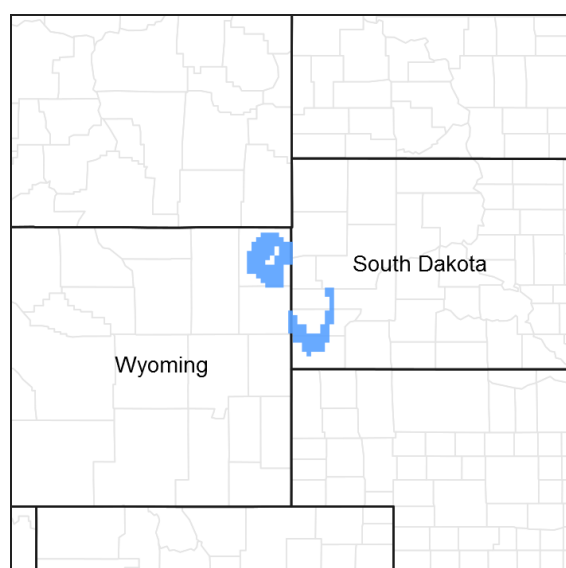


## **Ecological site R061XS010SD Loamy-South (16-18" PZ)**

Last updated: 7/17/2024  
 Accessed: 05/13/2025

### **General information**

**Provisional.** A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.



**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

### **MLRA notes**

Major Land Resource Area (MLRA): 061X–Black Hills Foot Slopes

The Black Hills Foot Slopes (MLRA 61) is shared between Wyoming (WY) (58 percent) and South Dakota (SD) (42 percent). The MLRA is approximately 1,865 square miles. The towns of Spearfish, Sturgis, and Hot Springs, South Dakota, and Newcastle and Sundance, Wyoming, are all in this MLRA. Rapid City, South Dakota, is on the eastern edge of the MLRA. Wind Cave National Park, Devils Tower National Monument, and parts of Thunder Basin National Grassland and the Black Hills National Forest are also in MLRA 61. Devils Tower was the nation's first National Monument, designated by President Theodore Roosevelt in 1906.

The Black Hills Foot Slopes consists of steeply dipping rocks circling the domed mountains of the Black Hills. As the mountains were uplifted, older sediments were tipped up and dipped away from the core of the mountains. The Lower Cretaceous Fall River and Lakota (Inyan Kara Group) sandstones, which are on the outside edge of the area, are referred to as the Dakota Hogback. The next geologic formation is the Triassic-aged red beds of the Spearfish shale. It forms a low valley. This "red valley" surrounds the Black Hills between the two ridges formed by the Inyan Kara (hogback) and Minnekahta Formations associated with the Black Hills (MLRA 62). The Lakota called the red beds the "Race Track." The red beds have gypsum and anhydrous layers. Ground water seepage can dissolve these layers, creating sinkholes on the surface.

The average elevation of MLRA 61 ranges from 2,950 to 3,940 feet with extremes to 5,580 feet. Slopes are

generally hilly; however, the interior red beds are nearly level to moderately sloping. The exterior hogback is steep, erosion-resistant rock. The Belle Fourche River is the only river flowing through MLRA 61. It passes through Hulett, Wyoming.

The dominant soil orders in this MLRA are Alfisols, Entisols, and Mollisols. The soils in the area predominantly have frigid or mesic soil temperature regimes and aridic or ustic soil moisture regimes. The soils are shallow to very deep, generally well drained, and loamy.

Average annual precipitation is 16 to 22 inches. The majority of rainfall occurs early in the growing season. Some high-intensity thunderstorms occur in mid-late summer. This MLRA supports open grassland, open ponderosa forest, and savanna-like vegetation. The grassland is characterized by native grasses, such as big bluestem, little bluestem, western wheatgrass, needle and thread, prairie dropseed, and green needlegrass. Bur oak grows throughout the northern area and can develop into nearly pure stands.

The major resource concerns are water quality, wind erosion, water erosion, and urban expansion.

MLRA 61 is 54 percent privately owned rangeland and 19 percent forest land. Federal lands make up 7 percent of the rangeland and 5 percent of the forest land. The remaining 15 percent of the MLRA is privately owned cropland and urban development (USDA-NRCS, 2006: Ag Handbook 296).

## **LRU notes**

For development of ecological sites, MLRA 61 is divided into three precipitation zones (PZ).

The northern area (18-22" PZ) extends from just south of Rapid City, South Dakota, north to the Wyoming border.

The southern area (16-18" PZ) extends from Newcastle, Wyoming, south to Hot Springs, South Dakota, then north to just south of Rapid City.

The western area (16-20" PZ) is primarily located in Wyoming, extending from Newcastle in the south, to north of the Bear Lodge Mountains, then south through the gap between the Bear Lodge Mountains and the Black Hills.

One additional grouping of ecological sites represents sites that are common for the entire MLRA and do not have a precipitation zone designation.

The forest lands in MLRA 61 are represented by three forest ecological sites, which are currently correlated to MLRA 62 Black Hills.

## **Classification relationships**

USDA

Land Resource Region G—Western Great Plains Range and Irrigated Region:

Major Land Resource Area (MLRA) 61—Black Hills Foot Slopes

US Environmental Protection Agency (EPA)

Level IV Ecoregions of the Conterminous United States:

Black Hills Foothills—17a

USDA Forest Service

Ecological Subregions: Sections and Subsections of Conterminous United States:

Black Hills Coniferous Forest Province—M334:

Black Hills Foothills Subsection—M334Aa

## **Ecological site concept**

The Loamy 16-18" PZ ecological site occurs throughout the southern portion of MLRA 61. It is located on upland landscapes and does not receive additional moisture from runoff or overflow. The typical slopes range from 1 to 15 percent. Soils are deep, (greater than 20 inches). The "A" horizon is 4 to 9 inches deep with textures ranging from loam to silt loam. Subsurface textures range from fine sandy loam to silty clay.

The vegetation in the Reference State (1.0) consists of cool-season and warm-season grasses. Western wheatgrass, needle and thread, and green needlegrass are the dominant cool-season grasses. Forbs are common and diverse. Shrubs such as western snowberry, rose, and leadplant, will likely be present in minor amounts. The Loamy 16-18" PZ site is susceptible to invasion of non-native cool-season grasses.

