

Ecological site EX044B01A020

Gravelly (Gr) 10-14" PZ Frigid

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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): 044B–Central Rocky Mountain Valleys

Major Land Resource Area (MLRA) 44B, Central Rocky Mountain Valleys, is nearly 3.7 million acres of southwest Montana and borders two MLRAs: 43B Central Rocky Mountains and Foothills and 46 Northern and Central Rocky Mountain Foothills. The major watersheds of this MLRA are those of the Missouri and Yellowstone Rivers and their associated headwaters such as the Beaverhead, Big Hole, Jefferson, Ruby, Madison, Gallatin, and Shields Rivers. These waters allow for extensive irrigation for crop production in an area that would generally only be compatible with rangeland and grazing. The Missouri River and its headwaters are behind several reservoirs that supply irrigation water, hydroelectric power, and municipal water. Limited portions of the MLRA are west of the Continental Divide along the Clark Fork River. The primary land use of this MLRA is production agriculture (grazing, small grain production, and hay), but there is some limited mining. Urban development is high with large expanses of rangeland converted to subdivisions for a rapidly growing population. The MLRA consists of one Land Resource Unit (LRU) and seven climate based LRU subsets. These subsets are based on a combination of Relative Effective Annual Precipitation (REAP) and frost free days. Each subset expresses a distinct set of plants that differentiate it from other LRU subsets. Annual precipitation ranges from a low of 9 inches to a high near 24 inches. The driest areas tend to be in the valley bottoms of southwest Montana in the rain shadow of the mountains. The wettest portions tend to be near the edge of the MLRA at the border with MLRA 43B. Frost free days also vary widely from less than 30 days in the Big Hole Valley to around 110 days in the warm valleys along the Yellowstone and Missouri Rivers. The plant communities of the MRLA are highly variable, but the dominant community is a cool-season grass and shrub-steppe community. Warm-season grasses have an extremely limited extent in this MLRA. Most subspecies of big sagebrush are present, to some degree, across the MLRA.

LRU notes

MLRA 44B has one LRU that covers the entire MLRA. The LRU has been broken into seven climate subsets based on a combination of Relative Effective Annual Precipitation (REAP) and frost free days. Each combination of REAP and frost free days results in a common plant community that is shared across the subset. Each subset is giving a letter designation of A through F for sites that do not receive additional water and Y for sites that receive additional water. LRU 01 Subset A has a REAP of nine to 14 inches (228.6-355.6mm) with a frost free days range of 70 to 110 days. This combination of REAP and frost free days results in a nearly treeless sagebrush steppe landscape. The soil moisture regime is Ustic, dry that borders on Aridic and has a Frigid soil temperature regime.

Classification relationships

Grassland and Shrubland Habitat Types of Western Montana. (Mueggler and Stewart 1980) 1. *Agropyron spicatum*/*Bouteloua gracilis* habitat type 2. *Artemisia tridentata*/*Agropyron spicatum* habitat type EPA Ecoregions of North America (US EPA 2013) Level I: Northwestern Forested Mountains Level II: Western Cordillera Level III: Middle Rockies and Northwestern Great Plains Level IV: Paradise Valley Townsend Basin Dry Intermontane Sagebrush Valleys Shield-Smith Valleys USDA Forest Service National Hierarchical Framework of Ecological Units (Cleland et al. 2007): Domain: Dry Division: M330 – Temperate Steppe Division – Mountain Provinces Province: M332 –Middle Rocky Mountain Steppe – Coniferous Forest – Alpine Meadow Section: M332D – Belt Mountains Section M332E – Beaverhead Mountains Section Subsection: M332Ej – Southwest Montana Intermontane Basins and Valleys M332Dk – Central Montana Broad Valleys

Ecological site concept

The Gravelly ecological site is an upland site formed from alluvium or slope alluvium and is on slopes less than 15 percent. The site does not receive additional moisture from a water table or flooding. It is moderately deep to very deep site and has no root-restrictive layers within 20 inches (50cm). The surface of the site has less than five percent stone. The soil is sandy skeletal within 10 inches of the

surface. The site does not have saline or saline-sodic influences and is not strongly or violently effervescent within four inches of the mineral surface. This site occurs on abandoned stream terraces near major waterways, drainages, outwash fans, and terrace escarpments.

