USDA Natural Resources
Conservation Service

Ecological site R043BY430WY
Overflow (Ov) 15-19” Northern Plains 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.

Associated sites

R043BY404WY	**Clayey (Cy) 15-19” Northern Plains Precipitation Zone**
R043BY428WY	**Lowland (LL) 15-19” Northern Plains Precipitation Zone**
R043BY450WY	**Sandy (Sy) 15-19” Northern Plains Precipitation Zone**

Similar sites

R058BY130WY	**Overflow (Ov) 10-14” PZ** Overflow 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 areas that receive additional water from overflow of intermittent streams or runoff from adjacent slopes.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Stream terrace
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Frequent
Ponding frequency	None
Elevation	1,128–2,286 m
Slope	0–6%
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

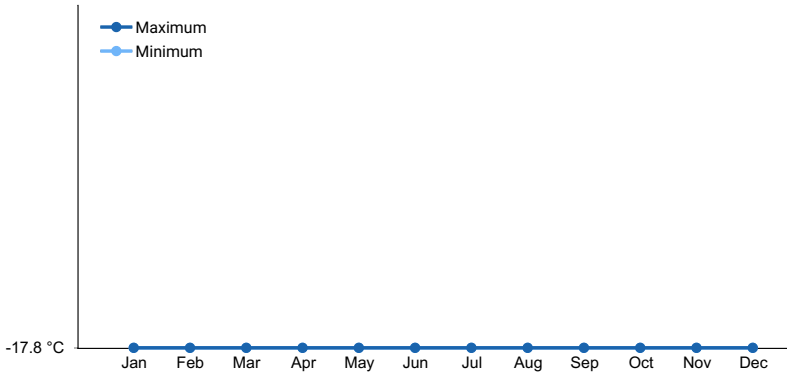


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

Stream type: None

Soil features

The soils of this site are deep (greater than 20”to bedrock), well drained and moderately permeable. Topsoils may vary from a sandy loam through light silty clay loams. Coarser or finer textured surface soils may also be present provided they are less than 2 to 4 inches thick. These areas receive additional water from overflow of intermittent streams or runoff from adjacent slopes.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to excessively drained
Permeability class	Moderate to rapid
Soil depth	51–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–15.75 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–10
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 blue grama and silver sagebrush will increase. Species such as cheatgrass will invade. Cool season grasses such as basin wildrye, green needlegrass and western wheatgrass will decrease in frequency and production.

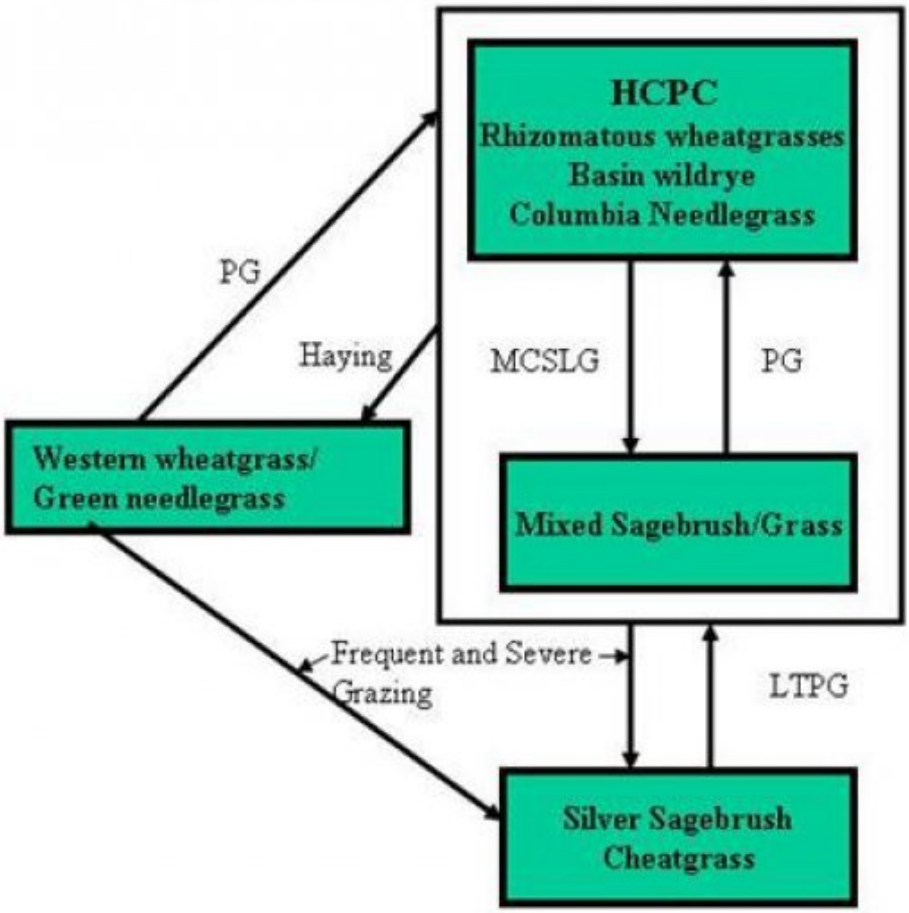
The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical 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: 43BY – Central Rocky Mountains