## Associated sites

R061XS012SD	<b>Thin Upland-South (16-18" PZ)</b> The Thin Upland 16-18" PZ ecological site is found on steeper slopes adjacent to the Loamy 16-18" PZ ecological site.
R061XS024SD	<b>Shallow Loamy-South (16-18" PZ)</b> The Shallow Loamy ecological site is found on ridge tops and steep slopes adjacent to the Loamy 16-18" PZ ecological site.
R061XY020SD	<b>Overflow</b> The Overflow ecological site is found on lower landscapes below the Loamy 16-18" PZ ecological site in flood plains and creek channels.
R061XS011SD	<b>Clayey-South (16-18" PZ)</b> The Clayey 16-18" PZ ecological site is found on the same landscape position adjacent to the Loamy 16-18" PZ ecological site.

## Similar sites

R061XS011SD	<b>Clayey-South (16-18" PZ)</b> The Clayey 16-18" PZ ecological site will have more green needlegrass, less needle and thread, and big bluestem than the Loamy 16-18" PZ ecological site.
R061XY020SD	<b>Overflow</b> The Overflow ecological site will have more big bluestem, and greater vegetative production than the Loamy 16-18" PZ ecological site.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Hesperostipa comata</i> ssp. <i>comata</i>

## Physiographic features

The Loamy 16-18" PZ ecological site occurs on level to moderately sloping uplands.

**Table 2. Representative physiographic features**

Landforms	(1) Upland > Hill (2) Upland > Plain (3)
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	2,900–4,000 ft
Slope	1–15%
Aspect	Aspect is not a significant factor

## Climatic features

The climate in the southern LRU of MLRA 61 is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland steppes to the east. Average annual precipitation ranges from 16 to 18 inches with most falling during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums. The wide range is due to the high elevation and dry air, which permit rapidly incoming and outgoing radiation. In winter, cold air outbreaks from Canada move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in the winter and bring rapid rises in temperature. Extreme storms may occur during the winter. They most severely affect ranch operations during late winter and spring.

The average annual temperature is about 48 °F. January is the coldest month with average temperatures ranging from about 24 °F (Newcastle, WY) to about 27 °F (Hot Springs, SD). July is the warmest month with average temperatures ranging from about 72 °F (Rapid City, SD) to about 74 °F (Newcastle, WY). The range of average monthly temperatures between the coldest and warmest months is about 49 °F. Wind speeds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Winds are generally stronger during the day than at night. Occasionally, storms bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Cool-season plants may green-up in September and October if adequate soil moisture is present.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	109-113 days
Freeze-free period (characteristic range)	127-131 days
Precipitation total (characteristic range)	16-18 in
Frost-free period (actual range)	107-117 days
Freeze-free period (actual range)	125-136 days
Precipitation total (actual range)	16-18 in
Frost-free period (average)	111 days
Freeze-free period (average)	130 days
Precipitation total (average)	17 in

## Climate stations used

- (1) EDMONT [USC00392557], Edgemont, SD
- (2) EDMONT 23 NNW [USC00392565], Custer, SD
- (3) HOT SPRINGS [USC00394007], Hot Springs, SD
- (4) RAPID CITY 4NW [USC00396947], Rapid City, SD
- (5) NEWCASTLE [USC00486660], Newcastle, WY

## Influencing water features

No riparian areas or wetland features are directly associated with the Loamy 16-18" PZ ecological site.

## Wetland description

Not Applicable.

## Soil features

Soils common to the Loamy 16-18" PZ ecological site have a surface layer that is 4 to 9 inches thick, with textures ranging from loam to silty clay, and weak fine to medium granular structure. Subsurface textures range from very

fine sandy loam to silty clay. Slopes range from about 1 to 15 percent. The soils in this site are well drained and formed in residuum, alluvium, and eolian deposits. The soils have a moderate to moderately-slow infiltration rate. Subsurface soil layers are nonrestrictive to water movement and root penetration.

This site typically should show slight to no evidence of rills, wind-scoured areas or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact.

Major Soils correlated to the Loamy 16-18" PZ ecological site include, Altvan, Boneek, Gurney, Norka, Recluse, Savo, and Tilford.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 10 percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and production.

More information regarding the soil is available in soil survey reports. Contact the local USDA Service Center for details specific to your area of interest or go online to access USDA's Web Soil Survey.

**Table 4. Representative soil features**

Parent material	(1) Alluvium (2) Residuum
Surface texture	(1) Loam (2) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	40–80 in
Surface fragment cover <=3"	0–4%
Surface fragment cover >3"	0–3%
Available water capacity (0-40in)	6–8 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0–4%

## Ecological dynamics

The Loamy 16-18" PZ ecological site developed under Northern Great Plains climatic conditions; light to severe grazing by bison and other large herbivores; sporadic, natural or human-caused wildfire (often of light intensities); and other biotic and abiotic factors that typically influence soil and site development. Changes occur in the plant communities due to short-term weather variations, effects of native and exotic plant and animal species, and management actions. Although the following plant community descriptions are typical of the transitions between communities, severe disturbances, such as periods of well below average precipitation and the introduction of non-native cool-season grasses, can cause significant shifts in plant communities and species composition.

