Ecological site EX043B23C157
Shallow Sedimentary (SwS)
Absaroka Subalpine Zone

Last updated: 10/04/2019
Accessed: 09/11/2026

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.

MLRA notes

Major Land Resource Area (MLRA): 043B–Central Rocky Mountains

Major Land Resource Unit (MLRA) 43B: Central Rocky Mountains 43B – Central Rocky Mountains – The Central Rocky Mountains extends from northern Montana to southern extent of Wyoming and from Idaho to central Wyoming. The southern extent of 43B is comprised of a combination of metamorphic, igneous, and sedimentary mountains and foothills. Climatic changes across this extent are broad and create several unique breaks in the landscape. Further information regarding MLRAs, refer to: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook.

LRU notes

Land Resource Unit (LRU) 43B23C: Absaroka Subalpine Zone Based on the shifts in geology, precipitation patterns and other climatic factors, as well as elevation and vegetation, the Absaroka Range was divided into LRU 23. Further division of this LRU is necessary due to the gradient moving from the foothills to the summit, as well as aspect shifts (north/east face versus south/west face). Subset C is the high elevation zone noted for dense timber interspersed with open parks and longer persisting snowpack (within timberline). Precipitation can range from 18 to 20 plus inches and is more noted for the duration of snow cover and shorter growing season. To verify or identify Subset C (the referenced subset for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key. This LRU/Subset occurs on the eastern divide of the Absaroka Range. This LRU starts north of Clark, WY and runs to the Thermopolis, WY area. Once the Absaroka Range merges with the Owl Creek and Wind River Ranges, the climatic patterns and elevational changes shifts the plant community and creates a break in the LRU/Subset. The extent of soils currently correlated to this ecological site does not fit within the digitized boundary. Many of the noted soils are provisional and will be reviewed and corrected in mapping update projects. Other map units are correlated as small inclusions within other MLRA's/LRU's based on elevation, landform, and biological references. Moisture Regime: Typic Ustic Temperature Regime: Cryic Dominant Cover: Rangeland – Sagebrush Steppe (major species is Mountain Big Sagebrush) Representative Value (RV) Effective Precipitation: 20+ inches (508 mm) RV Frost-Free Days: 31-65 days

Classification relationships

Relationship to Other Established Classification Systems: National Vegetation Classification System (NVC): 2 Shrub & Herb Vegetation Class 2.B Temperate & Boreal Grassland & Shrubland Subclass 2.B.2 Temperate Grassland & Shrubland Formation 2.B.2.Na Western North American Grassland & Shrubland Division M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macro-group G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group Ecoregions (EPA): Level I: 6 North Western Forested Mountains Level II: 6.2 Western Cordillera Level III: 6.2.10 Middle Rockies Level IV: 6.2.17ao – Absaroka Volcanic Subalpine Zone 6.2.17i – Absaroka – Gallatin Volcanic Mountains

Ecological site concept

• Site receives no additional water. • Slope is 60% • Soils are: o Textures range from very fine sandy loam to clay loam in top 4" (10 cm) of mineral soil surface o All subsurface horizons have a weighted average of >18% clay but 35% clay. o Shallow (10-20+ in. (25-50+ cm) o 10% stone and boulder cover and 10% cobble and gravel cover o Not skeletal (35% rock fragments) within 20" (50 cm) of mineral soil surface o Non-saline, sodic, or saline-sodic

Associated sites

R043BY122WY	**Loamy High Mountains** Loamy

Similar sites

R043BY122WY	**Loamy High Mountains** Loamy (Ly) 20+M has higher production and higher shrub density.
R043BY262WY	**Shallow Loamy Foothills and Mountains West** Shallow Loamy (SwLy) 15-19W has lower production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana* (2) *Prunus virginiana*
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Festuca idahoensis*

Legacy ID

R043BX757WY

Physiographic features

This site occurs on rolling to steep slopes and ridges.

Table 2. Representative physiographic features

Landforms	(1) Mountain range > Mountain slope (2) Mountain range > Ridge (3) Mountain range > Escarpment
Runoff class	Negligible to high
Elevation	1,980 – 3,660 m
Slope	10 – 60 %
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation range from 18 to 35 inches (457 – 889 mm). The normal precipitation pattern is evenly distributed through the year and averages over 20 inches. Annual snowfall averages 150 to 200 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

Because of the varied topography, the wind will vary considerably for different parts of the area. 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.

