Ecological site EX044B01A110
Sandy (Sy)
10-14" PZ Frigid

Last updated: 2/11/2025
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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

Mueggler and Stewart. 1980. Grassland and Shrubland habitat types of Western Montana 1. Stipa comata/Bouteloua gracilis h.t. 2. Agropyron spicatum/Bouteloua gracilis h.t. Montana Natural Heritage Program Vegetation Classification 1. Stipa comata - Bouteloua gracilis Herbaceous Vegetation (STICOM – BOUGRA) Needle and thread/Blue grama Natural Heritage Conservation Rank-G5 / S5 Edition / Author- 99-11-16 / S.V. Cooper, EPA Ecoregions of Montana, Second Edition: Level I: Northwestern Forested Mountains Level II: Western Cordillera Level III: Middle Rockies & Northern Great Plains Level IV: Paradise Valley Townsend Basin Dry Intermontane Sagebrush Valleys Shield-Smith Valleys National Hierarchical Framework of Ecological Units: 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 Sandy 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. Soil surface texture are coarse sandy loam to fine sandy loam texture in

surface mineral 4 inches. It is moderately deep to very deep and has no root-restrictive layers within 20 inches (50cm). The surface of the site has less than five percent stone cover and is not skeletal, with less than 35 percent rock fragments in the 10 to 20-inch depth. The site does not have a saline or saline-sodic influence and is not strongly or violently effervescent within four inches of the mineral surface.

Associated sites

EX044B01A032	**Loamy (Lo) 10-14" PZ Frigid** The Loamy ecological site will be a neighboring site on the same landscape position. The plant core plant community will be similar and has a similar state and transition model.

Similar sites

EX044B01A032	**Loamy (Lo) 10-14" PZ Frigid** The Loamy ecological site shares plant communities and expresses a similar state and transition model. The Loamy site tends to have a finer texture soil with a slightly better biomass production.
EX044B01A036	**Droughty (Dr) 10-14" PZ Frigid** The Droughty ecological site occupies the same general landscape, has similar plant community and pathways but will have increased rock fragments in the soil profile with a reduced overall production

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis* (2) *Krascheninnikovia lanata*
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Hesperostipa comata*

Legacy ID

R044BA110MT

Physiographic features

This ecological site occurs on gentle sloping fan remnants, stream terraces, and floodplain steppes with slopes up to 15 percent. Parent material for this site is alluvium or slope alluvium

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Flood-plain step (2) Intermontane basin > Fan remnant (3) Intermontane basin > Alluvial fan
Flooding frequency	None

Ponding frequency	None
Elevation	1,370 – 1,830 m
Slope	0 – 10 %
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0 – 20 %

Climatic features

The Central Rocky Mountain Valleys MLRA has a continental climate. Fifty to sixty percent of the annual long-term average precipitation falls between May and August. Average precipitation for LRU 01 Subset A is 12 inches (305mm), and the frost-free period averages 78 days.

Precipitation is highest in May and June. Some of Montana's driest areas are located in sheltered mountain valleys due to the rain-shadow effects of the neighboring mountain ranges.

Table 4 Representative climatic features

Frost-free period (characteristic range)	50-90 days
Freeze-free period (characteristic range)	90-120 days
Precipitation total (characteristic range)	280-330 mm
Frost-free period (actual range)	30-110 days
Freeze-free period (actual range)	70-130 days
Precipitation total (actual range)	230-360 mm
Frost-free period (average)	80 days

Freeze-free period (average)	110 days
Precipitation total (average)	310 mm

- (1) DILLION U OF MONTANA WESTERN [USC00242409], Dillon, MT
- (2) WHITE SULPHUR SPRNGS 2 [USC00248930], White Sulphur Springs, MT
- (3) DILLON AP [USW00024138], Dillon, MT
- (4) ALDER 17 S [USC00240110], Virginia City, MT
- (5) TOWNSEND [USC00248324], Townsend, MT
- (6) TRIDENT [USC00248363], Three Forks, MT
- (7) DEER LODGE 3 W [USC00242275], Deer Lodge, MT
- (8) HELENA RGNL AP [USW00024144], Helena, MT
- (9) TWIN BRIDGES [USC00248430], Sheridan, MT
- (10) ENNIS [USC00242793], Ennis, MT