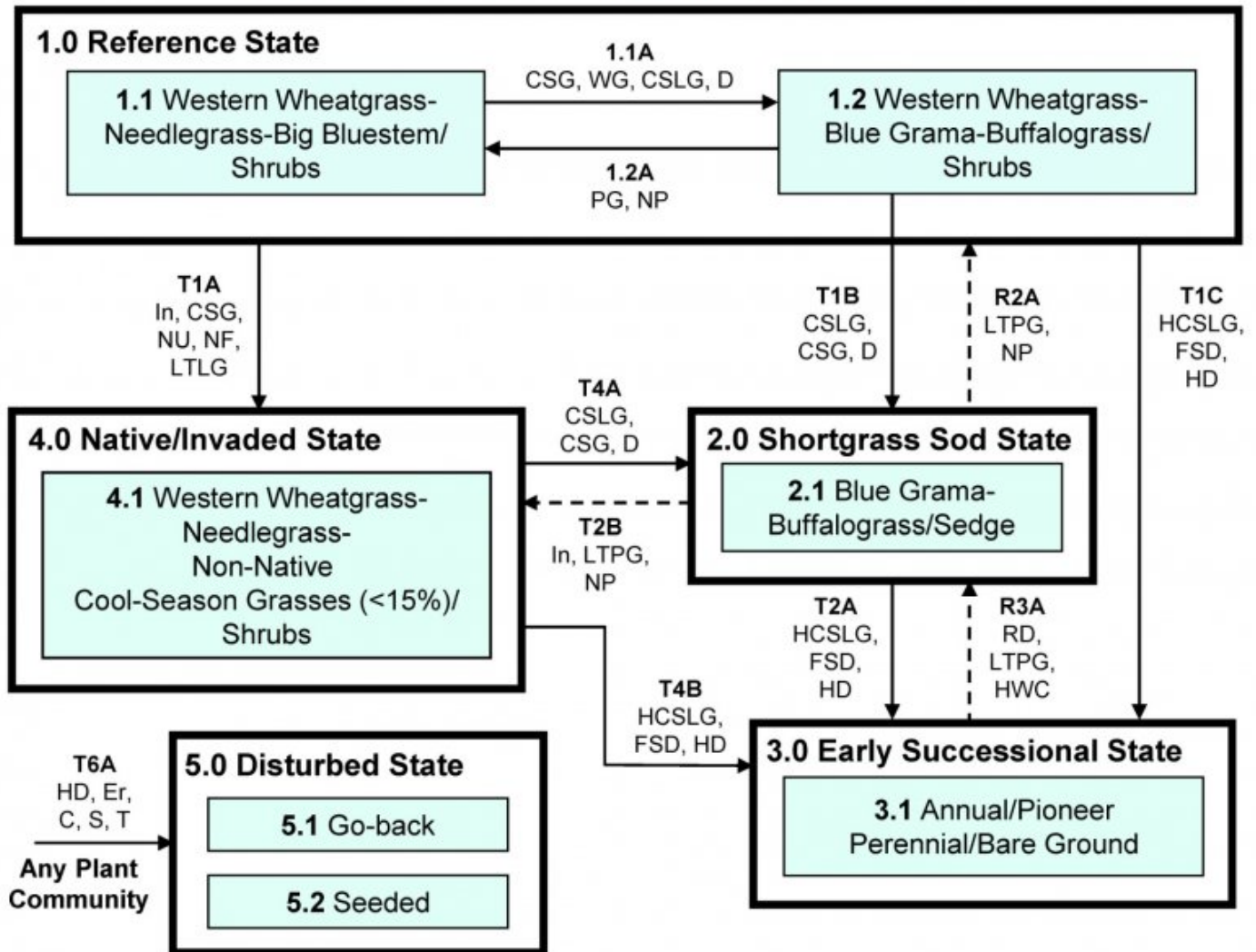
Continuous season-long grazing (during the typical growing season of May through October) or heavy continuous grazing (e.g., every spring or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes departure from the Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs Plant Community (1.1). Blue grama will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Needle and thread, green needlegrass, big bluestem, and sideoats grama will decrease in frequency and production. Excessive defoliation can cause threeawn and annuals to increase and dominate the site. Extended periods of non-use or lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as western wheatgrass, needlegrass, and non-native cool-season grasses.

Interpretations are primarily based on the Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs Plant Community (1.1). It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following state-and-transition diagram illustrates the common plant communities on the site and the transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

## **State and transition model**

# Loamy 16-18" PZ – R061XS010SD 6/28/19



C – Cropping  
 CSG – Continuous seasonal grazing  
 CSLG – Continuous season-long grazing  
 D – Drought  
 Er – Erosion  
 FSD – Frequent and severe defoliation  
 HCSLG – Heavy continuous season-long grazing  
 HD – Heavy disturbance  
 WG – Winter grazing  
 HWC – Herbaceous weed control  
 In – Invasion of non-native cool-season grasses

LTLG – Long-term light grazing  
 LTPG – Long-term prescribed grazing  
 NF – No fire  
 NP – Normal precipitation  
 NU – No use  
 PG – Prescribed grazing  
 RD – Removal of disturbance  
 S – Seeding  
 T – Tillage  
 --> Transition may not be rapid or feasible



### Diagram Legend: Loamy 16-18" PZ - R061XS010SD

<b>T1A</b>	1.0 to 4.0	Invasion of non-native cool-season grasses; continuous seasonal grazing (summer); long-term light grazing; or non-use and no fire.
<b>T1B</b>	1.0 to 2.0	Continuous season-long grazing; continuous seasonal grazing; or heavy grazing in combination with drought.
<b>T1C</b>	1.0 to 3.0	Heavy, continuous season-long grazing; frequent and severe defoliation; or heavy disturbance.
<b>T2A</b>	2.0 to 3.0	Heavy, continuous season-long grazing; frequent and severe defoliation; or heavy disturbance.
<b>T2B</b>	1.0 to 4.0	Invasion of non-native cool-season grasses; long-term prescribed grazing with change in season of use, adequate time for recovery; and a return to normal precipitation patterns following drought. Transition may not be fast or feasible.
<b>T4A</b>	4.0 to 2.0	Continuous season-long grazing; continuous seasonal grazing; or heavy grazing in combination with drought.
<b>T4B</b>	4.0 to 3.0	Heavy, continuous season-long grazing; frequent and severe defoliation; or heavy disturbance.
<b>T6A</b>	Any Plant Community to 5.0	Heavy disturbance such as soil erosion; tillage; abandoned cropland; or tillage and seeding to introduced perennial forage crops.
<b>R2A</b>	2.0 to 1.0	Long-term prescribed grazing with proper stocking rates, change in season of use, adequate time for plant recovery following grazing event; a return to normal precipitation patterns following drought. This transition may not be fast or feasible.
<b>R3A</b>	3.0 to 2.0	Removal of disturbance coupled with long-term prescribed grazing including, proper stocking rates, change in season of use, and adequate recovery following grazing event. Herbaceous weed control may be needed. Transition may not be fast or feasible.
<b>1.1A</b>	1.1 to 1.2	Continuous seasonal grazing (spring); late winter grazing; continuous season-long grazing; or heavy grazing in combination with drought.
<b>1.2A</b>	1.2 to 1.1	Prescribed grazing with proper stocking rates, change in season of use, adequate time for plant recovery following grazing event; and a return to normal precipitation patterns following drought.

