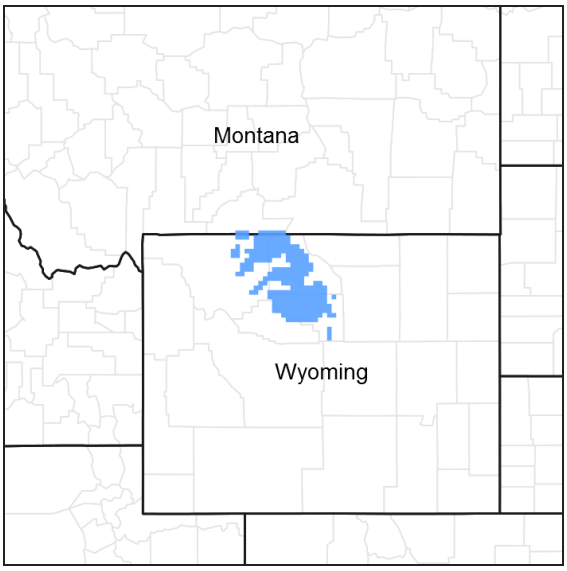


Figure 1. Mapped extent

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

R032XY118WY	**Impervious Clay (IC) 5-9” Big Horn Basin Precipitation Zone**
R032XY122WY	**Loamy (Ly) 5-9” Big Horn Basin Precipitation Zone**

Similar sites

R032XY344WY	**Saline Upland (SU) 10-14" East Precipitation Zone** Saline Upland 10-14” Foothills and Basins East P.Z., 032XY344WY has higher production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on nearly level to moderately sloping land.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Alluvial fan (3) Stream terrace
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	Very rare to rare
Ponding frequency	None
Elevation	1,128–1,829 m
Slope	0–15%
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 generally from 8” to 20” deep but may exceed 60” in depth. They are well-drained soils formed in alluvium from sodic or alkaline materials. These soils have moderate to slow permeability and are moderately to strongly saline and/or alkaline. The surface soil will vary from 2 to 6 inches in thickness. Some soils may contain more soluble salts in the subsoils than in the surface soils. The soil characteristic having the most influence on the plant community is the high quantity of soluble salts.

Major Soil Series correlated to this site include: Muff, Greybull, Persayo, Uffens, Stutzman, Chipeta, Deaver, Sayles, Cestnik, Torchlight, and Bributte.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Very fine sandy loam (3) Fine sandy loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	20–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	3.56–16 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	4–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	8–16
Soil reaction (1:1 water) (0-101.6cm)	7.4–11
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 plants and drought resistant mid cool-season perennial grasses. 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 birdfoot sagebrush and greasewood will increase. Weedy annuals will invade. Cool season grasses such as Indian ricegrass, bottlebrush squirreltail, 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.

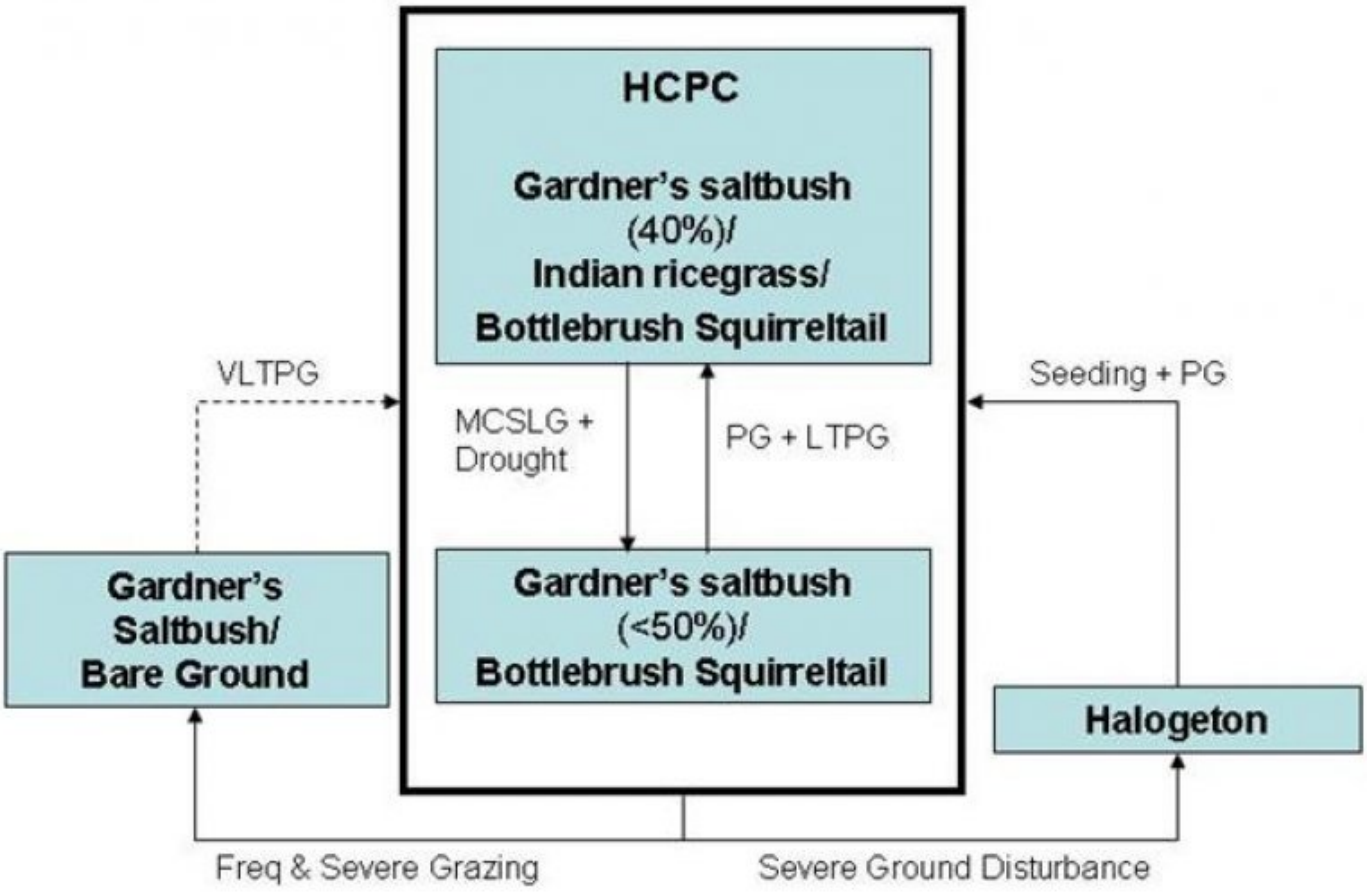
The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in

