

## Ecological site R064XY011NE Sandy 14-17" PZ

Accessed: 05/03/2024

### 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.

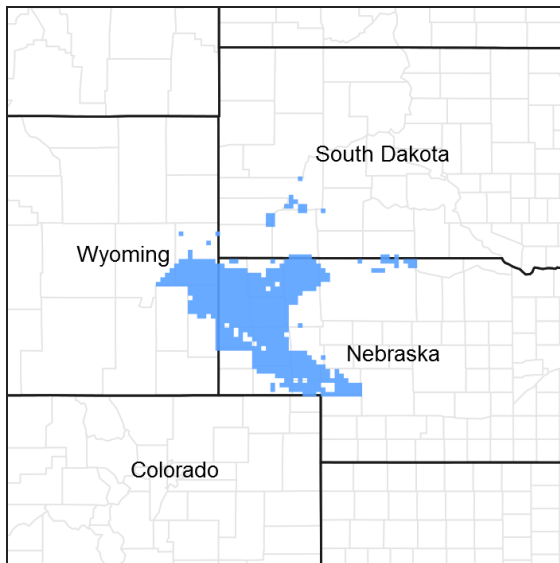


Figure 1. Mapped extent

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): 064X–Mixed Sandy and Silty Tableland and Badlands

#### MLRA Notes:

The Mixed Sandy and Silty Tableland and Badlands (MLRA 64) is almost equally shared between South Dakota (42 percent) and Nebraska (41 percent) with a small portion in Wyoming (17 percent). The MRLA is 11,895 square miles. The towns of Kadoka and Pine Ridge, South Dakota; Chadron, Alliance, and Scottsbluff, Nebraska; and Lusk, Wyoming are all within the boundaries of this MLRA.

Badlands National Park, a portion of the Nebraska National Forest, and parts of the Oglala and Buffalo Gap National Grasslands, Agate Fossil Beds National Monument, Chadron State Park, Fort Robinson State Park, and the Pine Ridge Indian Reservation are in this MLRA. The Badlands are internationally renowned for their Oligocene vertebrate fossils.

The northern section of the MLRA is old plateaus and terraces that have been deeply eroded by wind, water, and time. The southern section consists of nearly level to broad intervalley remnants of smooth fluvial plains. These two sections are separated by the Pine Ridge escarpment. Elevations gradually increase from 2,950 feet to 3,940 feet as one moves east to west. The main drainageway through the Badlands National Park is the White River. The headwaters of both the White and Niobrara Rivers are located in MLRA 64. The Pine Ridge escarpment is located at the northernmost extent of the Ogallala Aquifer.

Tertiary continental sediments consisting of sandstone, siltstone, and claystone underlie most of the area. Many of the bedrock units in the southern third of the MLRA are covered by loess. Soils range from shallow to very deep, and from generally well-drained to excessively drained, and are loamy or sandy. The Badlands consist of stream-laid layers of silt, clay, and sand mixed with layers of volcanic ash.

Annual precipitation for the area is 14 to 20 inches. Most of the rainfall occurs as frontal storms in the spring and early summer months. This area supports a mixture of short-, mid-, and tall-statured warm- and cool-season grasses. On the Pine Ridge Escarpment, these plants grow in association with ponderosa pine, Rocky Mountain juniper, western snowberry, skunkbush sumac, common chokecherry, and rose. Wyoming big sagebrush occurs in minor amounts in the drier far western portion of the MLRA; however, small remnant stands can be found in the eastern portion of the Oglala National Grassland in Nebraska.

Sixty percent of the MLRA is grassland, eleven percent of which is under Federal management. Twenty-two percent of the area is used as cropland, and four percent is forested. Major resource concerns include the hazards of wind and water erosion, and surface water quality (USDA, NRCS. 2006. Ag Handbook 296).

