Ecological site EX044B01A137
Shallow to Gravel Limy (SwGrLy)
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 9 to 14 inches (228.6 to 355.6 millimeters) with frost free days ranging from 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 Shallow to Gravel Limy ecological site is an upland site formed from alluvium, colluvium, or slope alluvium. 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 15 percent stone or boulder

cover. The Shallow to Gravel ecological site is sandy skeletal, with greater than 35 percent rock fragments in the 10 to 20-inch depth. Soil surface textures are loamy sand to sand. The site is strongly or violently effervescent within four inches of the mineral surface.

Associated sites

EX044B01A031	**Limy Droughty (LyDr) 10-14" PZ Frigid** The Limy Droughty ecological site shares a similar landscape position and expresses a similar plant community potential.
EX044B01A132	**Shallow Limy (SwLy) 10-14" PZ Frigid** The Shallow Limy ecological site is positioned above the Shallow to Gravel Limy ecological site.

Similar sites

EX044B01A031	**Limy Droughty (LyDr) 10-14" PZ Frigid** The Limy Droughty ecological site has a similar plant community as the Shallow to Gravel Limy ecological site but has a finer texture and a higher overall plant production.
EX044B01A132	**Shallow Limy (SwLy) 10-14" PZ Frigid** The Shallow Limy ecological site has a similar plant community and may even express similar plant production, but has a finer texture and is shallow to a root-restrictive layer.

Table 1. Dominant plant species

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

Legacy ID

R044BA137MT

Physiographic features

This ecological site most often occurs on level or nearly level alluvial fans, knolls, stream terraces, and terrace escarpments. The core slopes range from two to five percent, but can occasionally occur on slopes greater than 15 percent.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Alluvial fan (2) Intermontane basin > Terrace (3) Intermontane basin > Knoll (4) Intermontane basin > Fan remnant (5) Intermontane basin > Escarpment
Runoff class	Low to medium
Elevation	1,460 – 1,980 m
Slope	0 – 10 %
Water table depth	150 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Elevation	Not specified
Slope	0 – 50 %
Water table depth	Not specified

Climatic features

The Central Rocky Mountain Valleys MLRA has a continental climate. Fifty to sixty percent of the annual long-term average total precipitation falls between May and August. Most of the precipitation in the winter is snow on frozen ground. Average precipitation for LRU 01 Subset A is 12 inches (305 mm) 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, because of the rain-shadow effects on the leeside of some ranges.

Table 4 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 is an upland site not associated with no water table.

Wetland description

This site is not associated with wetland characteristics.

Soil features

These soils are moderately deep to very deep and excessively drained. These soils are formed from alluvium, slope alluvium, and colluvium. The soil is composed of sandy-skeletal material (rock fragments account for more than 35 percent of the volume in the 10- to 20-inch layer). This skeletal material decreases the water-holding capacity of the site. The soil is strongly to violently effervescent in the top four inches. Typically, soil surface textures consist of loam, sandy loam, and loamy sand. Soils typically have a gravelly or cobbly modifier. Common soil series are Thessvo and Scravo. These soils may exist across multiple ecological sites due to natural variations in slope, texture, rock fragments, and pH.

Table 5. Representative soil features

Parent material	(1) Alluvium – sedimentary rock (2) Colluvium – sedimentary rock (3) Slope alluvium – sedimentary rock

Surface texture	(1) Gravelly loam (2) Sandy loam (3) Loamy sand
Family particle size	(1) Sandy-skeletal
Drainage class	Well drained to excessively drained
Permeability class	Moderate to very rapid
Soil depth	150 cm
Surface fragment cover <=3"	0 – 20 %
Surface fragment cover >3"	0 – 20 %
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Electrical conductivity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.9 – 8.4
Subsurface fragment volume <=3" (25.4-50.8cm)	20 – 70 %
Subsurface fragment volume >3" (25.4-50.8cm)	0 – 40 %