Influencing water features

Site is not affected by water features

Wetland description

This site is not associated with wetland characteristics

Soil features

These soils are moderately deep to very deep, with moderately rapid permeability, and they are well drained. These soils are formed from alluvium derived from undifferentiated origins. Soil surface textures typically range from coarse sandy loam to fine sandy loam. Slopes rarely exceed 10 percent but may be as high as 15 percent. Common soil series contained within this ecological site include Anaconda, Cozberg, and Kalsted. These soils may exist across multiple ecological sites 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 5. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock (2) Slope alluvium – igneous, metamorphic and sedimentary rock
Surface texture	(1) Gravelly sandy loam (2) Sandy loam (3) Loamy sand
Drainage class	Well drained
Permeability class	Moderately rapid
Depth to restrictive layer	50 cm

Soil depth	50 – 100 cm
Surface fragment cover <=3"	0 – 30 %
Surface fragment cover >3"	0 – 30 %
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Electrical conductivity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.1 – 8.4
Subsurface fragment volume <=3" (25.4-50.8cm)	0 – 20 %
Subsurface fragment volume >3" (25.4-50.8cm)	0 – 20 %

Ecological dynamics

The Sandy ecological site has slight variations within the plant community that occur due to changes in elevation, frost-free days, and relative effective annual precipitation. Bluebunch wheatgrass, for example, occupies most known combinations of elevation and climate; under a drier moisture regime, bluebunch might share dominance with needle and thread. These warmer, drier sites also tend to exhibit higher populations of warm-season plants such as prairie sandreed, blue grama, sand dropseed, dotted gayfeather, and purple prairie clover.

The reference plant community is dominated by bluebunch wheatgrass (Pseudoroegneria spicata) and needle and thread (Hesperostipa comata). Subdominant species include thickspike wheatgrass (Elymus lanceolatus), Wyoming big sagebrush (Artemisia tridentata ssp. wyomingensis), 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 relatively minor vegetative component.

Natural fire was a major ecological driver of this entire ecological site. Fire tended to restrict tree and sagebrush growth to small patches and promote an herbaceous plant community. The natural fire return interval was highly variable, ranging up to 100 years; however, it was likely shorter than 35 years (Arno and Gruell 1983). Since 1910, there has been a significant increase in the suppression of fire in sagebrush and trees.

Wyoming big sagebrush steppe communities historically had low fuel loadings and were characterized by 10- to 70-year interval fires that produced a mosaic of burned and unburned lands (Bunting et al., 1987). A shift to the dominance of shrubs may occur in response to improper grazing management, drought, or where big sagebrush occurs due to a lack of fire. Shrub encroachment by a variety of species, including broom snakeweed (Gutierrezia sarothrae), fringed sagewort (Artemisia frigida), Wyoming big sagebrush (Artemisia tridentata ssp. wyomingensis), rubber rabbitbrush (Ericameria nauseosa), green rabbitbrush (Chrysothamnus viscidiflorus), and plains prickly pear

(Opuntia polyacantha) occurs 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. Grazed areas received periodic high intensity, short duration grazing pressure due to bison's nomadic nature and herd structure. Forage for livestock was noted as 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. Livestock grazing has occurred on most of this ecological site in southwestern Montana for more than 150 years. The gold boom in 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, Montana sheep production began to increase and dominated the livestock industry until the 1930s. Since the 1930s, cattle production has dominated the livestock industry in the region (Wyckoff and Hansen 2001).

Some of the major invasive species that can occur on this site include (but are not limited to) spotted knapweed (Centaurea stoebe), leafy spurge (Euphorbia esula), cheatgrass (Bromus tectorum), field brome (Bromus arevensis), ventenata (Ventenata dubia), yellow toadflax (Linaria vulgaris), and dandelion (Taraxicum spp.). Invasive weeds are beginning to have a high impact on this ecological site, especially cheatgrass.

Plant Communities and Transitions
A state and transition model for this ecological site are depicted. 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.

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. For information on STMs, see the following citations: Bestelmeyer et al. (2003), Bestelmeyer et al. (2004), Bestelmeyer and Brown (2005), and Stringham et al. (2003).