## State 1

### Reference State

The Reference State represents what is believed to show the natural range of variability that dominated the dynamics of the ecological site prior to European settlement. This site in the Reference State (1.0) is dominated by cool-season grasses and subdominant warm-season grasses. Grazing, or the lack of grazing, fire, and drought are the major drivers between plant communities. Continuous season-long grazing can push this state to a warm-season shortgrass-dominated State (2.0). Non-use, no fire, and invasion of non-native cool-season grasses will result in a transition to a Native/Invaded State (4.0). Today, a similar state can be found on areas that are properly managed with grazing and prescribed burning, and sometimes on areas receiving occasional short periods of rest.

## Community 1.1

### Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs





Interpretations are based primarily on the Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs Plant Community, which is also considered to be the Reference Plant Community (1.1). The potential vegetation is about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs and trees. The community is dominated by cool-season grasses and subdominant warm-season grasses. The major grasses include western wheatgrass, needle and thread, green needlegrass, big bluestem, and sideoats grama. Other grass or grass-like species include blue grama, thickspike wheatgrass, Indiangrass, plains muhly, and threadleaf sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regard to site and soil stability, watershed function, and biologic integrity.

**Table 5. Annual production by plant type**

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1830	2296	2720
Forb	135	280	450
Shrub/Vine	135	210	300
Tree	0	14	30
<b>Total</b>	<b>2100</b>	<b>2800</b>	<b>3500</b>

**Figure 9. Plant community growth curve (percent production by month).**  
SD6102, Black Hills Foot Slopes, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm-season sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	10	23	34	15	6	5	4		

## Community 1.2

### Western Wheatgrass-Blue Grama-Buffalograss/Shrubs

This plant community evolved under continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year); continuous season-long grazing; or from over utilization during extended drought periods. The potential plant community is made up of approximately 70 percent grasses and grass-like species, 15 percent forbs, and 15 percent shrubs and trees. Dominant grass and grass-like species include western wheatgrass, blue grama, needleleaf sedge, and buffalograss. Grasses of secondary importance include needle and thread, green needlegrass, hairy grama, and sideoats grama. Forbs commonly found in this plant community include white sagebrush (cudweed sagewort), goldenrod, scurfpea, and western ragweed. When compared to the Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs Plant Community (1.1), blue grama and threadleaf sedge have increased. Needle and thread, green needlegrass and other tall and mid-statured grasses have decreased, and production is also reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

**Table 6. Annual production by plant type**

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1390	1749	2075
Shrub/Vine	105	220	350
Forb	105	220	350
Tree	0	11	25
<b>Total</b>	<b>1600</b>	<b>2200</b>	<b>2800</b>

**Figure 11. Plant community growth curve (percent production by month).**  
SD6102, Black Hills Foot Slopes, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm-season sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	10	23	34	15	6	5	4		

## Pathway 1.1A

### Community 1.1 to 1.2

Continuous seasonal grazing which includes grazing at moderate to heavy stocking levels at the same time of year each year; winter grazing that extends into the spring green-up; continuous season-long grazing; or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing; will shift the Reference Plant Community (1.1) to the Western Wheatgrass-Blue Grama-Buffalograss/Shrubs Plant Community (1.2).

## Pathway 1.2A

### Community 1.2 to 1.1

Prescribed grazing (alternating season of use and providing adequate recovery periods); or periodic light to moderate grazing possibly including periodic rest; and a return to normal precipitation following drought; will convert the Western Wheatgrass-Blue Grama-Buffalograss/Shrubs Plant Community (1.2) to the Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs Plant Community (1.1).

### Conservation practices

Prescribed Grazing
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## State 2

### Shortgrass Sod State

This state occurs as a result of above recommended stocking levels, inadequate recovery periods between grazing events, or a combination of these disturbances. This state is dominated by warm-season grasses, with cool-season grasses being subdominant. The shallow, compact nature of the roots of the dominant species causes increased runoff and reduced infiltration. These conditions combine to cause the site to become more droughty, and thus reduce the opportunity for recruitment and establishment of the taller-statured grasses. This state is relatively stable and resistant to change. Historically, rangeland mechanical treatment of this site has been an option used to improve forage production and plant species composition on rangeland. These mechanical treatments include such things as contour furrowing, contour pitting, terracing, chiseling, and disking. The purpose of the practice is to mechanically break up a sod-bound vegetative condition or compacted soils, resulting in less runoff and better infiltration. Many of these treatments were implemented during the 1930s through the 1970s with mixed results. This is primarily due to improper grazing management following the renovation practice. Another drawback, in addition to the cost, is these practices result in a near-permanently roughed ground surface.

## Community 2.1

### Blue Grama-Buffalograss/Sedge

This plant community evolved under moderate to heavy continuous season-long grazing, or from over utilization during extended drought periods. This plant community may also exist adjacent to prairie dog colonies or water sources. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 10 percent forbs, and 15 percent shrubs and trees. Dominant grasses typically include blue grama, buffalograss, and threadleaf sedge. Grasses of secondary importance include western wheatgrass, hairy grama, sun sedge, needle and thread, and sand dropseed. Forbs commonly found in this plant community include white sagebrush (cudweed sagewort), goldenrod, scurfpea, Cuman ragweed, and western yarrow. When compared to the Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs Plant Community Phase (1.1), blue grama, buffalograss, and threadleaf sedge are dominant on this plant community. Cool-season grasses have decreased significantly. This vegetation state is very resistant to change. The herbaceous species present are well adapted to grazing; however, composition can be altered through long-term prescribed grazing. This plant community has significantly less production. The thick sod prevents other species from getting established. Lack of litter and reduced plant vigor causes higher soil temperatures, poor water infiltration rates, and high evapotranspiration which gives blue grama a

competitive advantage over most other grasses. Soil erosion will be minimal due to the sod forming habit of blue grama and buffalograss.