Associated sites

EX044B01A032	<p>Loamy (Lo) 10-14" PZ Frigid</p> <p>The Loamy ecological site occupies similar landscape position and has as similar plant community.</p>
EX044B01A134	<p>Shallow to Gravel (SwGr) 10-14" PZ Frigid</p> <p>The Shallow to Gravel ecological site occupies similar shoulder and summit positions.</p>

Similar sites

EX044B01A134	<p>Shallow to Gravel (SwGr) 10-14" PZ Frigid</p> <p>The Shallow to Gravel ecological site shares a similar Reference State Plant community as well as pathways and response to management but expresses slightly higher production values and exists on the shoulder and summit positions on the landscape.</p>
EX044B01A110	<p>Sandy (Sy) 10-14" PZ Frigid</p> <p>The Sandy ecological site shares a similar Reference State Plant community as well as pathways and response to management, but expresses higher production values and a different shrub component.</p>

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Hesperostipa comata</i>

Legacy ID

R044BA020MT

Physiographic features

This site occurs on abandoned stream terraces near major waterways, drainages, outwash fans, and terrace escarpments. Slopes are typically less than 8 percent however variations may exist up to 15 percent.

Table 2. Representative physiographic features

Geomorphic position, terraces	(1) Tread
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Landforms	(1) Intermontane basin > Stream terrace (2) Intermontane basin > Outwash terrace (3) Intermontane basin > Fan remnant
Flooding frequency	None to very rare
Elevation	1,280 – 1,980 m
Slope	0 – 10 %
Water table depth	150 cm

Climatic features

The Central Rocky Mountain Valleys MLRA has a continental climate and some of Montana's driest areas are located in sheltered mountain valleys due to the rain-shadow effects of the neighboring mountain ranges. The average precipitation for LRU 01 Subset A is 12 inches (305mm), and the frost-free period averages 78 days. Fifty to 60 percent of the annual precipitation falls between May and August and precipitation is highest in May and June.

Table 3 Representative climatic features

Frost-free period (characteristic range)	70-110 days
Freeze-free period (characteristic range)	110-140 days
Precipitation total (characteristic range)	230-360 mm
Frost-free period (actual range)	70-110 days
Freeze-free period (actual range)	110-140 days
Precipitation total (actual range)	230-360 mm
Frost-free period (average)	80 days
Freeze-free period (average)	130 days
Precipitation total (average)	310 mm

■ (1) DEER LODGE 3 W [USC00242275], Deer Lodge, MT

- (2) DILLION U OF MONTANA WESTERN [USC00242409], Dillon, MT
- (3) GLEN 2 E [USC00243570], Dillon, MT
- (4) ENNIS [USC00242793], Ennis, MT
- (5) BOULDER [USC00241008], Boulder, MT
- (6) GARDINER [USC00243378], Gardiner, MT
- (7) TOWNSEND [USC00248324], Townsend, MT
- (8) TRIDENT [USC00248363], Three Forks, MT
- (9) TWIN BRIDGES [USC00248430], Sheridan, MT
- (10) WHITE SULPHUR SPRNGS 2 [USC00248930], White Sulphur Springs, MT
- (11) DILLON AP [USW00024138], Dillon, MT
- (12) HELENA RGNL AP [USW00024144], Helena, MT

Influencing water features

This ecological site often exists on stream terraces, fan remnants, and outwash terraces. This site does not have a water table that influences the plant community. Previous fluvial processes no longer exist on this site; however, evidence of alluviation may be visible in the soil profile, such as stratification, sorting of mixed geology, and rounded stones.

Wetland description

This site is not associated with wetlands.

Soil features

These soils are moderately deep to very deep, have moderately rapid to very rapid permeability, and are well to excessively drained. These soils formed from alluvium of mixed origin. Typically soil surface textures consist of sandy loam, and loamy sand. Soils often have a gravelly, cobbly, or very cobbly surface. Common soil series in this ecological site include Scravo and Riverrun. These soils may exist across multiple ecological sites in different map units due to natural variations in slope, texture, rock fragments, and pH. An onsite soil pit and the most current ecological site key are required to classify an ecological site.

Table 4. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock
Surface texture	(1) Gravelly sandy loam (2) Very gravelly sandy loam (3) Very cobbly sandy loam (4) Cobbly sandy loam
Family particle size	(1) Sandy or sandy-skeletal (2) Loamy-skeletal over sandy or sandy-skeletal
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to very rapid
Soil depth	50 – 250 cm
Surface fragment cover <=3"	10 – 40 %

Surface fragment cover >3"	0 – 20 %
Available water capacity (0-101.6cm)	3.05 – 9.65 cm
Soil reaction (1:1 water) (0-25.4cm)	6.2 – 7.8
Subsurface fragment volume <=3" (0-50.8cm)	20 – 50 %
Subsurface fragment volume >3" (0-50.8cm)	10 – 30 %

Ecological dynamics

The Gravelly (Gr) ecological site reference plant community is dominated by bluebunch wheatgrass (*Pseudoroegneria spicata*) and needle and thread (*Hesperostipa comata*). Subdominant species trend toward Sandberg bluegrass (*Poa secunda*), winterfat (*Krascheninnikovia lanata*), and Indian ricegrass (*Achnatherum hymenoides*). This potential is suggested by investigations showing a predominance of perennial grasses on near-pristine range sites (Ross et al., 1973). In the reference plant community, shrubs are a minor vegetative component.