Ecological dynamics

The Shallow to Gravel Limy (SwGrLy) ecological site Reference State is a collection of two plant communities dominated by bluebunch wheatgrass (Pseudoroegneria spicata), thickspike wheatgrass (Elymus lanceolatus), and needle and thread (Hesperostipa comata). Subdominant species include Sandberg bluegrass (Poa secunda), Wyoming big sagebrush (Artemisia tridentata ssp. wyomingensis), and little sagebrush (Artemisia arbuscula). The distribution of little sagebrush is restricted to the southwest Montana counties of Beaverhead, Madison, Park, and Gallatin (Lesica et al. 2012). This potential is suggested by investigations showing a predominance of perennial grasses on near-pristine range sites (Ross et al., 1973).

The driving force of change in this ecological site is grazing; however, other influences such as fire and climate affect the plant communities. Fire is a natural disturbance on this ecological site; however, fuel loadings tend to be low, so fire is infrequent compared to neighboring sites. As the Reference State degrades (triggered by the reduction or absence of bluebunch wheatgrass), the plant community transitions to another state. Which state the Reference transitions occur in is often dictated by the timing, duration, and intensity of the disturbance. These potential changes in the community can have a profound impact on the 17 indicators of rangeland health, such as bare ground, production, and site stability. See the Rangeland Health Worksheet and Interpreting Indicators of Rangeland Health Handbook for more information.

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. 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 spotted knapweed (Centaurea stoebe), Dalmatian toadflax (Linaria dalmatica), leafy spurge (Euphorbia esula), and cheatgrass (Bromus tectorum). Invasive weeds are generally not an issue in most of this ecological site and tend to occupy limited areas in small patches near traditional watering facilities, along roads, and other areas that receive high soil disturbance. Cheatgrass and spotted knapweed pose the highest risk for invasion on the Shallow to Gravel Limy site.

Plant Communities and Transitional Pathways
A state and transition model (STM) for this ecological site is depicted in the below diagram. 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. Most observers find it easier to visualize or estimate the percent canopy for woody species (trees and shrubs). 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 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 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Mid-Statured Cool Season Bunchgrass**			224-504	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	196-359	25-40
	needle and thread	HECO26	*Hesperostipa comata*	62-112	15-20
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0-67	0-3
	green needlegrass	NAVI4	*Nassella viridula*	0-34	0-1
2	**Increaser Grasses/Grasslikes**			56-123	
	thickspike wheatgrass	ELLA3	*Elymus lanceolatus*	34-84	5-10
	prairie Junegrass	KOMA	*Koeleria macrantha*	6-28	2-5
	Sandberg bluegrass	POSE	*Poa secunda*	6-28	2-5
	plains reedgrass	CAMO	*Calamagrostis montanensis*	6-28	2-5
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0-22	0-1
	needleleaf sedge	CADU6	*Carex duriuscula*	6-17	2-4
	blue grama	BOGR2	*Bouteloua gracilis*	6-17	2-3

Forb					
3	**Forbs**			39-90	
	dotted blazing star	LIPU	*Liatris punctata*	7-56	1-3
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	11-56	1-3
	American vetch	VIAM	*Vicia americana*	11-50	1-5
	spiny phlox	PHHO	*Phlox hoodii*	7-39	1-2
	fleabane	ERIGE2	*Erigeron*	0-34	1-2
	desertparsley	LOMAT	*Lomatium*	0-28	0-2
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11-28	0-1
	rosy pussytoes	ANRO2	*Antennaria rosea*	0-11	0-1
	Drummond's milkvetch	ASDR3	*Astragalus drummondii*	0-11	0-1
	stemless mock goldenweed	STAC	*Stenotus acaulis*	0-11	0-1
	locoweed	OXYTR	*Oxytropis*	0-11	0-1
	bastard toadflax	COUM	*Comandra umbellata*	0-11	0-1
Shrub/Vine					
4	**Shrubs**			22-90	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0-67	2-15
	little sagebrush	ARAR8	*Artemisia arbuscula*	0-45	0-10
	black sagebrush	ARNO4	*Artemisia nova*	0-22	0-5
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	11-22	0-3
	winterfat	KRLA2	*Krascheninnikovia lanata*	0-22	1-2
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0-11	0-1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-6	0-1
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0-6	0-1
	prairie sagewort	ARFR4	*Artemisia frigida*	0-6	0-1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-1	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 3.1 plant community composition