more detail in the plant community narratives following the diagram.

State and transition model

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

Saline Upland 5-9 P.Z. BH
032XY144WY



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
Gardner’s saltbush/Indian ricegrass/Bottlebrush Squirreltail Plant Community

Community 1.1
Gardner’s saltbush/Indian ricegrass/Bottlebrush Squirreltail 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 saline and/or alkali soils. This plant community can be found on areas that are properly managed with grazing and on areas receiving short periods of rest. Potential vegetation is about 50% grasses or grass-like plants, 10% forbs, and 40% woody plants. Gardner’s saltbush dominates this state. Other salt tolerant shrubs include greasewood and birdfoot sagebrush. The major grasses include Indian ricegrass, bottlebrush squirreltail, Sandberg bluegrass, and rhizomatous wheatgrasses. 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 350 pounds per acre, but it can range from about 200 lbs. /acre in unfavorable years to about 550 lbs. /acre in above average years. This state is fragile, but well adapted to the Northern Intermountain Desertic Basins climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community, but is difficult to reestablish when damaged. (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 Gardner’s Saltbush/Bottlebrush Squirreltail Plant Community. • Severe ground disturbance will convert this state to the Halogeton Plant Community.

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
Gardner’s Saltbush/Bottlebrush Squirreltail Plant Community

Community 2.1
Gardner’s Saltbush/Bottlebrush Squirreltail Plant Community

Historically, this plant community evolved under grazing by large ungulates. Currently this vegetation state is found under moderate season-long grazing by livestock. Prolonged drought can also play an important role and will exacerbate these conditions. Gardner’s saltbush and bottlebrush squirreltail are major 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 grasses, and miscellaneous forbs. Dominant grasses include bottlebrush squirreltail and Sandberg bluegrass. Forbs commonly found in this plant community include Smooth woodyaster, Cous biscuitroot, Wild onion, and leafy wildparsley. Plains pricklypear and winterfat can also occur. When compared to the Historic Climax Plant Community, birdfoot sagebrush has increased. Indian ricegrass has decreased and may occur in only trace amounts. In addition, winterfat may or may not have changed depending on the season of use. The total annual production (air-dry weight) of this state is about 250 pounds per acre, but it can range from about 150 lbs. /acre in unfavorable years to about 350 lbs. /acre in above average years. This plant community is relatively 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 occur, but is not extensive. 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 will prevent further deterioration and over the long-term may return this state to near Historic Climax Plant Community. • Frequent and severe grazing will convert this state to Gardner Saltbush/Bare Ground Plant Community. • Severe ground disturbance will convert this state to the Halogeton 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
Gardner’s Saltbush/Bare Ground Plant Community