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. High winds are generally blocked by high mountains but occur in conjunction with thunderstorms, which are common in late summer. Growth of native cool-season plants begins about June 1, but can be as late as July 15, and continues until the beginning of September.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. Climate station representative of this precipitation zone include: “Cooke City 2W” and “Tower Falls”. The following graphs and charts are a collective sample representing the averaged normals and 30-year annual rainfall data for the selected weather stations from 1981 to 2010.

Table 3 Representative climatic features

Frost-free period (characteristic range)	0-0 days
Freeze-free period (characteristic range)	20-50 days
Precipitation total (characteristic range)	460-580 mm
Frost-free period (actual range)	0-0 days
Freeze-free period (actual range)	20-50 days
Precipitation total (actual range)	430-610 mm
Frost-free period (average)	0 days
Freeze-free period (average)	40 days
Precipitation total (average)	530 mm

- (1) COOKE CITY 2 W [USC00241995], Gardiner, MT
- (2) TOWER FALLS [USC00489025], Yellowstone National Park, WY

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches (150 cm)) and have minimal influence from surface water/overland flow. There may be isolated features that are affected by snow pack that persists longer than surrounding areas due to position on the landform (shaded/protected pockets).

Soil features

The soils of this site are shallow (10-20”to bedrock) well-drained soils formed in residuum. Textures range from very fine sandy loams to clay loams. Bedrock is commonly limestone, siltstone, or shale. 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 clay loam (3) Channery sandy clay loam (4) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderate
Soil depth	30 – 50 cm
Surface fragment cover <=3"	0 – 20 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	2.54 – 10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 8.4

Subsurface fragment volume <=3" (Depth not specified)	0 – 30 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

Ecological dynamics

Ecological Dynamics of the Site:

As this site deteriorates, species such as rhizomatous wheatgrass, snowbrush ceanothus, snowberry, and mountain big sagebrush will increase. Bitterbrush and cool season bunchgrasses such as bluebunch wheatgrass and spike fescue 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

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1				476-667	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	476-667	–
2				286-476	
	Idaho fescue	FEID	*Festuca idahoensis*	286-476	–
3				191-381	
	spike trisetum	TRSP2	*Trisetum spicatum*	191-381	–
4				191-381	
	spike fescue	LEKI2	*Leucopoa kingii*	191-381	–
5				95-191	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	95-191	–
6				191-381	
	Grass, perennial	2GP	*Grass, perennial*	0-95	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	0-95	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	0-95	–
	western needlegrass	ACOC3	*Achnatherum occidentale*	0-95	–
	bentgrass	AGROS2	*Agrostis*	0-95	–
	mountain brome	BRMA4	*Bromus marginatus*	0-95	–
	California oatgrass	DACA3	*Danthonia californica*	0-95	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0-95	–