Overflow 15-19"NP P.Z.
R043BY430WY



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 - Moderate Sodium in Soil

State 1
Rhizomatous Wheatgrasses, Basin Wildrye, Columbia Needlegrass Plant Community

Community 1.1
Rhizomatous Wheatgrasses, Basin Wildrye, Columbia Needlegrass 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 80% grasses or grass-like plants, 10% forbs and 10% woody plants. The state is dominated by cool season midgrasses. The major grasses include basin wildrye, rhizomatous wheatgrass, columbia needlegrass, slender wheatgrass and green needlegrass. Other grasses occurring on the site include Sandberg bluegrass, Canada wildrye, needleleaf sedge, blue grama, and prairie junegrass. Woody plants include chokecherry, silver sagebrush, hawthorn, wild plums and snowberry. This state produces between 2000 and 4000 pounds annually, depending on the growing conditions. The state is extremely 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). Transitions or pathways leading to other plant communities are as follows: • Moderate, continuous season-long grazing will convert the plant community to the Mixed sagebrush/Grass Vegetation State. • Heavy, continuous, improper grazing will convert this plant community to the Silver sagebrush/cheatgrass Vegetation State. • Haying will convert the plant community to the Western wheatgrass/Green neeedlegrass vegetation state.

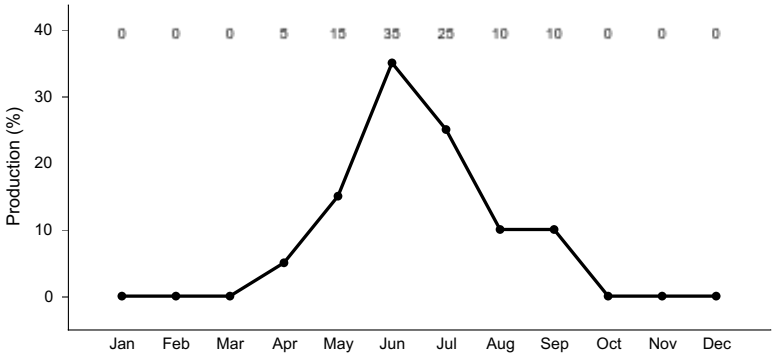


Figure 3. Plant community growth curve (percent production by month). WY1302, 15-19NP Extra water sites - LL, Ov, CyO, SL.

State 2
Mixed Sagebrush/Grass Plant Community

Community 2.1
Mixed Sagebrush/Grass Plant Community

This plant community evolved under moderate grazing by domestic livestock. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant grasses include rhizomatous wheatgrasses, Kentucky bluegrass, Sandberg bluegrass, and green needlegrass. Grasses of secondary importance include blue grama, prairie junegrass, and slender wheatgrass. Cheatgrass has invaded this site. Silver sagebrush has increased, with canopy cover up to 30%. Forbs, commonly found in this plant community, include Louisiana sagewort (cudweed), plains wallflower, hairy goldaster, slimflower scurfpea, and scarlet globemallow. Fringed sagewort is commonly found. Plains pricklypear and winterfat can also occur. When compared to the Historical Climax Plant Community, rhizomatous wheatgrasses and green needlegrass have decreased. Needleandthread and Sandberg bluegrass have increased. Silver sagebrush has increased. The overstory of sagebrush and understory of grass and forbs provide a diverse plant community which will support domestic livestock and wildlife such as birds, mule deer and antelope. This state produces between 1500 and 3000 pounds annually, depending on the growing conditions. The state is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact. The watershed is usually functioning. Transitions or pathways leading to other plant communities are as follows: • Prescribed grazing, will result in a plant community very similar to the Historic Climax Plant Community except that the silver sagebrush will persist. • Heavy, improper grazing use will result in the Silver sagebrush/cheatgrass plant community.

