Ecological site R043BY160WY
Shallow Igneous High Mountains

Accessed: 04/24/2024

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.

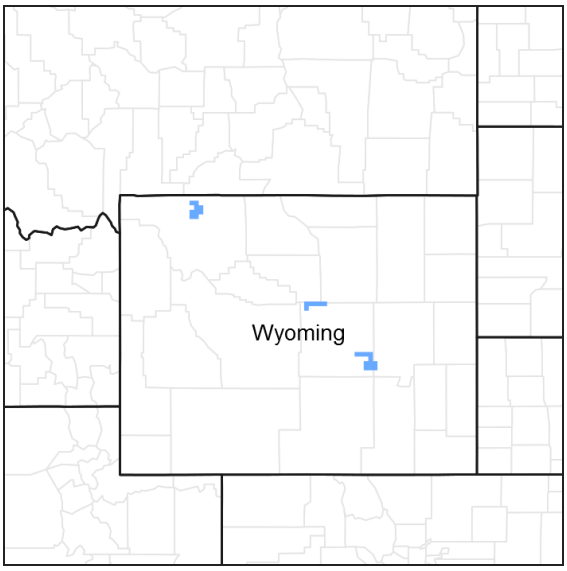


Figure 1. Mapped extent

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

R043BY116WY	**Igneous High Mountains** Igneous
R043BY162WY	**Shallow Loamy High Mountains** Shallow Loamy

Similar sites

R043BY116WY	**Igneous High Mountains** Igneous (Ig) 20+M has lower production and less bitterbrush.
R043BY260WY	**Shallow Igneous Foothills and Mountains West** Shallow Igneous (Swl) 15-19W has lower production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site is found on rolling to steep mountain slopes and ridges.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	6,500–12,000 ft
Slope	5–70%
Ponding depth	0 in

Climatic features

Annual precipitation is fairly evenly distributed through the year and averages over 20 inches. Snows are heavy and usually remain in place during the winter. Annual snowfall averages 150 to 200 inches per year. 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. This is predominantly due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks in winter move rapidly from northwest to southeast and account for extreme minimum temperatures.

Prevailing winds are from the southwest, and strong winds are less frequent than over other areas of Wyoming. Occasional storms, however, can bring brief periods of high winds with gusts exceeding 50 mph.

Growth of native cool season plants begins about June 1 at lower elevations, as late as July 15 at higher elevations, and continues until the beginning of September.

The following information is from the “Moran 5 WNW” climate station:

Minimum Maximum 5 yrs. out of 10 between
Frost-free period (days): 31 78 June 30 – August 24
Freeze-free period (days): 65 118 June 5 – September 9

Annual Precipitation (inches): <20.78 >29.35 (2 years in 10)

Mean annual precipitation: 25.23 inches

Mean annual air temperature: 36.5?F (22.1?F Avg. Min. to 50.9?F Avg. Max.)

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=wy website. Other climate station representative of this precipitation zone include ”Alta 1 NW”, “Lake Yellowstone”, “Moose”, “Old Faithful”, and “Snake River” in Teton County; “Bedford 3 SE” in Lincoln County; and “Bondurant” in Sublette County.

Table 3. Representative climatic features

Frost-free period (average)	78 days
Freeze-free period (average)	118 days
Precipitation total (average)	29 in

Influencing water features

Soil features

These are shallow (10-20”), well-drained soils with medium to moderately coarse textures over igneous or volcanic bedrock. This site may also include some deep gravelly and/or cobbly soils on south and west facing slopes which react like shallow soils.

Table 4. Representative soil features

Surface texture	(1) Gravelly loam (2) Cobbly sandy loam (3) Very cobbly
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	10–20 in
Surface fragment cover <=3"	10–25%
Surface fragment cover >3"	20–45%
Available water capacity (0-40in)	0.6–1.2 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–7.2
Subsurface fragment volume <=3" (Depth not specified)	15–30%
Subsurface fragment volume >3" (Depth not specified)	30–50%