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Grasses/Grasslikes**			857-1715	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	560-1009	35-55
	needle and thread	HECO26	*Hesperostipa comata*	157-560	10-20
	prairie sandreed	CALO	*Calamovilfa longifolia*	0-336	0-10
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	78-168	5-10
	thickspike wheatgrass	ELLA3	*Elymus lanceolatus*	78-168	0-5
	western wheatgrass	PASM	*Pascopyrum smithii*	0-112	0-5
	sand dropseed	SPCR	*Sporobolus cryptandrus*	39-84	1-4
	prairie Junegrass	KOMA	*Koeleria macrantha*	11-84	1-3
	threadleaf sedge	CAFI	*Carex filifolia*	11-67	1-3
	Sandberg bluegrass	POSE	*Poa secunda*	17-67	1-3
	blue grama	BOGR2	*Bouteloua gracilis*	11-67	1-3
	needleleaf sedge	CADU6	*Carex duriuscula*	0-56	1-3
Forb					
2	**Forbs**			48-95	
	dotted blazing star	LIPU	*Liatris punctata*	11-129	0-2

	hairy false goldenaster	HEVI4	*Heterotheca villosa*	6-67	0-1
	spiny phlox	PHHO	*Phlox hoodii*	17-67	0-1
	bastard toadflax	COUM	*Comandra umbellata*	17-67	0-1
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	34-67	0-1
	American vetch	VIAM	*Vicia americana*	11-50	0-1
	fleabane	ERIGE2	*Erigeron*	11-50	0-1
	rosy pussytoes	ANRO2	*Antennaria rosea*	11-50	0-1
	desertparsley	LOMAT	*Lomatium*	0-50	0-1
	common yarrow	ACMI2	*Achillea millefolium*	0-50	0-1
	Drummond's milkvetch	ASDR3	*Astragalus drummondii*	0-39	0-1
	woolly groundsel	PACA15	*Packera cana*	0-34	0-1
	locoweed	OXYTR	*Oxytropis*	0-17	0-1
	purple prairie clover	DAPU5	*Dalea purpurea*	–	–
Shrub/Vine					
3	**Shrubs**			48-95	
	winterfat	KRLA2	*Krascheninnikovia lanata*	17-95	2-5
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0-67	2-5
	spineless horsebrush	TECA2	*Tetradymia canescens*	0-50	0-3
	soapweed yucca	YUGL	*Yucca glauca*	0-50	0-3
	Woods' rose	ROWO	*Rosa woodsii*	0-28	0-1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-17	0-1
	prairie sagewort	ARFR4	*Artemisia frigida*	0-17	0-1
	tarragon	ARDR4	*Artemisia dracunculus*	0-17	0-1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-11	0-1
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0-11	0-1

Table 7. Community 1.2 plant community composition

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

Table 8. Community 2.1 plant community composition

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

Table 9. Community 2.2 plant community composition

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

Table 10. Community 3.1 plant community composition

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

Table 11. Community 4.1 plant community composition

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

Table 12. Community 5.1 plant community composition

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

Animal community

The Sandy 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 relatively high grass component of the

Reference Community 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 Bluebunch Wheatgrass Community (1.1) is likely to have minimal sage grouse presence given its low sagebrush canopy cover. However, the potentially diverse forb component of the Bunchgrass State may provide important early-season (spring) foraging habitat for the greater sage-grouse. Other communities on the site with sufficient sagebrush cover may harbor sage grouse populations, specifically Community 2.1 (the Needle and Thread Community), where big sagebrush populations are under a reduced fire regime. Also, as sagebrush canopy cover increases under Altered State and, to a limited extent, under Degraded 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. This is often a preferred site for grazing by livestock, and animals tend to congregate in these areas. To maintain the productivity of the Limy site, grazing on adjoining sites with less production must be managed carefully to be sure utilization on this site is not excessive. Management objectives should include maintenance or improvement of the native plant community. Careful management of the timing and duration of grazing is important. Shorter 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 bluebunch injury. Since needle and thread normally matures earlier than bluebunch wheatgrass and produces a sharp awn, this species is usually avoided after seed set. Changing the grazing season of use will help utilize needle and thread more efficiently while preventing overuse of bluebunch wheatgrass. 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 non-prescribed grazing of this site will be detrimental, will alter the plant composition and production over time, and will result in the transition to the Altered Bunchgrass 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 Altered State can degrade further to the Degraded Shortgrass State or the Invaded State. Management should focus on grazing management strategies that will prevent further degradation, such as seasonal grazing deferment or winter grazing where feasible. Communities within this state are still stable and healthy under proper management. Forage quantity and quality may be substantially decreased from the Bunchgrass State. 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 has to be carefully managed to avoid further soil loss and degradation and possible livestock health issues. 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. Grazing may be possible in a degraded state, but it is generally not economically or environmentally sustainable.