The Gravelly ecological site occurs across a relatively large landscape, slight variations within the plant community occur due to elevation, frost-free days, and relative effective annual precipitation. Bluebunch wheatgrass, for example, occupies most known combinations of elevation and climate; however, under the drier sites within this Climate Subset, it often shares dominance with needle and thread. These warmer, drier sites also tend to exhibit higher populations of warm-season shortgrass such as blue grama and sand dropseed. Conversely, colder, wetter sites within this Climate Subset often exhibit slight increases in Wyoming big sagebrush production, while bluebunch wheatgrass production also increases.

A shift to the dominance of shrubs may occur in response to improper grazing management, drought, or where Wyoming big sagebrush occurs due to a lack of fire. Shrub encroachment by a variety of species, including, broom snakeweed (*Gutierrezia sarothrae*), prairie sagewort (*Artemisia frigida*), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and plains prickly pear (*Opuntia polyacantha*) occur within this site as the mid-stature bunchgrasses decrease. Shrub dominance and grass loss are associated with soil erosion and, ultimately, thinning of the native soil surface. Subsequent loss of soil could lead to a Degraded Shortgrass State. All states could also lead to the Invaded State when there is a lack of weed prevention and control measures.

Historical records indicate that, prior to the introduction of livestock (cattle and sheep) during the late 1800s, elk and bison grazed this ecological site. Due to bison's nomadic nature and herd structure, grazed areas received periodic high intensity, short duration grazing pressure. Livestock forage was noted as being minimal in areas recently grazed by bison (Lesica and Cooper 1997). Meriwether Lewis documented that he was met by 60 Shoshone warriors on horseback in August 1805, and the Corps of Discovery was later supplied with horses by the same band of Shoshone. This suggests that the areas near the modern-day Montana towns of Twin Bridges, Dillon, Grant, and Dell were grazed by an untold number of horses for nearly 50 years prior to the large introduction of cattle and sheep. The gold boom of the 1860s brought the first herds of livestock overland from Texas, and homesteaders began settling the area. During this time, cattle were the primary domestic grazers in the area. In the 1890s, sheep production increased by more than 400 percent and dominated the livestock industry until the 1930s. Since then, cattle production has dominated the livestock industry of the region (Wyckoff and Hansen 2001).

Some of the major invasive species that can occur on this site include spotted knapweed (*Centaurea stoebe*), leafy spurge (*Euphorbia esula*), and cheatgrass (*Bromus tectorum*). Nonnative invasive weeds are common in most of this ecological site, but they tend to occupy small patches near traditional watering facilities, along roads, and other areas that receive high soil disturbance.

A state and transition model for this ecological site is depicted below. Thorough descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field data, field observations, and interpretations by experts. It is likely to change as knowledge increases.

The plant communities within the same ecological site will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are intended to cover the core species and the known range of conditions and responses.

Both percent species composition by weight and percent canopy cover are referenced in this document. Canopy cover drives the transitions between communities and states because of the influence of shade, the interception of rainfall, and the competition for available water. Species composition by dry weight remains an important descriptor of the herbaceous community and of the community as a whole. Woody species are included in the species composition for the site. Calculating the similarity index requires species composition by dry weight.

Although there is considerable qualitative experience supporting the pathways and transitions within the state and transition model (STM), no quantitative information exists that specifically identifies threshold parameters between grassland types and invaded types in this ecological site.