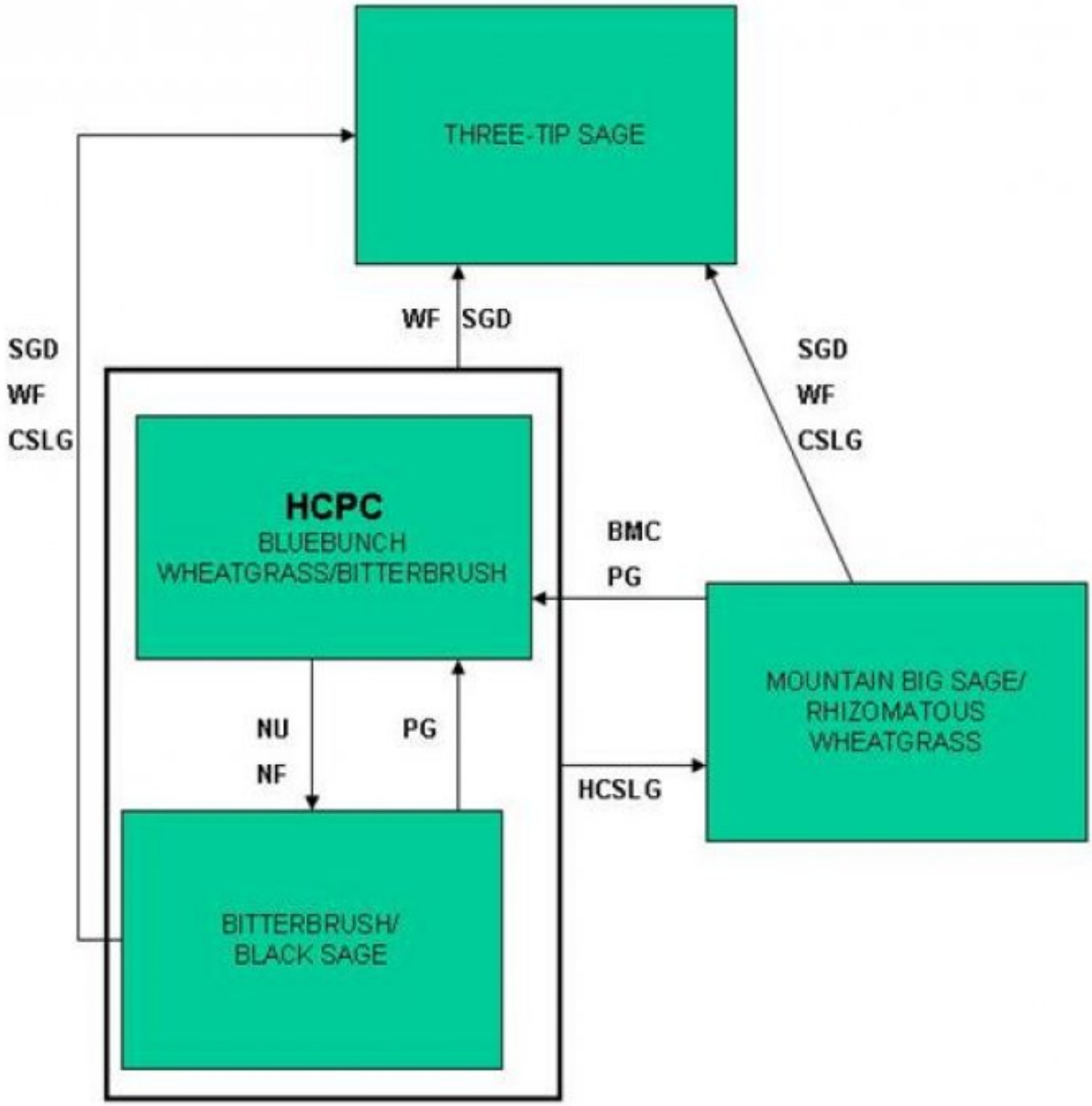
Ecological dynamics

As this site deteriorates, species such as rhizomatous wheatgrass, bottlebrush squirreltail, three-tip and mountain big sagebrush, and snowberry will increase. Bluebunch wheatgrass, spike fescue, and bitterbrush 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