For development of ecological sites, MLRA 64 is divided into two precipitation zones (PZ): 14 to 17 inches and 17 to 20 inches of precipitation per year. The drier zone, 14 to 17 inches, extends from Wyoming eastward to Alliance and Oshkosh, Nebraska, south of the Pine Ridge Escarpment. The wetter 17 to 20 inches zone extends from the western end of the Pine Ridge Escarpment near Lusk, Wyoming, eastward along the escarpment through Nebraska and into the Big Badlands area of South Dakota. MLRA 64 stops at the western edge of the Nebraska Sand Hills (MLRA 65).

### Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 64 – Mixed Sandy and Silty Tableland and Badlands

US Environmental Protection Agency (EPA) Level IV Ecoregions of the Conterminous United States:

High Plains—25; Pine Ridge Escarpment—25a, Flat to Rolling Plains—25d, Pine Bluffs and Hills—25f, and Sandy and Silty Tablelands—25g

Northwestern Great Plains—43; White River Badlands—43h, and Keya Paha Tablelands—43i

### Ecological site concept

The Sandy 14-17” PZ ecological site occurs throughout the drier portion of MLRA 64. It is located on upland landscapes and does not receive additional moisture from runoff or overflow. Typical slope ranges from 0 to 30 percent. Soils are deep, (greater than 20 inches) with surface textures ranging from loamy sand to very fine sandy loam. Subsurface textures range from sand to very fine sandy loamy. Vegetation in the Reference Plant Community consists of a mix of cool- and warm-season grasses. Dominant grasses include prairie sandreed, needle and thread, little bluestem, western wheatgrass, and blue grama. Forbs are common and diverse. Shrubs include leadplant, rose, and sand sage brush. In the Wyoming portion of the MLRA, silver sagebrush and green rabbitbrush will be the most common shrubs. Wyoming big sagebrush does not commonly occur on this site in MLRA 64. The Sandy 14-17” PZ site is susceptible to invasion of non-native, cool-season grasses, especially annual bromes.

### Associated sites

R064XY012NE	<b>Sands</b> The Sands ecological site can be located adjacent to the Sandy 14-17” PZ site.
R064XY029NE	<b>Sandy Lowland</b> The Sandy Lowland ecological site can be found along drainage ways adjacent to the Sandy 14-17” PZ site.

### Similar sites

R064XY012NE	<b>Sands</b> The Sands ecological site will be found on rolling landscapes and will have more sand bluestem.
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R064XY032NE	<b>Sandy 17-20" PZ</b> The Sandy 17-20" PZ ecological site will have more sand and little bluestem, and will have higher forage production.
R064XY029NE	<b>Sandy Lowland</b> The Sandy Lowland ecological site will be found on lower landscape position adjacent to drainage ways. There will be more switchgrass, possible trees, and higher forage production.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Calamovilfa longifolia</i> (2) <i>Andropogon hallii</i>

## Physiographic features

This site occurs on nearly level to steeply sloping hillslopes, terraces and alluvial fans.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Stream terrace (3) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	884–1,219 m
Slope	0–30%
Aspect	Aspect is not a significant factor

## Climatic features

MLRA 64 is considered to have a continental climate consisting of cold winters and hot summers, low humidity, light rainfall, and ample sunshine. Extremes in temperature may also abound. The climate is the result of the location of MLRA 64 near the geographic center of North America. There are few natural barriers on the Northern Great Plains, and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 14 to 17 inches per year. The normal average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 24°F (Lusk 2 SW, WY) to about 26°F (Hemingford, NE). July is the warmest month with temperatures averaging from about 69°F (Lusk 2 SW, WY) to about 73°F (Hemingford, NE). The range of normal average monthly temperatures between the coldest and warmest months is about 50°F. This large annual range attests to the continental nature of this area's climate. Hourly winds 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. Daytime winds are generally stronger than nighttime and occasional strong storms may 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. Green-up of cool-season plants may occur in September and October when adequate soil moisture is present.