Community 3.1
Gardner’s Saltbush/Bare Ground Plant Community

This plant community can occur where sites are subjected to continuous yearlong grazing. Gardner’s saltbush dominates this state and in some cases comprises almost 100% of the plant community. The interspaces between plants have expanded significantly leaving the amount of bare ground prevalent and the soil surface exposed to erosive elements. Cool season grasses have been eliminated or greatly reduced. Noxious weeds such as Russian knapweed and halogeton may invade into the large openings. When compared to the HCPC, plant production is greatly diminished due to the excessive amount of bare ground. The total annual production (air-dry weight) of this state is about 100 pounds per acre, but it can range from about 75 lbs./acre in unfavorable years to about 200 lbs./acre in above average years. This plant community is resistant to change as the stand becomes more decadent. These areas may actually be more resistant to fire as less fine fuels are available and the bare ground between the sagebrush plants is increased. 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 extremely low. The plant vigor is diminished and replacement capabilities are severely reduced due to the decrease in the 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: • Very long term prescribed grazing may eventually return this plant community at or near the HCPC. • Severe ground disturbance will convert this state to the Halogeton Plant Community.

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			

State 4
Halogeton Plant Community

Community 4.1
Halogeton Plant Community

This plant community is a result of severe ground disturbance. Halogeton, bottlebrush squirreltail, and bare ground are a major part of this state. Sparse saline tolerant grasses can be found in the understory with the balance made up of annual forbs. The total annual production (air-dry weight) of this state is about 75 pounds per acre, but it can range from about 50 lbs./acre in unfavorable years to about 150 lbs./acre in above average years. The state is vulnerable to excessive erosion. The biotic integrity of this plant community is at risk depending on how far a shift has occurred in plant composition toward halogeton and annual forbs. The watershed is at risk as bare ground increases. Transitional pathways leading to other plant communities are as follows: • Re-seeding followed by deferment for 1 to 2 years as part of a Prescribed Grazing plan will return this plant community to near Historic Climax Plant Community (Gardner’s Saltbush/Bunchgrass State) although halogeton will remain a part of the plant community. Additional deferment may be necessary and should be prescribed on an individual site basis.

Figure 7. 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				59–118	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	59–118	–
2				59–118	
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	59–118	–
3				20–39	
	western wheatgrass	PASM	*Pascopyrum smithii*	20–39	–
4				0–20	
	Sandberg bluegrass	POSE	*Poa secunda*	0–20	–
5				0–20	
	Grass, perennial	2GP	*Grass, perennial*	0–20	–
Forb					
6				4–39	
	Forb, perennial	2FP	*Forb, perennial*	0–20	–
	textile onion	ALTE	*Allium textile*	0–20	–
	milkvetch	ASTRA	*Astragalus*	0–20	–
	salsify	TRPO	*Tragopogon porrifolius*	0–20	–
	woodyaster	XYLOR	*Xylorhiza*	0–20	–
Shrub/Vine					
7				78–157	
	Gardner's saltbush	ATGA	*Atriplex gardneri*	78–157	–
8				0–39	
	bud sagebrush	PICRO	*Picrothamnus*	0–39	–
9				4–39	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–20	–
	birdfoot sagebrush	ARPE6	*Artemisia pedatifida*	0–20	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–20	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–20	–

Animal community

Animal Community – Wildlife Interpretations
Historic Climax Plant Community: The predominance of woody plants in this plant community provides winter grazing for mixed-feeders, such elk, and antelope. Suitable thermal and escape cover for these animals are limited due to the low quantities of tall woody plants. When found adjacent to sagebrush-dominated states, this plant community may provide lek sites for sage grouse. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Some grassland obligate small mammals would occur here.
Gardner’s Saltbush/Bottlebrush Squirreltail Plant Community: The combination of shrubs, grasses, and forbs can provide a forage source for large animals. Suitable thermal and escape cover for these animals are limited due to

the low quantities of tall woody plants. When found adjacent to sagebrush dominated states, this plant community may provide lek sites for sage grouse. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Some grassland obligate small mammals would occur here.

Gardner's Saltbush/Bare Ground Plant Community: This plant community exhibits a low level of plant species diversity. It may provide some forage value for antelope, but in most cases it is not a desirable plant community to select as a wildlife habitat management objective.

Halogeton Plant Community: This plant community exhibits a low level of plant species diversity. It is not a desirable plant community to select as a wildlife habitat management objective.

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 200-550 .10
Gardner's Saltbush/Bottlebrush Squirreltail 150-350 .08
Gardner's Saltbush/Bare Ground 75-200 .05
Halogeton Plant Community 50-150 .03

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

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

Recreational uses

This site provides some hunting opportunities for upland game species.

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	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:** Rills should not be present

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

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 30-40%

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

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 50% 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 slow to moderate.

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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 Grasses > Shrubs > Forbs > Short stature Grasses

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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):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 300 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:** Birdfoot sagebrush, greasewood, Unpalatable forbs, Annuals, Exotics, 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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