BMA – Brush Management (all methods)
BMC – Brush Management (chemical)
BMF – Brush Management (fire)
BMM – Brush Management (mechanical)
CSP – Chemical Seedbed Preparation
CSLG – Continuous Season-long Grazing
DR – Drainage
CSG – Continuous Spring Grazing
HB – Heavy Browse
HCSLG – Heavy Continuous Season-long Grazing
HI – Heavy Inundation
LPG – Long-term Prescribed Grazing
MT – Mechanical Treatment (chiseling, ripping, pitting)
NF – No Fire
NS – Natural Succession
NWC – Noxious Weed Control
NWI – Noxious Weed Invasion
NU – Nonuse
P&C – Plow & Crop (including hay)
PG – Prescribed Grazing
RPT – Re-plant Trees
RS – Re-seed
SGD – Severe Ground Disturbance
SHC – Severe Hoof Compaction
WD – Wildlife Damage (Beaver)
WF - Wildfire

State 1
Bluebunch Wheatgrass/Bitterbrush Plant Community (HCPC)

Community 1.1
Bluebunch Wheatgrass/Bitterbrush Plant Community (HCPC)

The interpretive plant community for this site is the Historic Climax Plant Community. Potential vegetation is about 65% grasses or grass-like plants, 10% forbs, and 25% woody plants. The major grasses include bluebunch wheatgrass, spike fescue, and thickspike wheatgrass. Other grasses include mutton, big, and Canby bluegrass, Columbia needlegrass, bottlebrush squirreltail, California and timber oatgrass, Idaho fescue, Letterman and western needlegrass, mountain brome, mountain muhly, oniongrass, spike trisetum, bentgrass, and prairie junegrass. Bitterbrush and black sagebrush are the dominant woody plants. Other woody plants include snowberry, snowbrush ceanothus, mountain big sagebrush, and three-tip sagebrush. A typical plant composition for this state consists of bluebunch wheatgrass 35-45%, spike fescue 15-25%, thickspike wheatgrass 5-15%, other grasses and grass-like plants 10-20%, perennial forbs 5-10%, bitterbrush 10-15%, black sagebrush 5-10%, and 5-15% other woody species. Ground cover, by ocular estimate, varies greatly depending on the amount of exposed parent material, and herbage cover ranges from 15-25%. The total annual production (air-dry weight) of this state is about 1500 pounds per acre, but it can range from about 1200 lbs./acre in unfavorable years to about 1800 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0101 Growth curve name: 20+M, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) The state is stable and well adapted to the Central Rocky Mountains 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: • Nonuse and No Fire will convert this plant community to the Bitterbrush/Black Sage State. • Heavy Continuous Season-Long Grazing will convert this plant community to the Mountain Big Sage/Rhizomatous Wheatgrass State. • Wildfire or Severe Ground Disturbance will convert this plant community to the Three-tip Sage State.

Figure 3. Plant community growth curve (percent production by month). WY0101, 20+ upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				5	30	40	20	5			

State 2
Bitterbrush/Black Sage Plant Community

Community 2.1
Bitterbrush/Black Sage Plant Community

This plant community is a result of nonuse and protection from fire. Bitterbrush, mountain big sagebrush, and black sagebrush are significant components of this plant community, often making up 50-75% of the annual production. Dominant grasses include bluebunch wheatgrass and Columbia needlegrass. The total annual production (air-dry weight) of this state is about 1200 pounds per acre, but it can range from about 1000 lbs./acre in unfavorable years to about 1600 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0101 Growth curve name: 20+M, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) The state is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact, however forage value will decrease and wildlife values will shift toward different species. The watershed is functioning. Transitional pathways leading to other plant communities are as follows: • Prescribed Grazing will return this state to near Historic Climax Plant Community (Bluebunch Wheatgrass/Bitterbrush State). • Heavy Continuous Season-long Grazing will convert this plant community to the Mountain Big Sage/Rhizomatous Wheatgrass State. • Continuous Season-Long Grazing with Severe Ground Disturbance or Wildfire will convert this plant community to the Three-tip Sage State.