	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0-95	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0-95	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-95	–
	oniongrass	MEBU	*Melica bulbosa*	0-95	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0-95	–
	alpine timothy	PHAL2	*Phleum alpinum*	0-95	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	0-95	–
	muttongrass	POFE	*Poa fendleriana*	0-95	–
Forb					
7				95-191	
	Forb, perennial	2FP	*Forb, perennial*	0-95	–
	common yarrow	ACMI2	*Achillea millefolium*	0-95	–
	agoseris	AGOSE	*Agoseris*	0-95	–
	pussytoes	ANTEN	*Antennaria*	0-95	–
	milkvetch	ASTRA	*Astragalus*	0-95	–
	balsamroot	BALSA	*Balsamorhiza*	0-95	–
	Indian paintbrush	CASTI2	*Castilleja*	0-95	–
	larkspur	DELPH	*Delphinium*	0-95	–
	fleabane	ERIGE2	*Erigeron*	0-95	–
	buckwheat	ERIOG	*Eriogonum*	0-95	–
	geranium	GERAN	*Geranium*	0-95	–
	sunflower	HELIA3	*Helianthus*	0-95	–
	flax	LINUM	*Linum*	0-95	–
	stoneseed	LITHO3	*Lithospermum*	0-95	–
	desertparsley	LOMAT	*Lomatium*	0-95	–
	lupine	LUPIN	*Lupinus*	0-95	–
	creeping barberry	MARE11	*Mahonia repens*	0-95	–
	bluebells	MERTE	*Mertensia*	0-95	–
	ragwort	PACKE	*Packera*	0-95	–
	phlox	PHLOX	*Phlox*	0-95	–
	stonecrop	SEDUM	*Sedum*	0-95	–
	ragwort	SENEC	*Senecio*	0-95	–
	aster	SYMPH4	*Symphyotrichum*	0-95	–
	clover	TRIFO	*Trifolium*	0-95	–
	American vetch	VIAM	*Vicia americana*	0-95	–
Shrub/Vine					
8				95-191	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	95-191	–
9				95-286	
	Shrub, deciduous	2SD	*Shrub, deciduous*	0-95	–
	Shrub, evergreen	2SE	*Shrub, evergreen*	0-95	–
	Tree, deciduous	2TD	*Tree, deciduous*	0-95	–
	Tree, evergreen	2TE	*Tree, evergreen*	0-95	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	0-95	–
	silver sagebrush	ARCA13	*Artemisia cana*	0-95	–
	threetip sagebrush	ARTR4	*Artemisia tripartita*	0-95	–

	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0-95	–
	snowbrush ceanothus	CEVE	*Ceanothus velutinus*	0-95	–
	chokecherry	PRVI	*Prunus virginiana*	0-95	–
	snowberry	SYMPH	*Symphoricarpos*	0-95	–

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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. However, sagebrush and bitterbrush provide important winter forage for mule deer and elk. Birds that would frequent this plant community include horned larks and golden eagles. Mountain Big Sage/Idaho Fescue 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) 1300-2000 0.5 Mountain Big Sage/Idaho Fescue 800-1600 0.25 Three-tip Sage 500-1200 0.1 * - 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 dominated by soils in hydrologic group D. Infiltration is low when soils are wet due to shallow depth to bedrock and/or impervious subsurface layer. Runoff potential for this site varies from high to moderate depending on soil depth, bedrock type (impervious vs. permeable), and ground cover (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.

Wood products

No appreciable wood products are present on the site.

Inventory data references

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, USDI and USDA Interpreting Indicators of Rangeland Health Version 3, and USDA NRCS Soil Surveys from various counties. Information presented here has been derived from NRCS inventory data, Field observations from range trained personnel, and the existing range site descriptions. Those involved in developing the Loamy range site include: Karen Clause, Range Management Specialist, NRCS and Everet Bainter,

Range Management Specialist. Those involved in the development of the new concept for Loamy and Loamy Calcareous Ecological site include: Ray Gullion, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Jack Mononi, Range Management Specialist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS. Inventory Data References: Ocular field estimations observed by trained personnel were completed at each site. Then sites were selected where a 100-foot tape was stretched, and the following sample procedures were completed by inventory staff. For full sampling protocol and guidelines with forms please refer to the Wyoming ESI Operating Procedures, compiled in 2012 for the Powell and Rock Springs Soil Survey Office, USDA-NRCS. • Double Sampling Production Data (4.8 square foot hoop used to estimate 10 points, clipped a minimum of 2 of these estimated points, with two 21-foot X 21-foot square extended shrub plots). • Line Point Intercept (over story and understory captured with soil cover). Height of herbaceous and woody cover is collected every three feet along established transect.) • Continuous Line Intercept (Woody Canopy Cover, with minimum gap of 0.2 of a foot for all woody species and succulents. Intercept height collected at each measurement.), • Gap Intercept (Basal Gap measured with a minimum gap requirement of 0.7 foot.), • Sample Point (10 – 1-meter square point photographs taken at set distances on transect. Red using the sample point computer program established by the High Plains Agricultural Research Center, WY). • Soil Stability (Slake Test – surface and subsurface samples collected and processed according to the soil stability guidelines provided by the Jornada Research Center, NM.)

Other references

Baker, William L. 2006. Fire and Restoration of Sagebrush Ecosystems. Wildlife Society Bulletin 34(1): 177-185.