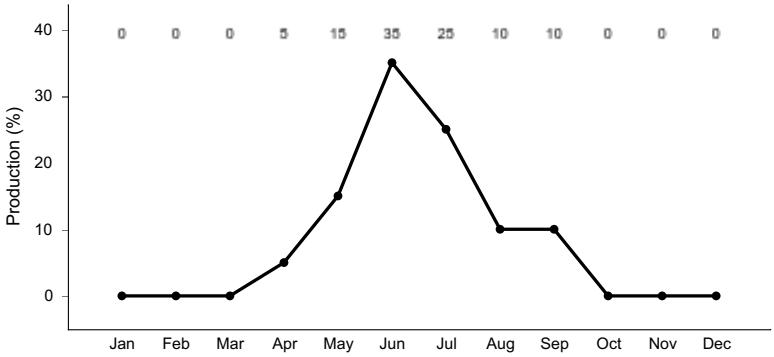


Figure 4. Plant community growth curve (percent production by month). WY1302, 15-19NP Extra water sites - LL, Ov, CyO, SL.

State 3
Silver Sagebrush/Cheatgrass Plant Community

Community 3.1
Silver Sagebrush/Cheatgrass Plant Community

This plant community is the result of long-term improper grazing use. This state is dominated by western wheatgrass, Kentucky bluegrass, cheatgrass and blue grama. It has been invaded by noxious weeds such as Canada thistle and American licorice. Production ranges from 800 to 2000 pounds annually, depending on climatic conditions. Basin wildrye, and green needlegrass have been lost. Silver sagebrush has increased. This state is productive but lacks the diversity of the HCPC. The biotic integrity is threatened by the invasion of noxious weeds. The soil of this state is protected. The watershed is functioning but may produce excessive runoff. This plant community is not resistant to change and is more vulnerable to severe disturbance than the HCPC. The introduction of grazing or fire quickly changes the plant community. Soil erosion is accelerated because of increased bare ground. Water flow patterns and pedestaling are obvious. Infiltration is reduced and runoff is increased. Transitions or pathways leading to other plant communities are as follows: • Proper grazing use over the long-term will return this state to near Historic Climax Plant Community, except that silver sagebrush will persist.

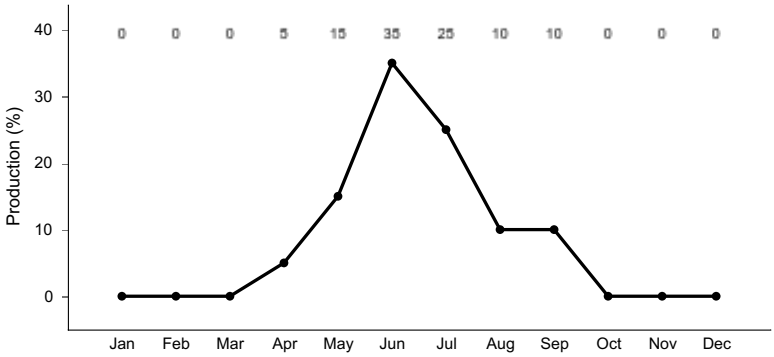


Figure 5. Plant community growth curve (percent production by month). WY1302, 15-19NP Extra water sites - LL, Ov, CyO, SL.

State 4
Western Wheatgrass/Green Needlegrass Plant Community

Community 4.1
Western Wheatgrass/Green Needlegrass Plant Community

This plant community is the result of haying. It is dominated by western wheatgrass and green needlegrass. These grasses form a sod which is very productive and is often used for dryland hay. Basin wildrye has been lost through haying. Production ranges from 1000 to 3000 pounds. This state is productive but lacks the diversity of the HCPC. The soil of this state is protected. The watershed is functioning but may produce excessive runoff. The biotic function is reduced by the lack of plant diversity. • Proper grazing use will return this state to near Historic Climax Plant Community. • Improper grazing will change this state to the Silversagebrush/cheatgrass Plant Community.