Figure 4. Plant community growth curve (percent production by month). WY0101, 20+ upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				5	30	40	20	5			

State 3
Mountain Big Sage/Rhizomatous Wheatgrass Plant Community

Community 3.1
Mountain Big Sage/Rhizomatous Wheatgrass Plant Community

This plant community results from heavy, continuous season-long grazing. Mountain big sagebrush, green rabbitbrush and various forbs are significant components of this plant community. Dominant grasses in the understory include rhizomatous wheatgrass, Canby bluegrass, and Letterman needlegrass. Phlox and goldenweed are common forbs found in this state. The total annual production (air-dry weight) of this state is about 1000 pounds per acre, but it can range from about 800 lbs./acre in unfavorable years to about 1400 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0101 Growth curve name: 20+M, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) Soil erosion is accelerated because of increased bare ground. The biotic community is relatively stable. The watershed is functioning, but is at risk of further degradation. Water flow patterns and pedestals are obvious. Infiltration is reduced and runoff is increased. Transitional pathways leading to other plant communities are as follows: • Chemical Brush Management followed by deferment for 1 to 2 years as part of a Prescribed Grazing plan will return this state to near Historic Climax Plant Community (Bluebunch Wheatgrass/Bitterbrush State). Care should be taken when planning brush management to consider wildlife habitat and critical winter ranges. • Continuous Season-Long Grazing with Severe Ground Disturbance or Wildfire will convert this plant community to the Three-tip Sage State.

Figure 5. Plant community growth curve (percent production by month). WY0101, 20+ upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				5	30	40	20	5			

State 4
Three-Tip Sage Plant Community

Community 4.1
Three-Tip Sage Plant Community

This vegetation state currently is a result of improper grazing management techniques followed by wildfire or severe ground disturbance. Three-tip sage flourishes and rhizomatous wheatgrass is the dominant understory grass. Other grasses/ grasslikes include needleleaf sedge and Letterman needlegrass. The total annual production (air-dry weight) of this state is about 700 pounds per acre, but it can range from about 500 lbs./acre in unfavorable years to about 1200 lbs./acre in above average years. The following is the growth curve of this plant community expected during a normal year: Growth curve number: WY0101 Growth curve name: 20+M, UPLAND SITES Growth curve description: ALL UPLAND SITES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 0 0 0 0 5 30 40 20 5 0 0 0 (Monthly percentages of total annual growth) 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 sprouting shrubs and annual forbs. The watershed is at risk as bare ground increases. Transitional pathways leading to other plant communities are as follows: It is not often practicable or economically feasible to convert this plant community.

Figure 6. Plant community growth curve (percent production by month). WY0101, 20+ upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				5	30	40	20	5			

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				525–675	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	525–675	–
2				225–375	
	spike fescue	LEKI2	*Leucopoa kingii*	225–375	–
3				75–225	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	75–225	–
4				150–300	
	Grass, perennial	2GP	*Grass, perennial*	0–75	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	0–75	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	0–75	–
	western needlegrass	ACOC3	*Achnatherum occidentale*	0–75	–
	bentgrass	AGROS2	*Agrostis*	0–75	–
	mountain brome	BRMA4	*Bromus marginatus*	0–75	–
	California oatgrass	DACA3	*Danthonia californica*	0–75	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0–75	–
	onespike danthonia	DAUN	*Danthonia unispicata*	0–75	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–75	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–75	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–75	–
	oniongrass	MEBU	*Melica bulbosa*	0–75	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0–75	–
	muttongrass	POFE	*Poa fendleriana*	0–75	–
	spike trisetum	TRSP2	*Trisetum spicatum*	0–75	–
Forb					
5				75–150	
	Forb, perennial	2FP	*Forb, perennial*	0–75	–
	common yarrow	ACMI2	*Achillea millefolium*	0–75	–
	agoseris	AGOSE	*Agoseris*	0–75	–
	pussytoes	ANTEN	*Antennaria*	0–75	–
	milkvetch	ASTRA	*Astragalus*	0–75	–
	balsamroot	BALSA	*Balsamorhiza*	0–75	–
	Indian paintbrush	CASTI2	*Castilleja*	0–75	–
	fleabane	ERIGE2	*Erigeron*	0–75	–
	buckwheat	ERIOG	*Eriogonum*	0–75	–
	stoneseed	LITHO3	*Lithospermum*	0–75	–
	creeping barberry	MARE11	*Mahonia repens*	0–75	–
	bluebells	MERTE	*Mertensia*	0–75	–