**Table 3. Representative climatic features**

Frost-free period (average)	114 days
Freeze-free period (average)	133 days
Precipitation total (average)	406 mm

## Climate stations used

- (1) AGATE 3 E [USC00250030], Harrison, NE
- (2) HAY SPRINGS 12 S [USC00253715], Hay Springs, NE
- (3) HEMINGFORD [USC00253755], Hemingford, NE
- (4) LUSK 2 SW [USC00485830], Lusk, WY
- (5) TORRINGTON 29N [USC00488997], Jay Em, WY
- (6) ALLIANCE 1WNW [USC00250130], Alliance, NE

## Influencing water features

No riparian areas or wetland features are directly associated with the Sandy 14-17" PZ ecological site.

## Soil features

The soils in this site are well-drained to somewhat excessively-drained, and formed in eolian sand, alluvium, colluvium, or residuum. They are derived primarily from sandstone or eolian deposits and occur on slopes of 0 to 30 percent. The fine sand to very fine sandy loam, surface layer is 3 to 22 inches thick. Subsoil textures in this site are sand to very fine sandy loam. This site should show slight to no evidence of rills, wind-scoured areas or pedestalled plants. Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

Major soils correlated to the Sandy 14-17" PZ site include Busher, Dailey, Jayem, Phiferson, Sarben, and Vetal.

These soils are susceptible to wind and water erosion. The hazard of water erosion increases on slopes greater than about 15 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/or production.

More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

**Table 4. Representative soil features**

Parent material	(1) Alluvium–calcareous sandstone
Surface texture	(1) Loamy very fine sand (2) Fine sandy loam (3) Very fine sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Soil depth	51–203 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4

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

## Ecological dynamics

This 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/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions specify more typical transitions between communities that will occur, 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/or species composition.

Continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence causes this site to depart from the Prairie Sandreed-Needle and thread-Bluestem Plant Community (1.1). Species such as sand dropseed, needle and thread and blue grama will increase, while prairie sandreed, little bluestem, and sand bluestem will decrease.

Interpretations are primarily based on the Prairie Sandreed-Needle and Thread-Bluestem Plant Community. 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 communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