**Table 7. Annual production by plant type**

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	950	1272	1580
Shrub/Vine	75	160	250
Forb	75	160	250
Tree	0	8	20
<b>Total</b>	<b>1100</b>	<b>1600</b>	<b>2100</b>

**Figure 13. Plant community growth curve (percent production by month). SD6104, Black Hills Foot Slopes, warm-season dominant, cool-season sub-dominant. Warm-season dominant, cool-season sub-dominant.**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	7	17	25	25	15	7	1		

### State 3 Early Successional State

This state occurs as a result of extreme disturbance that typically removes most of the native species normally present on this site. Disturbance in the form of severe grazing over several years is the most typical. Occupation by black-tailed prairie dogs may also result in this transition. The dominant species present is highly variable, but the common characteristics include high amounts of bare ground, reduced soil aggregate stability, increased runoff, and increased erosion (including increased sediment loads in the runoff). Restoration of the ecological processes will be very difficult.

#### Community 3.1 Annual/Pioneer Perennial/Bare Ground

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, livestock concentration areas, defoliation by rodents, etc.). The potential plant community is made up of approximately 60 to 80 percent grasses and grass-like species, 15 to 35 percent forbs, and 2 to 5 percent shrubs. The dominant grass is often threeawn. Other grasses may include cheatgrass, field brome, sedge, blue grama, sand dropseed, bluegrass, and western wheatgrass. The dominant forbs include fetid marigold, sweetclover, Cumin ragweed, white sagebrush (cudweed sagewort), and other invader-like species. The dominant shrubs include fringed sagewort, broom snakeweed, and cactus. A wide variety of other early successional plant species can occupy this site in varying amounts. This plant community is susceptible to invasion of Canada thistle and other non-native species because of the relatively high percent of bare ground. Compared to the Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs Plant Community (1.1), threeawn, annual brome grasses, and percentage of bare ground has increased. Western wheatgrass, needlegrasses, and other cool-season grasses have decreased, as have the warm-season species including big bluestem, sideoats grama, and little bluestem. Plant diversity is low (plant richness may be high, but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites.

### State 4 Native/Invaded State

The Native/Invaded State is dominated by native cool- and warm-season grasses, and subdominant non-native

cool-season grasses. It can be found on areas that would appear to be properly managed with grazing and possibly prescribed burning. Extended periods of non-use and no fire, or long-term light grazing can result in the invasion and establishment of non-native cool-season grasses onto this site. If the native cool-season grasses decline a corresponding increase of non-native cool-season grasses can occur. The non-native cool-season grasses will include, smooth brome, Kentucky bluegrass, cheatgrass, and field brome.

**Community 4.1**  
**Western Wheatgrass-Needlegrass-Non-Native Cool-Season Grasses (<15%)/Shrubs**

This plant community develops when non-native cool-season grasses, such as Kentucky bluegrass or smooth brome, invade and become established on the site. This may occur due to the site’s close proximity to seed sources, expansion from road ditches, improved pastures, other invaded sites, or from contaminated hay. Repeated seasonal grazing (typically during the summer), or long-term light grazing, or extended periods of non-use and no fire, will allow these non-native cool-season grasses to increase in the plant community. Plant litter accumulates in large amounts when this community first develops. Litter buildup reduces mature native plant vigor and density, and seedling recruitment declines. Eventually litter levels become high enough that plant density decreases. Typically, rhizomatous grasses form small colonies because of a lack of tiller stimulation. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. The community is dominated by cool-season grasses. The major grasses include western wheatgrass, needle and thread, green needlegrass, Kentucky bluegrass, and smooth brome. Other grass and grass-like species include big bluestem, blue grama, sideoats grama, thickspike wheatgrass, and needleleaf sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The non-native species typically do not increase to the point of dominance; however, their presence tends to reduce the overall diversity of the plant community. As such, this is a somewhat sustainable plant community in regard to site and soil stability, watershed function, and biologic integrity.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1850	2132	2370
Shrub/Vine	125	260	425
Forb	125	195	275
Tree	0	13	30
Total	2100	2600	3100

Figure 15. Plant community growth curve (percent production by month).  
SD6202, Black Hills, cool-season dominant, warm-season sub-dominant.  
Cool-season dominant, warm-season sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

**State 5**  
**Disturbed State**

This State can be transitioned to from any plant community. The two separate vegetative plant communities, Go-Back and Seeded, are highly variable in nature. They are derived through different management scenarios and are not related successional. Infiltration, runoff, and soil erosion will vary depending on the vegetation present on the site. The Go-Back Plant Community (5.1) was previously tilled for crop production and then abandoned. The plant community that develops on this site will be greatly influenced by the plant communities that are located on adjacent land. The Seeded Plant Community (5.2) was typically tilled and then seeded to a perennial forage species or mix of species.

**Community 5.1**  
**Go-Back**

The Go-back plant community can be reached whenever severe mechanical disturbance occurs (e.g., tilled and

abandoned cropland). During the early successional stages, the species that mainly dominate the plant community are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes being dominated by threeawn, bluegrass, smooth brome, annual brome, broom snakeweed, sweetclover, and non-native thistles. Other plants that commonly occur on the site can include western wheatgrass, prickly lettuce, horseweed, mullein, Kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health.

## **Community 5.2**

### **Seeded**

The Seeded Plant Community is normally those areas seeded to pubescent or intermediate wheatgrass, alfalfa, switchgrass, or other forage species. For adapted species and expected production, refer to the USDA-NRCS eFOTG for the appropriate Forage Suitability Group description.

## **Transition T1B**

### **State 1 to 2**

Continuous seasonal grazing (stocking levels above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning early in the season); continuous season-long grazing; or extended periods of drought will transition the Reference State (1.0) to the Shortgrass Sod State (2.0). This transition is most likely to occur from the Western Wheatgrass-Blue Grama-Buffalograss/Shrubs Plant Community (1.2).

## **Transition T1C**

### **State 1 to 3**

Heavy, continuous season-long grazing; frequent and severe defoliation; or heavy disturbance; will transition the Reference State (1.0) to the Early Successional State (3.0).

## **Transition T1A**

### **State 1 to 4**

Continuous summer seasonal grazing; long-term light grazing; or non-use and no fire; and the invasion of non-native cool-season grasses; will transition the Reference State (1.0) to the Native/Invaded State (4.0).

## **Transition T6A**

### **State 1 to 5**

Heavy disturbance including soil erosion; tillage; abandoned cropland; or seeding to improved pasture species; result in a transition to the Disturbed State (5.0).