	ragwort	PACKE	*Packera*	0–75	–
	phlox	PHLOX	*Phlox*	0–75	–
	ragwort	SENEC	*Senecio*	0–75	–
	snowberry	SYMPH	*Symphoricarpos*	0–75	–
	clover	TRIFO	*Trifolium*	0–75	–
	American vetch	VIAM	*Vicia americana*	0–75	–
	violet	VIOLA	*Viola*	0–75	–
Shrub/Vine					
6				150–225	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	150–225	–
7				75–150	
	black sagebrush	ARNO4	*Artemisia nova*	75–150	–
8				75–225	
	Shrub, deciduous	2SD	*Shrub, deciduous*	0–75	–
	Shrub, evergreen	2SE	*Shrub, evergreen*	0–75	–
	Tree, deciduous	2TD	*Tree, deciduous*	0–75	–
	Tree, evergreen	2TE	*Tree, evergreen*	0–75	–
	threetip sagebrush	ARTR4	*Artemisia tripartita*	0–75	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–75	–
	snowbrush ceanothus	CEVE	*Ceanothus velutinus*	0–75	–
	snowberry	SYMPH	*Symphoricarpos*	0–75	–

Animal community

Animal Community – Wildlife Interpretations
Bluebunch Wheatgrass/Bitterbrush Plant Community (HCPC): Suitable thermal and escape cover for most wildlife is limited due to the low height and density of woody plants. Bitterbrush and sagebrush provide important winter forage for mule deer and elk.

Bitterbrush/Black Sage Plant Community: This plant community may be beneficial for the same wildlife that would use the Historic Climax Plant Community.

Mountain Big Sage/Rhizomatous Wheatgrass Plant Community: This plant community may be beneficial for the same wildlife 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.

Three-Tip Sage Plant Community: This plant community exhibits a low level of plant species diversity. In most cases 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)
Bluebunch Wheatgrass/Bitterbrush (HCPC) 1200-1800 .45
Bitterbrush/Black Sage 1000-1600 .3
Mountain Big Sage/Rhizomatous Wheatgrass 800-1400 .2
Three-Tip Sage 500-1200 .1

* - 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, depth and degree of bedrock fracturing, slope, and ground cover (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 limited hunting opportunities for upland game species.

Wood products

No appreciable wood products are present on the site.

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 were also used. Those involved in developing this site include: Bill Christensen, Range Management Specialist, NRCS; Karen Clause, Range Management Specialist, NRCS; and Everet Bainter, Range Management Specialist, NRCS. 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

Contributors

K. Clause

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)	K. Clause, E. Bainter
Contact for lead author	karen.clause@wy.usda.gov or 307-367-2257
Date	03/16/2007
Approved by	E. Bainter
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rare to nonexistent. Where present, short and widely spaced.

---

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

---

3. **Number and height of erosional pedestals or terracettes:** Rare to nonexistent.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground can range from 0-25%.

---

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:** Rare to nonexistent.

---

7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous and large woody litter not expected to move.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Stability Index ratings range from 2 (interspaces) to 6 (under plant canopy), but average values should be 3.5 or greater.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil data is limited for this site. Soil Organic Matter of less than 4-16% is expected.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 50-75% grasses, 10% forbs, and 15-40% shrubs.

Evenly distributed plant canopy (50-75%) and litter plus moderate infiltration rates result in minimal runoff. Basal cover is typically greater than 10% and affects runoff on this site. Surface rock fragments of 5-30% provide stability to the site, but reduce infiltration.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

---

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-size, cool season bunchgrasses>> perennial shrubs>> cool season rhizomatous grasses>perennial forbs>short cool season bunchgrasses

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal decadence, typically associated with shrub component.

---

14. **Average percent litter cover (%) and depth (in):** Litter ranges from 15-20% of total canopy measurement with total litter (including beneath the plant canopy) from 50-80% expected. Herbaceous litter depth typically ranges from 3-10mm. Woody litter can be up to a couple inches (4-6 cm).

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** English: 1200-1800 lb/ac (1500 lb/ac average); Metric 1344-2016 kg/ha (1680 kg/ha average).

---

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:** Bare ground greater than 40% is the most common indicator of a threshold being crossed. Rabbitbrush, Sandberg bluegrass, buckwheat, yarrow, and phlox are common increasers. Annual weeds such as cheatgrass and mustards are common invasive species in disturbed sites.

---

17. **Perennial plant reproductive capability:** All species are capable of reproducing, except in extreme drought years.