Bestelmeyer, B., and J. R. Brown. 2005. State-and-transition models 101: a fresh look at vegetation change. The Quivira Coalition Newsletter, Vol. 7, No. 3.

Bestelmeyer, B., J. R. Brown, K. M. Havstad, B. Alexander, G. Chavez, J. E. Herrick. 2003. Development and use of state and transition models for rangelands. Journal of Range Management 56(2):114-126.

Bestelmeyer, B., J. E. Herrick, J. R. Brown, D. A. Trujillo, and K. M. Havstad. 2004. Land management in the American Southwest: a state-and-transition approach to ecosystem complexity. Environmental Management 34(1):38-51.

Herrick, J. E., J. W. Van Zee, K. M. Havstad, L. M. Burkett, and W. G. Whitford. 2005. Monitoring manual for grassland, shrubland and savanna Ecosystems. Volume I Quick Start. USDA - ARS Jornada Experimental Range, Las Cruces, New Mexico.

Herrick, J. E., J. W. Van Zee, K. M. Havstad, L. M. Burkett, and W. G. Whitford. 2005. Monitoring manual for grassland, shrubland and savanna Ecosystems. Volume II: Design, supplementary methods and interpretation. USDA - ARS Jornada Experimental Range, Las Cruces, New Mexico.

NRCS. 2014. (electronic) National Water and Climate Center. Available online at http://www.wcc.nrcs.usda.gov/

NRCS. 2014. (electronic) Field Office Technical Guide. Available online at http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=WY NRCS. 2009. Plant Guide: Cheatgrass. Prepared by Skinner et al., National Plant Data Center.

Pellant, M., P. Shaver, D. A. Pyke, and J. E. Herrick. 2005. Interpreting indicators of rangeland health. Version 4. Technical Reference 1734-6.

USDI-BLM. Ricketts, M. J., R. S. Noggles, and B. Landgraf-Gibbons. 2004. Pryor Mountain Wild Horse Range Survey and Assessment. USDA-Natural Resources Conservation Service.

Schoeneberger, P. J., D. A. Wysocki, E. C. Benham, and Soil Survey Staff. 2012. Field book for describing and sampling soils, Version 3.0. Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE. (http://soils.usda.gov/technical/fieldbook/)

Stringham, T. K. and W. C. Krueger. 2001. States, transitions, and thresholds: Further refinement for rangeland applications. Agricultural Experiment Station, Oregon State University. Special Report 1024.

Stringham, T. K., W. C. Kreuger, and P. L Shaver. 2003. State and transition modeling: an ecological process approach. Journal of Range Management 56(2):106-113.

United States Department of Agriculture. Soil Survey Division Staff. 1993. Soil Survey Manual, United States Department of Agriculture Handbook No. 18, Chapter 3: Examination and Description of Soils. Pg.192-196.

USDA, NRCS. 1997. National Range and Pasture Handbook. (http://www.glti.nrcs.usda.gov/technical/publications/nrph.html)

Trlica, M. J. 1999. Grass growth and response to grazing. Colorado State University. Cooperative Extension. Range. Natural Resource Series. No. 6.108.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA/NRCS). 2007. The PLANTS Database

(http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA/NRCS), Soil Survey Staff. 2010. Keys to Soil Taxonomy, Eleventh Edition, 2010.

USDA/NRCS Soil survey manuals for appropriate counties within MLRA 43B.

Western Regional Climate Center. (2014) (electronic) Station Metadata. Available online at: http://www.wrcc.dri.edu/summary/climsmwy.html.

Contributors

K. Clause

Approval

Scott Woodall, 10/04/2019

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	
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 OM of 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 65-80% grasses, 10% forbs, and 10-25% shrubs. Evenly distributed plant canopy (50-75%) and litter plus moderate infiltration rates result in minimal runoff. Basal cover is typically more 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: Mid-size, cool season bunchgrasses

    Sub-dominant: perennial shrubs = perennial forbs = cool season rhizomatous grasses

    Other: short cool season bunchgrasses

    Additional:

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: 1300-2000 lb/ac (1700 lb/ac average); Metric 1456-2240 kg/ha (1904 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. Thistles and annual weeds are common invasive species in disturbed sites.

---

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