## **Restoration pathway R2A**

### **State 2 to 1**

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead the Shortgrass Sod State (2.0) over a threshold to the Reference State (1.0). The transition will probably be to the Western Wheatgrass-Blue Grama-Buffalograss/Shrubs Plant Community (1.2), assuming adequate seed and vegetative sources are present. This could require significant time and inputs to achieve and, in the end, may not meet management objectives.

## **Conservation practices**

Prescribed Grazing
--------------------

## **Transition T2A**

## State 2 to 3

Heavy, continuous season-long grazing; frequent severe defoliation; or heavy disturbance will likely move the Shortgrass Sod State (2.0) to the Early Successional State (3.0).

## Transition T2B

### State 2 to 4

Long-term prescribed grazing, with change in season of use, adequate time for recovery, and a return to normal precipitation patterns following drought will result in a transition of the Shortgrass Sod State (2.0). Due to the invasion of non-native cool-season perennial grasses the trajectory of this transition will be towards the Native/Invaded State (4.0). This transition may not be fast or feasible.

#### Conservation practices

Prescribed Grazing
--------------------

## Transition T6A

### State 2 to 5

Heavy disturbance including soil erosion; tillage; abandoned cropland; or seeding to improved pasture species; results in a transition to the Disturbed State (5.0).

## Restoration pathway R3A

### State 3 to 2

Removal of disturbances coupled with long-term prescribed grazing with change in season of use, and adequate recovery time following grazing events, may return the Early Successional State (3.0) to the Shortgrass Sod State (2.0). Herbaceous weed control may also be needed. This transition could require significant time and input to achieve and, in the end, may not meet management objectives.

#### Conservation practices

Prescribed Grazing
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Herbaceous Weed Control
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## Transition T6A

### State 3 to 5

Heavy disturbance including soil erosion; tillage; abandoned cropland; or seeding to improved pasture species; result in a transition to the Disturbed State (5.0).

## Transition T4A

### State 4 to 2

Continuous season-long grazing; continuous seasonal grazing; or heavy grazing in combination with drought; will transition the Native/Invaded State (4.0) to the Shortgrass Sod State (2.0).

## Transition TB

### State 4 to 3

Heavy, continuous season-long grazing; frequent and severe defoliation; or heavy disturbance; will transition the Native/Invaded State (4.0) to the Early Successional State (3.0).

## Transition T6A

### State 4 to 5

Heavy disturbance including soil erosion; tillage; abandoned cropland; or seeding to improved pasture species; result in a transition to the Disturbed State (5.0).

## Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrass			420–980	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	420–840	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–280	–
2	Cool-Season Bunchgrass			420–980	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	140–700	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	140–700	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–280	–
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	0–140	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–56	–
3	Tall Warm-Season Grasses			56–280	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	56–280	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–84	–
4	Mid- Warm-Season Grasses			140–280	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	56–280	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	28–84	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–84	–
5	Short Warm-Season Grasses			56–140	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	28–140	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–56	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	28–56	–
	threeawn	ARIST	<i>Aristida</i>	0–56	–
6	Other Native Grasses			56–140	
	Grass, perennial	2GP	<i>Grass, perennial</i>	28–112	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	28–84	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–28	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–28	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–28	–
7	Grass-Likes			28–140	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	28–84	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0–56	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–56	–
8	Non-Native Cool-Season Grasses			0	
Forb					
9	Forbs			140–420	
	Forb, native	2FN	<i>Forb, native</i>	28–84	–
	goldenrod	SOLI10	<i>Solidago</i>	28–56	–



	goldenrod	SOLEB	<i>Solidago</i>	28–56	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	28–56	–
	American vetch	VIAM	<i>Vicia americana</i>	28–56	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	28–56	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	28–56	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	28–56	–
	fleabane	ERIGE2	<i>Erigeron</i>	28–56	–
	beardtongue	PENST	<i>Penstemon</i>	28–56	–
	prairie clover	DALEA	<i>Dalea</i>	28–56	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	28–56	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–56	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	28–56	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	28–56	–
	scurfpea	PSORA2	<i>Psoralea</i>	28–56	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–28	–
	common starlily	LEMO4	<i>Leucocrinum montanum</i>	0–28	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–28	–
	western wallflower	ERAS2	<i>Erysimum asperum</i>	0–28	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	0–28	–
	four o'clock	MIRAB	<i>Mirabilis</i>	0–28	–
	western marbleseed	ONBEO	<i>Onosmodium bejariense</i> var. <i>occidentale</i>	0–28	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–28	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–28	–
	desert biscuitroot	LOFO	<i>Lomatium foeniculaceum</i>	0–28	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–28	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–28	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–28	–
<b>Shrub/Vine</b>					
10	<b>Shrubs</b>			140–280	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0–84	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	28–84	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	28–84	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–84	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	28–56	–
	rose	ROSA5	<i>Rosa</i>	28–56	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–56	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–28	–
<b>Tree</b>					
11	<b>Trees</b>			0–28	
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	0–28	–
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0–28	–
	bur oak	QUMA2	<i>Quercus macrocarpa</i>	0–28	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrass			220–550	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	220–550	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–110	–
2	Cool-Season Bunchgrass			22–330	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	22–220	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–220	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–44	–
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	0–22	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–22	–
3	Tall Warm-Season Grasses			0–66	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–66	–
4	Mid- Warm-Season Grasses			22–154	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	22–132	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–44	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–22	–
5	Short Warm-Season Grasses			220–660	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	110–330	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	44–220	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–176	–
	threeawn	ARIST	<i>Aristida</i>	22–88	–
6	Other Native Grasses			22–110	
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–66	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–66	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–44	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–44	–
7	Grass-Likes			44–220	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	44–220	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0–110	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–44	–
8	Non-Native Cool-Season Grasses			0	
Forb					
9	Forbs			110–330	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–110	–
	goldenrod	SOLID	<i>Solidago</i>	22–66	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	22–66	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	22–66	–
	Forb, native	2FN	<i>Forb, native</i>	0–66	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	22–44	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	22–44	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–22	–

	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–22	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–22	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–22	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–22	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–22	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–22	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–22	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–22	–
<b>Shrub/Vine</b>					
10	<b>Shrubs</b>			110–330	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	22–154	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	22–154	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	22–110	–
	pricklypear	OPUNT	<i>Opuntia</i>	22–88	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0–66	–
	rose	ROSA5	<i>Rosa</i>	22–44	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–44	–
<b>Tree</b>					
11	<b>Trees</b>			0–22	
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	0–22	–
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0–22	–
	bur oak	QUMA2	<i>Quercus macrocarpa</i>	0–22	–