## State and transition model

**Sandy 14-17" PZ – R064XY011NE 5/18/18**

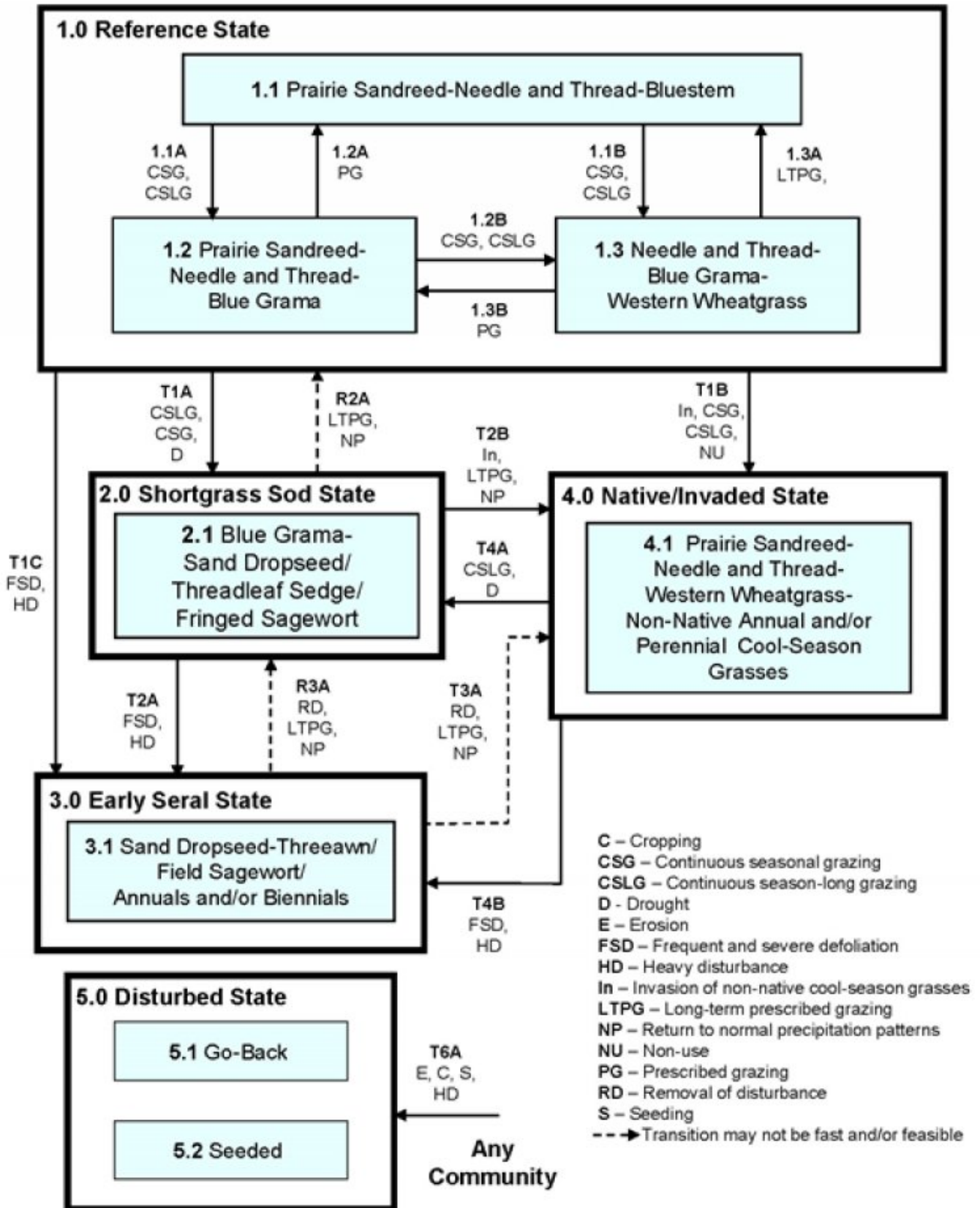


Figure 6. Sandy 14-17" PZ - R064XY011NE.

**Diagram Legend - Sandy 14-17" PZ - R064XY011NE**

T1A	Continuous season-long grazing or heavy grazing in combination with drought.	
T1B	Invasion of non-native cool-season grasses, continuous seasonal grazing, or continuous season-long grazing.	
T1C	Frequent and severe defoliation and/or heavy disturbance.	
T2A	Frequent and severe defoliation and/or heavy disturbance.	
T2B	Invasion of non-native cool-season grasses, normal precipitation patterns, and long-term prescribed grazing with change in season of use and adequate time for recovery.	
T3A	Removal of disturbance coupled with long-term prescribed grazing with change in season of use, adequate recovery time, and a return to normal precipitation patterns. Transition may not be fast or feasible.	
T4A	Continuous season-long grazing or heavy grazing in combination with drought.	
T4B	Frequent and severe defoliation and/or heavy disturbance.	
T6A	Heavy disturbance such as tillage, cropping, abandonment of cropland, long-term non-use, soil erosion, invasion of non-native weedy species, or seeding to perennial forage species.	
R2A	Long-term prescribed grazing with change in season of use and adequate time for recovery, and a return to normal precipitation patterns. Transition may not be fast or feasible.	
R3A	Removal of disturbance coupled with long-term prescribed grazing with change in season of use, adequate recovery time, and a return to normal precipitation patterns. Transition may not be fast or feasible.	
CP 1.1A	1.1 - 1.2	Continuous seasonal grazing (spring), winter grazing, continuous season-long grazing, or heavy grazing in combination with drought.
CP 1.1B	1.1 -1.3	Continuous season-long grazing, or heavy grazing in combination with drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing with proper stocking, change in season of use, adequate time for recovery, and a return to normal precipitation patterns following drought.
CP 1.2B	1.2 - 1.3	Continuous seasonal grazing (spring), winter grazing, continuous season-long grazing, or heavy grazing in combination with drought.
CP 1.3A	1.3 - 1.1	Long-term prescribed grazing with proper stocking, change in season of use, adequate time for recovery, and a return to normal precipitation patterns following drought.
CP 1.3B	1.3 - 1.2	Prescribed grazing with proper stocking, change in season of use, adequate time for recovery, and a return to normal precipitation patterns following drought.