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	Mid-Statured Bunchgrasses			504-638	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	420-504	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	49-123	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0-67	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0-49	–
2	Rhizomatous Grasses			45-101	
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	45-101	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-67	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	0-34	–
2	Shortgrasses/Grasslikes			45-101	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	22-49	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	11-45	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-28	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0-28	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-22	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	0-11	–
Forb					
3	Forbs			36-56	
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-22	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	6-17	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	11-17	–
	American vetch	VIAM	<i>Vicia americana</i>	11-17	–
	ballhead sandwort	ARCO5	<i>Arenaria congesta</i>	0-11	–
	beardtongue	PENST	<i>Penstemon</i>	0-11	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0-11	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-11	–
	fleabane	ERIGE2	<i>Erigeron</i>	0-11	–

	buckwheat	ERIOG	<i>Eriogonum</i>	0-11	-
	desertparsley	LOMAT	<i>Lomatium</i>	0-6	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-6	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-6	-
Shrub/Vine					
4	Shrubs			67-101	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	28-56	-
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-56	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	17-45	-
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	28-45	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-28	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-22	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-22	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-11	-
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0-11	-

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 4.1 plant community composition

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

The Gravelly ecological site provides a variety of wildlife habitats for an array of species. Prior to the settlement of this area, large herds of antelope, elk, and bison roamed. Though the bison have been replaced, mostly with domesticated livestock, elk and antelope still frequently utilize this largely intact landscape for winter habitat in areas adjacent to forests. The high bunchgrass component of the Reference State provides excellent nesting cover for multiple neotropical migratory birds that select for open grasslands, such as the long-billed curlew and McCown's longspur. Greater sage grouse may be present on sites with suitable habitat, typically requiring a minimum of 15 percent sagebrush canopy cover (Wallestad 1975). The Bunchgrass-Shrub Community (1.1) is likely to have optimal sage grouse presence given its high sagebrush canopy cover. The potentially diverse forb component of the Reference State may also provide important early-season (spring) foraging habitat for the greater sage grouse and their broods. Other communities on the site with sufficient sagebrush cover may harbor sage grouse populations, specifically Rhizomatous Community 2.1, where big sagebrush populations are under a reduced fire regime. Also, as sagebrush canopy cover increases under the Rhizomatous Community and, to a limited extent, under Shortgrass-Shrub State 3.1, pygmy rabbit, Brewer's sparrow, and mule deer use may also increase. Managed livestock grazing is suitable on this site due to the potential to produce an abundance of high-quality forage. In order to maintain the productivity of the site, grazing on this site must be managed carefully to make sure utilization is not excessive. Management objectives should include the maintenance or improvement of the native plant community. Careful management of the timing and duration of grazing is important. Short grazing periods and adequate deferment during the growing season are recommended for plant maintenance, health, and recovery. According to McLean et al., early-season defoliation of bluebunch wheatgrass can result in high mortality and reduced vigor in plants. They also suggest, based on prior studies, that regrowth is necessary before dormancy to reduce injury to the bluebunch. The grazing season has a greater impact on winterfat than the intensity of grazing. Late-winter or early-spring grazing is detrimental. However, early winter grazing may actually be beneficial (Blaisdell 1984). Continual unmanaged grazing of this site will be detrimental, alter the plant composition and production over time, and result in the transition to the Rhizomatous State. The transition to other states will depend on the duration of poorly managed grazing as well as other circumstances such as weather conditions and fire frequency.

The Rhizomatous State is subject to further degradation into the Degraded Shortgrass State or Invaded State. Management should focus on grazing management strategies that will prevent further degradation, such as rest rotation, seasonal grazing deferment, or winter grazing where feasible. Communities within this state are still stable under proper management. Forage quantity and quality may be substantially decreased compared to the Reference State. In the Degraded Shortgrass State, grazing may be possible but is generally not economically or environmentally sustainable. Grazing is possible in the Invaded State. Invasive species are generally less palatable than native grasses. Forage production is typically greatly reduced in this state. Due to the aggressive nature of invasive species, sites in the Invaded State face an increased risk of further degradation by invasive-dominant communities. Grazing must be carefully managed to avoid further soil loss and degradation. Prescriptive grazing can be used to manage invasive species. In some instances, carefully targeted grazing (sometimes in combination with other treatments) can reduce or maintain the species composition of invasive species.