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Rhizomatous Wheatgrass</b>			0–160	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–160	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–80	–
2	<b>Cool-Season Bunchgrass</b>			16–160	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	16–112	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–80	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–32	–
3	<b>Tall Warm-Season Grasses</b>			0	
4	<b>Mid- Warm-Season Grasses</b>			0–80	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–80	–
5	<b>Short Warm-Season Grasses</b>			320–720	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	240–560	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	80–160	–
	threeawn	ARIST	<i>Aristida</i>	16–112	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–80	–
6	<b>Other Native Grasses</b>			16–128	

	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–80	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–48	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–48	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	16–32	–
7	<b>Grass-Likes</b>			80–320	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	80–320	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0–128	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–32	–
8	<b>Non-Native Cool-Season Grasses</b>			16–160	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	16–160	–
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–80	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–64	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–32	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–16	–
<b>Forb</b>					
9	<b>Forbs</b>			80–240	
	Forb, introduced	2FI	<i>Forb, introduced</i>	16–80	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	16–64	–
	goldenrod	SOLID	<i>Solidago</i>	16–48	–
	scurfpea	PSORA2	<i>Psoralegium</i>	16–48	–
	Forb, native	2FN	<i>Forb, native</i>	0–48	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	16–32	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	16–32	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	16–32	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–16	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–16	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–16	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–16	–
<b>Shrub/Vine</b>					
10	<b>Shrubs</b>			80–240	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	16–128	–
	pricklypear	OPUNT	<i>Opuntia</i>	16–80	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	16–80	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	16–48	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0–32	–
	rose	ROSA5	<i>Rosa</i>	0–16	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–16	–
<b>Tree</b>					
11	<b>Trees</b>			0–16	
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	0–16	–
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0–16	–
	bur oak	QUMA2	<i>Quercus macrocarpa</i>	0–16	–

Table 12. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Rhizomatous Wheatgrass</b>			390–910	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	390–910	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–52	–
2	<b>Cool-Season Bunch Grass</b>			260–780	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	130–520	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	130–260	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–130	–
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	0–78	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–52	–
3	<b>Tall Warm-Season Grasses</b>			0–130	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–130	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–26	–
4	<b>Mid- Warm-Season Grasses</b>			26–130	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	26–130	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–78	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–78	–
5	<b>Short Warm-Season Grasses</b>			26–130	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	26–130	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–78	–
	threeawn	ARIST	<i>Aristida</i>	0–52	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–26	–
6	<b>Other Native Grasses</b>			26–130	
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	26–78	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–78	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–26	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–26	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–26	–
7	<b>Grass-Likes</b>			26–130	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	26–78	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0–78	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–78	–
8	<b>Non-Native Cool-Season Grasses</b>			130–390	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	130–390	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–390	–
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–260	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	26–130	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–52	–
<b>Forb</b>					
9	<b>Forbs</b>			130–260	
	Forb, introduced	OFI	Forb, introduced	26–130	

	Forb, introduced	ZFI	Forb, introduced	26-130	-
	scurfpea	PSORA2	<i>Psoraleidum</i>	26-78	-
	Forb, native	2FN	<i>Forb, native</i>	26-78	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	26-78	-
	goldenrod	SOLID	<i>Solidago</i>	26-78	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-52	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	26-52	-
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	0-52	-
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	26-52	-
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0-26	-
	western wallflower	ERAS2	<i>Erysimum asperum</i>	0-26	-
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0-26	-
	common starlily	LEMO4	<i>Leucocrinum montanum</i>	0-26	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0-26	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-26	-
	prairie clover	DALEA	<i>Dalea</i>	0-26	-
	deathcamas	ZIGAD	<i>Zigadenus</i>	0-26	-
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-26	-
	fleabane	ERIGE2	<i>Erigeron</i>	0-26	-
	four o'clock	MIRAB	<i>Mirabilis</i>	0-26	-
	American vetch	VIAM	<i>Vicia americana</i>	0-26	-
	cinquefoil	POTEN	<i>Potentilla</i>	0-26	-
<b>Shrub/Vine</b>					
10	<b>Shrubs</b>			130-390	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	26-130	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0-52	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	26-52	-
	leadplant	AMCA6	<i>Amorpha canescens</i>	26-52	-
	rose	ROSA5	<i>Rosa</i>	26-52	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-26	-
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0-26	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-26	-
<b>Tree</b>					
11	<b>Trees</b>			0-26	
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	0-26	-
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0-26	-
	bur oak	QUMA2	<i>Quercus macrocarpa</i>	0-26	-

## Animal community

Wildlife Interpretations:

MLRA 61 lies within the drier portion of the northern mixed-grass prairie ecosystem where sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this area consisted of diverse grass- and shrubland habitats interspersed with varying densities of depressional instream wetlands and woody riparian corridors. These habitats provided critical life cycle components for many users. Many species of grassland birds,

small mammals, reptiles, amphibians, and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as several small mammal and insect species, were the primary consumers linking the grassland resources to predators such as the gray wolf, mountain lion, and grizzly bear, and smaller carnivores such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant; however, the species remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox were associated with prairie dog complexes.

Historically, the northern mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbance factors either singly or in combination. Following European settlement, livestock grazing, cropland conversion, elimination of fire, energy development, and other anthropogenic factors influenced species composition and abundance. Introduced and invasive species further impacted plant and animal communities. The bison was a historical keystone species but had been extirpated in this area as a free-ranging herbivore. The loss of the bison and reduction of prairie dog populations and fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development has reduced habitat quality for area-sensitive species.

Within MLRA 61, the Loamy 16-18" PZ ecological site provides upland grassland cover with an associated forb component. It was typically part of an expansive grassland landscape that included combinations of Clayey, Shallow, Stony Hills, Overflow, Subirrigated, and Terrace ecological sites.