Figure 7. Sandy 14-17" PZ - R064XY011NE.

**State 1  
Reference State**

This 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), will be dominated by warm- and cool-season grasses. Grazing or the lack of grazing, fire 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). Invasion of non-native cool-season perennial or annual grasses will result in a transition to the Native/Invaded State (4.0). In Wyoming, the plant community pathways within the Reference State will more likely go from 1.1 to 1.3. In Nebraska, it will more likely go from 1.1 to 1.2. Even though the average mean annual precipitation in the 14-17" PZ ranges between 16.0 and 16.5 inches the timing and amount of precipitation is expressed in subtle differences in plant communities on this site. Wyoming receives approximately 1.4 inches less moisture in May and June than in

Nebraska. As a result this site in Wyoming will express more cool-season mid-grasses and drought tolerant warm-season short grasses. In Nebraska the same site, with slightly more precipitation in May and June will express more tall- and mid-stature warm-season grasses and less production from cool-season grasses.

## Community 1.1 Prairie Sandreed/Needle and Thread-Bluestem

Interpretations are based primarily on the Prairie Sandreed-Needle and Thread-Bluestem Plant Community. This is also considered to be Reference Plant Community (1.1). This site can be found on areas that are properly managed with grazing, and on areas receiving occasional short periods of rest. The potential vegetation is about 85 percent grasses or grass-likes, 10 percent forbs, and 5 percent shrubs. The site is dominated by mid- and tall-grasses. The major grasses are, prairie sandreed, needle and thread, little bluestem, and sand bluestem. Other grass and grass-like species occurring on the site are blue grama, western wheatgrass, and threadleaf sedge. Significant forbs include dotted gayfeather, penstemon and prairie coneflower. Shrubs in this community are rose, sand sagebrush, fringed sagewort and in the far western portion of the MLRA, silver sagebrush and rabbitbrush. This plant community is well adapted to the Northern Great Plains climatic conditions. Community dynamics, nutrient cycle, water cycle and energy flow are functioning at the sites potential. Plant litter is properly distributed with some movement off-site and natural plant mortality is low. The high plant diversity allows for high drought tolerance.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1020	1560	1872
Shrub/Vine	17	99	185
Forb	84	135	185
<b>Total</b>	<b>1121</b>	<b>1794</b>	<b>2242</b>

Figure 9. Plant community growth curve (percent production by month). NE6404, Pine Ridge/Badlands, 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
		5	8	15	24	23	15	5	5		

## Community 1.2 Prairie Sandreed/Needle and Thread-Blue Grama

This plant community developed under continuous season-long grazing. The plant community's mid-grass component is reduced and an understory of short sod-forming grasses is increasing. This plant community can also develop under continuous seasonal grazing. This occurs when grazed at the same time of the growing season, every year. If grazed early, needle and thread will be reduced; whereas, if grazed later, little bluestem and sand bluestem will be reduced. The potential vegetation is about 90 percent grasses or grass-likes, 5 percent forbs, and 5 percent shrubs. Dominant grasses include prairie sandreed, needle and thread, and blue grama, and. Other grasses and grass-likes include western wheatgrass, sand dropseed, and threadleaf sedge. Forbs commonly found in this plant community include gayfeather, penstemon, prairie coneflower, white sagebrush, Cuman ragweed, and spiderwort. Shrubs in this community include rose, sand sagebrush, fringed sagewort, and broom snakeweed. When compared to the Reference Plant Community (1.1), sand bluestem and little bluestem have decreased. Prairie sandreed is beginning to decline. Needle and thread, blue grama, and sand dropseed are increasing. Plant diversity is high but on a downward trend. This plant community is not resistant to change. Management changes can easily shift this plant community. Soil erosion is low. The water cycle is functioning, infiltration is high, and runoff is low.