Hydrological functions

The hydrologic cycle functions best in the Bunchgrass State (1) with good infiltration and deep percolation of rainfall; however, the cycle degrades as the vegetation community declines. Rapid rainfall infiltration, high soil organic matter, good soil structure, and good porosity accompany high bunchgrass canopy cover of around 80 percent. High ground cover reduces raindrop impact on the soil surface, which keeps erosion and sedimentation transport low. Water leaving the site will have minimal sediment load, which allows for high water quality in associated streams. High rates of infiltration will allow water to move below the rooting zone during periods of heavy rainfall. The Bluebunch Wheatgrass Community (1.1) should have no rills or gullies present and drainage ways should be vegetated and stable. Water flow patterns, if present, will be barely observable. Plant pedestals are essentially non-existent. Plant litter remains in place and is not moved by wind or water. Improper grazing management results in a community shift to the Mixed Bunchgrass Community (1.2). This plant community has a similar canopy cover, but bare ground will be less than 15 percent. Therefore, the hydrologic cycle is functioning at a level like the water cycle in the Bluebunch Wheatgrass Community/Needle and thread (1.1). Compared to the Bluebunch Wheatgrass/Needle and thread Community (1.1) infiltration rates are slightly reduced and surface runoff is slightly higher. In the Shortgrass Community (2.2), Degraded Shortgrass State (3) and the Invaded State (4) canopy and ground cover are greatly reduced compared to the Bunchgrass State (1), which impedes the hydrologic cycle. Infiltration will decrease and runoff will increase due to reduced ground cover, presence of shallow-rooted species, rainfall splash, soil capping, reduced organic matter, and poor structure. Sparse ground cover and decreased infiltration can combine to increase frequency and severity of flooding within a watershed. Soil erosion is accelerated, quality of surface runoff is poor, and sedimentation increases.

Recreational uses

This site provides some limited recreational opportunities for hiking, horseback riding, big game and upland bird hunting. The forbs have flowers that appeal to photographers. This site provides valuable open space.

Wood products

none

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Approval

Kirt Walstad, 2/11/2025

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)	Grant Petersen
Contact for lead author	grant.petersen@usda.gov
Date	04/24/2019
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills will not be present in the reference state.

2. **Presence of water flow patterns:** Water flow patterns are rare in the reference state. If present, they will occur on steeper slopes (10-15%) and will be inconspicuous, disconnected, and very short in length.

3. **Number and height of erosional pedestals or terracettes:** No present

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is between 10 and 15 percent. This refers to exposed mineral soil not covered by litter, rocks, basal cover, plant cover, standing dead, lichen, and/or moss.

5. **Number of gullies and erosion associated with gullies:** Not Present in Reference State

6. **Extent of wind scoured, blowouts and/or depositional areas:** Not evident under normal conditions.

7. **Amount of litter movement (describe size and distance expected to travel):** Movement of fine herbaceous litter may occur within less than a foot from where it originated.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Due to the coarse nature of the soil associated with this ecological site, soil stability ratings will be low. Interspaces will often have ratings of 2 and under plant canopy and plant base value ratings will be 3-5.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Organic matter values are low for this site, ranging from 1–2 percent. The surface structure is weak to medium-fine granular. A horizon's coloration is variable; however, soil will have a wet Value of 4-6 or less and Chroma of 3 or less. Local geology may affect color, making it important to refer to the Official Series Description (OSD) for the characteristic range.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Infiltration is high. Evenly distributed across the site, bunchgrasses improve infiltration while rhizomatous grass protects the surface from runoff forces. The Gravelly ecological site is well drained and has a high infiltration rate, especially in the subsurface horizons. An even distribution of Mid-Staturred bunchgrasses (60–70%), rhizomatous grasses (5–10%), and a mix of short grasses (5–10%), forbs (1–10%), and shrubs (1–10%).

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Not 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: Mid-statured, perennial bunchgrasses

Sub-dominant: Rhizomatous grasses = perennial shortgrass ? Forbs ? Shrubs

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mortality in herbaceous species is not evident. Species with bunch growth forms may have some natural mortality in centers is 3% or less. Shrub and subshrub mortality does not exceed 5% for any given species.

14. **Average percent litter cover (%) and depth (in):** Total litter cover ranges from 15 to 30 percent. Litter is irregularly distributed on the soil surface and is often not at a measurable depth.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
Average annual production is 875. Low: 625 High 1050. Production varies based on effective precipitation and natural variability of soil properties for this ecological site.

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: Non-native invasive species on this ecological site include: dandelion (*Taraxicum* spp), cheatgrass (*Bromus tectorum*), field brome (*Bromus arvensis*), spotted knapweed (*Centaurea stoebe*), yellow toadflax (*Linaria vulgaris*), leafy spurge (*Euphorbia esula*) Native species with the ability to indicate degradation but species presence alone does not imply degradation include: Sandberg bluegrass (*Poa secunda*), big sagebrush (*Artemisia tridentata*), spineless horsebrush (*Tetradymia canescens*), broom snakeweed (*Gutierrezia sarothrae*), rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), Rocky Mountain juniper (*Juniperus scopulorum*),**

17. **Perennial plant reproductive capability: Reproductive capability is very high. The density of plants indicates that plants reproduce at a level sufficient to fill available resources. There is no restriction on seed or vegetative reproductive capacity. Plants are producing seed and/or reproductive tillers.**