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

Table 10. Community 4.1 plant community composition

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

Animal community

The Shallow to Gravel Limy ecological site of the Central Rocky Mountains Valleys, LRU 01 Subset A, provides a variety of wildlife habitat 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. 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 at this site, which often has a minimum of 15 percent sagebrush canopy cover required for hiding cover (Wallestad 1975). The Bluebunch Wheatgrass Community (1.1) is likely to have a seasonal sage grouse presence given its low big sagebrush canopy cover, but the presence of little sagebrush provides snow-free winter feeding and spring lekking sites. Other communities on the site with sufficient sagebrush cover may harbor sage grouse populations, specifically Community 2.1, where big sagebrush populations increase under a reduced fire regime. Additionally, as the sagebrush canopy cover increases, pygmy rabbit, Brewer's sparrow, and mule deer use may

increase. Managed livestock grazing is suitable on this site due to the typically gentle slopes and the potential to produce high-quality forage. 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 the opportunity for regrowth is necessary before dormancy to reduce injury to bluebunch wheatgrass. Continual non-prescribed grazing of this site will be injurious, will alter the plant composition and production over time, and will result in the transition to the Altered 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 is subject to further degradation to the Degraded State or 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/or quality may be substantially decreased from the Reference 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 as native plants are replaced. 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 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 (Thurow et al 1986). High ground cover reduces rain drop 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. 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. (McCalla et al 1984)

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.

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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	05/30/2019
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** **None Present**

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2. **Presence of water flow patterns:** **None Present**

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3. **Number and height of erosional pedestals or terracettes:** **None Present**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Bare ground is between 20-25 percent.**

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5. **Number of gullies and erosion associated with gullies:** None Present

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

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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.

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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 stability ratings will be low. Interspaces have ratings of 3-5 and under canopy will have values between 4-6.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil Structure at the surface is typically strong to medium fine granular. The A horizon should be 3-6 inches thick with color, when wet, typically ranging in Value of 5 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.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The Shallow to Gravel ecological site is well drained and has a high infiltration rate especially in the subsurface horizons. An even distribution of primarily mid stature grasses of site production, then cool season rhizomatous grasses along with a mix of shortgrass, forbs and shrubs.

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

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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, cool season, perennial bunchgrasses

    Sub-dominant: rhizomatous grasses > short cool season bunchgrass >= forbs = shrubs > > warm season grasses

    Other:

    Additional:

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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. Shrubs, subshrubs mortality does not exceed 5% for any given species.

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14. **Average percent litter cover (%) and depth (in):** **Litter cover varies from approximately 20 to 40% with a median value of 30%; comprised of primarily herbaceous litter. Most litter is irregularly distributed on the soil surface and is not at a measurable depth. Most litter is irregularly distributed on the soil surface and is not at a measurable depth.**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **Average annual production is 600. Low: 400 High 800. Production varies based on effective precipitation and natural variability of soil properties for this ecological site.**

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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:** **Potential invasive (including noxious) species (native and non-native). Invasive species on this ecological site include (but not limited to) dandelion, annual brome spp., spotted knapweed, yellow toadflax, leafy spurge, ventenata, etc. Native species such as rocky mtn Juniper, broom snakeweed, rabbitbrush spp., big sagebrush, blue grama, Sandberg's bluegrass, etc. when their populations are significant enough to affect ecological function, indicate site condition departure.**

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17. **Perennial plant reproductive capability:** **In the reference condition, all plants are vigorous enough for reproduction either by seed or rhizomes in order to balance natural mortality with species recruitment. Density of plants indicates that plants reproduce at level sufficient to fill available resource.**