Hydrological functions

The hydrologic cycle functions best in the Reference 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. High ground cover reduces raindrop impact on the soil surface, which keeps erosion and sedimentation transport low. Water leaving the site will have a 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 nonexistent. 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 the bare ground will be less than 15 percent covered. Therefore, the hydrologic cycle is functioning at a level similar to the water cycle in the Bluebunch Wheatgrass Community (1.1). In the Shortgrass Community (2.2), the Degraded 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, the 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 the frequency and severity of flooding within a watershed. Soil erosion is accelerated, the quality of surface runoff is poor, and sedimentation increases. The hydrology of the Conifer Encroached State (5) is highly variable, but studies suggest that an increased tree canopy affects the interception of rainfall as well as reduces the amount of available soil moisture for herbaceous vegetation. This can negatively affect infiltration and increase runoff.

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.

Inventory data references

Information presented was derived from the site's Range Site Description (Sandy 9 –14" P.Z., Northern Rocky Mountain Valleys, South, East of Continental Divide), NRCS clipping data, literature, field observations, and personal contacts with range-trained personnel (i.e., used professional opinion of agency specialists, observations of land managers, and outside scientists).

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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.

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Date	03/08/2019
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Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are not present in the reference condition.

2. **Presence of water flow patterns:** Flow patterns will not be present

3. **Number and height of erosional pedestals or terracettes:** Not Present

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground should be less than 20%. Bare ground may occur in small patches in canopy gaps between plants.

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind erosion will be extremely rare due to the limited bare ground and natural crusting the soil. Post natural disturbances in reference state, brief wind erosion may occur as plants re-establish.

7. **Amount of litter movement (describe size and distance expected to travel):** Minimal fine herbaceous litter movement may occur. The distance traveled will generally be less than 12 inches.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soils on this site are stable and should have stability ratings of 3-6 using the Soil Stability Method. A Horizon should be 4-6 inches thick.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil structure at the surface is typically weak fine granular to weak medium granular. A Horizon should be 4-6 inches thick with color, when wet, typically ranging in Value of 4 or less and Chroma of 3 or less. Local geology may affect color in which it is important to reference the Official Series Description (OSD) for characteristic range.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Site is well drained. The mixed fibrous rooting depth of dominant bunchgrasses combined with the taproots of forbs and shrubs in reference state allows for good infiltration. Plant cover (distribution and amount of canopy) currently adequate for site protection varies however in reference canopy percentage may be from 75-90% with even distribution of mid-statured bunchgrasses. An even distribution of mid stature grasses and cool season rhizomatous grasses along with a mix of shortgrass, forbs and shrubs (10-25%).

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: Cool season mid-statured bunchgrasses (Bluebunch wheatgrass, Praire Sandreed, Indian ricegrass)

    Sub-dominant: Cool season increaser Rhizomatous grasses = Cool season increaser bunchgrasses ? Shrubs ? Forbs = subshrubs

    Other: Native annual forbs and Cactus may be present accounting for trace amounts

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Not Present**

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14. **Average percent litter cover (%) and depth (in): Site tends to express limited amounts herbaceous litter that is typically less than 0.15 inches thick.**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 851 to 1700lbs/acre or 723 to 1905 kg/hectare. Average total annual product is approximately 1151lbs/acre or 1290kg/hectare**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Non-native invasive species on this ecological site include: Dandelion (Taraxicum spp), Cheatgrass (Bromus techtorum), Field brome (Bromus arvensis), Spotted knapweed (Centaurea stoebe), Yellow toadflax (Linaria vulgaris), Leafy Spurge (Euphorbia esula) Native species with the ability to indicate degradation however species presence alone does not imply degradation: Sandberg bluegrass (Poa secunda), Big sagebrush (Artemisia tridentata), Three-tip sagebrush (Artemisia tripartita), Broom snakeweed (Gutierrezia sarothrae), Rubber rabbitbrush (Ericameria nauseosa), Yellow rabbitbrush (Chrysothamnus viscidiflorus), Rocky Mountain Juniper (Juniperus scopulorum), Douglas fir (Psuedotsuga menziesii), Ponderosa pine (Pinus ponderosa)**

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17. **Perennial plant reproductive capability: Capability very high. Density of plants indicates that plants reproduce at level sufficient to fill available resource. No restriction on seed or vegetative reproductive capacity. Plants are producing seed and/or reproductive tillers.**