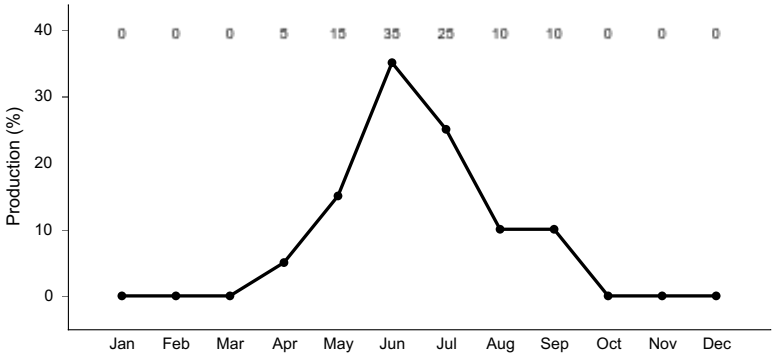


Figure 6. Plant community growth curve (percent production by month). WY1302, 15-19NP Extra water sites - LL, Ov, CyO, SL.

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				336–841	
	green needlegrass	NAVI4	*Nassella viridula*	336–841	–
2				336–841	
	western wheatgrass	PASM	*Pascopyrum smithii*	336–841	–
3				336–673	
	basin wildrye	LECI4	*Leymus cinereus*	336–673	–
4				168–336	
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	168–336	–
5				168–336	
	Canada wildrye	ELCA4	*Elymus canadensis*	168–336	–
6				168–336	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	168–336	–
7				168–504	
	Grass, perennial	2GP	*Grass, perennial*	0–168	–
	Pumpelly's brome	BRINP5	*Bromus inermis ssp. pumpellianus var. pumpellianus*	0–168	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–168	–
	needle and thread	HECO26	*Hesperostipa comata*	0–168	–
	fowl bluegrass	POPA2	*Poa palustris*	0–168	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–168	–
Forb					
8				168–336	
	Forb, perennial	2FP	*Forb, perennial*	0–168	–
	yarrow	ACHIL	*Achillea*	0–168	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–168	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–168	–

	prairie clover	DALEA	*Dalea*	0–168	–
	fleabane	ERIGE2	*Erigeron*	0–168	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–168	–
	dock	RUMEX	*Rumex*	0–168	–
	groundsel	TEPHR3	*Tephroseris*	0–168	–
	American vetch	VIAM	*Vicia americana*	0–168	–
	violet	VIOLA	*Viola*	0–168	–
Shrub/Vine					
9				168–336	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–168	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–168	–
	hawthorn	CRATA	*Crataegus*	0–168	–
	American plum	PRAM	*Prunus americana*	0–168	–
	chokecherry	PRVIV	*Prunus virginiana var. virginiana*	0–168	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–168	–

Animal community

Rhizomatous Wheatgrasses, Basin Wildrye, Columbia Needlegrass Plant Community (HCPC): The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, and 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, migratory song birds, and golden eagles. Many grassland obligate small mammals would occur here.

Mixed Sagebrush/Grass Plant Community: The combination of an overstory of sagebrush and an understory of grasses and forbs provide a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on 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.

Silver Sagebrush/Cheatgrass 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.

Western Wheatgrass/Green Needlegrass 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.

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)

Rhiz. WG, Basin wildrye, Columbia Needlegrass 2000-4000 .8
Mixed Sagebrush/Grass 1500-3000 .6
Silver Sagebrush/Cheatgrass 800-2000 .4
Western Wheatgrass/Green Needlegrass 1000-3000 .4

* - 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 and C. Infiltration ranges from moderate to rapid. 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 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 5 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)	
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

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 10-20% occurring in small areas throughout site

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

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.

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 80% 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:** 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 Slow to Slow.

---

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: Mid stature Cool Season Grasses > Shrubs = Forbs > Short stature Grasses/Grasslikes

---

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

---

14. **Average percent litter cover (%) and depth (in):** Average litter cover is 35-45% with depths of 0.25 to 1.0 inches

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3000 lbs/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:** Blue grama, Kentucky Bluegrass, Silver sagebrush, Cheatgrass, Fringed sagewort, and Species found on Noxious Weed List

---

17. **Perennial plant reproductive capability:** All species are capable of reproducing

---