This site provides habitat for species requiring unfragmented grassland. Important habitat features and components found commonly or exclusively on this site may include sharp-tailed grouse leks; upland nesting habitat for grassland birds, forbs and insects for brood habitat; and a forage source for small and large herbivores. Many grassland and shrub steppe nesting bird populations are declining. Extirpated species include free-ranging American bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Loamy 16-18" PZ ecological site has remained relatively intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, coyote, and a variety of reptiles, amphibians, and insects. Invasive species such as Kentucky bluegrass, smooth brome, and annual bromes have impacted the biological integrity of the site for some grassland birds. Changes in historic fire regime and domestic grazing have impacted the forb/shrub/grass percentages.

#### Grazing Interpretations:

The following list provides annual suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Therefore, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated, using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

The following initial suggested stocking rates are based on 912 lbs./acre (air-dry weight) per Animal-Unit-Month (AUM), with a 25 percent harvest efficiency of preferred and desirable forage species (refer to USDA NRCS, National Range and Pasture Handbook). An AUM is defined as the equivalent amount of forage required by a 1,000-pound cow, with or without calf, for one month.

Plant Community: Western Wheatgrass-Needlegrass-Big Bluestem/Shrubs (1.1)  
Average Production (lbs./acre, air-dry): 2,800  
Stocking Rate (AUM/acre): 0.77

Plant Community: Western Wheatgrass-Blue Grama-Buffalograss/Shrubs (1.2)  
Average Production (lbs./acre, air-dry): 2,200  
Stocking Rate (AUM/acre): 0.60

Plant Community: Blue Grama-Buffalograss/Sedge (2.1)  
Average Production (lbs./acre, air-dry): 1,600  
Stocking Rate (AUM/acre): 0.44



Plant Community: Western Wheatgrass-Needlegrass-Non-Native Cool-Season Grasses (<15%)/Shrubs (4.1)  
Average Production (lbs./acre, air-dry): 2,600\*  
Stocking Rate (AUM/acre): 0.71\*

Plant Community: All other plant communities identified in this document will have variable annual production values and will require on-site sampling to determine suggested initial stocking rates.

\* Total annual production and stocking rates are highly variable and will require on-site sampling.

Total annual production on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may need to be reduced to reflect only preferred or desirable forage species.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for livestock. During the dormant period, the forage for livestock likely has insufficient protein to meet livestock requirements. Added protein allows ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

## **Hydrological functions**

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups B and C. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, bluegrass, or smooth brome will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

## **Recreational uses**

This site provides opportunities for hunting upland game species. The wide variety of plants that bloom from spring until fall have aesthetic value that appeals to visitors.

## **Wood products**

No appreciable wood products are typically present on this site.

## **Other products**

Harvesting the seeds of native plants can provide additional income on this site.

## **Other information**

Revision Notes: "Previously Approved" Provisional

This provisional ecological site description (ESD) has passed quality control (QC) and quality assurance (QA) to ensure the it meets the 2014 NESH standards for a "Provisional" ecological site description.

This ecological site description (ESD) is an updated "Previously Approved" ESD that represented a first-generation tier of documentation that met all requirements as an "Approved" ESD as laid out in the 1997 National Range and Pasture Handbook (NRPH). The requirements for approved status changed with the release of the 2014 National Ecological Site Handbook (NESH). The previously approved document fully described the reference state and community phase in the state-and-transition model. All other alternative states were at least described in narrative form. The "Previously Approved" ESD has been field-tested for a minimum of five years and is a proven functional document for conservation planning. The "Previously Approved" ESD may not contain all tabular and narrative entries as required in the current "Approved" level of documentation, but it is expected this ESD will continue refinement toward the current "Approved" status.

#### Site Development and Testing Plan:

Future work, as described in an official project plan, is necessary to validate the information in this provisional ecological site description. The plan will include field activities for low-, medium-, and high-intensity sampling, soil correlations, and analysis of the data. Annual field reviews should be done by soil scientists and vegetation specialists. Final field review, peer review, quality control, and quality assurance reviews are required to produce the final document.

### Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; Cynthia Englebert, Range Management Specialist, Forest Service; George Gamblin, Range Management Specialist, NRCS; Ryan Murray, Range Management Specialist, NRCS; Cheryl Nielsen, Range Management Specialist, NRCS; L. Michael Stirling, Range Management Specialist, NRCS; Jim Westerman, Soil Scientist, NRCS.

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## **Contributors**

Stan C. Boltz  
Rick L. Peterson

## **Approval**

Suzanne Mayne-Kinney, 7/17/2024

## **Acknowledgments**

All ecological sites were written to the Provisional Level by Rick L. Peterson, ESS, Rapid City, SSO in FY20.

The ESDs were reviewed for quality control by Emily Helms, John Hartung, Mitch Faulkner, and Ryan Murray.

All ecological sites were then reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS in September 2020.

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## 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)	Stan Boltz
Contact for lead author	Stan Boltz, <a href="mailto:stanley.boltz@sd.usda.gov">stanley.boltz@sd.usda.gov</a> , 605-352-1236
Date	09/30/2009
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** Rills should not be present.

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2. **Presence of water flow patterns:** None, or barely visible and discontinuous.

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3. **Number and height of erosional pedestals or terracettes:** Essentially, non-existent.

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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 less than 5 percent and patches less than 2 inches in diameter.

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.

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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):** Soil aggregate stability rating usually 6. Typically high root content, organic matter, and granular structure. Soil surface is very resistant to erosion.
- 
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically granular, and mollic (higher organic matter) colors of A-horizon about 4 to 8 inches deep. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.
- 
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep rooted native grasses enhance infiltration and reduce runoff.
- 
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be evident.
- 
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: Rhizomatous wheatgrass (mid, cool-season) = needlegrasses (tall and mid, cool-season) >
- Sub-dominant: Forbs >
- Other: Tall, warm-season grasses = mid, warm-season grasses = shrubs > short sod grasses & grass-likes
- Additional: Other grasses occur in other functional groups in minor amounts.
- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.
- 
14. **Average percent litter cover (%) and depth ( in):** 80 to 90 percent plant litter cover, roughly 0.5 to 1 inch depth. Litter cover is in contact with soil surface.
- 
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Ranges from 1,500 to 2,900 pounds/acre. Reference value is 2,200 pounds/acre (air-dry weight basis).
- 
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:** Refer to State and Local Noxious Weed List; also Kentucky bluegrass, smooth brome grass.

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17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses typically have vigorous rhizomes or tillers.
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