Table 6. Annual production by plant type



Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	925	1365	1692
Shrub/Vine	11	86	163
Forb	73	118	163
<b>Total</b>	<b>1009</b>	<b>1569</b>	<b>2018</b>

Figure 11. Plant community growth curve (percent production by month). NE6404, Pine Ridge/Badlands, 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
		5	8	15	24	23	15	5	5		

### Community 1.3 Needle and Thread-Blue Grama-Western Wheatgrass



Figure 12. Sandy 14-17" PZ - R064XY011NE - Wyoming

This plant community typically develops, over a period of several years, under continuous seasonal grazing, continuous season-long grazing, and/or heavy grazing during extended periods of drought. This plant community is more likely to occur in the western portion of the 14-17" precipitation zone where May and June precipitation is less than that on the eastern side of the zone. It is dominated by more drought tolerant warm-season shortgrasses and cool-season bunchgrasses. The potential vegetation is about 80 percent grasses or grass-likes, 10 percent forbs, and 10 percent shrubs. The dominant grasses and grass-likes are blue grama, needle and thread, and threadleaf sedge. Other perennial grasses present include, sand dropseed, and some rhizomatous wheatgrass. Significant forbs include Cuman ragweed, slimflower scurphea, and white sagebrush. Compared to the Reference Plant Community (1.1), blue grama, needle and thread, and threadleaf sedge and have greatly increased. Prairie sandreed is limited to a few scattered colonies on the landscape. Little bluestem and sand bluestem are absent. Fringed sagewort and broom snakeweed are increasing. This plant community is resistant to change. Management changes can take an extended period of time to shift this plant community. Soil erosion is low. The water cycle is functioning but infiltration is moderate, and runoff has increased.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	801	1091	1154
Shrub/Vine	22	114	207
Forb	73	140	207
<b>Total</b>	<b>896</b>	<b>1345</b>	<b>1568</b>

Figure 14. Plant community growth curve (percent production by month).  
NE6403, Pine Ridge/Badlands, cool-season/warm-season co-dominant.  
Cool-season, warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	10	20	25	20	10	5	5		

Figure 15. Plant community growth curve (percent production by month).  
NE6404, Pine Ridge/Badlands, 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
		5	8	15	24	23	15	5	5		

### Pathway 1.1A Community 1.1 to 1.2

Continuous seasonal grazing (spring), winter grazing, continuous season-long grazing, or heavy grazing in combination with drought. This plant community pathway is more likely to occur in the eastern portion of the 14-17" precipitation zone than on the western portion of the precipitation zone.

### Pathway 1.1B Community 1.1 to 1.3

Continuous season-long grazing, or heavy grazing in combination with drought. This plant community pathway is more likely to occur in the western portion of the 14-17" precipitation zone where May and June precipitation is less than that on the eastern side of the zone.

### Pathway 1.2A Community 1.2 to 1.1

Prescribed grazing with adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Prairie Sandreed-Needle and Thread-Bluestem Plant Community (1.1).

#### Conservation practices

Prescribed Grazing
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### Pathway 1.2B Community 1.2 to 1.3

Continuous seasonal grazing, or continuous season-long grazing, and/or heavy grazing in combination with extended periods of drought will move this plant community (1.2), toward the Needle and Thread-Blue Grama-Western Wheatgrass (1.2) plant community.

### Pathway 1.3A Community 1.3 to 1.1

Long-term prescribed grazing in combination with adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Prairie Sandreed-Needle and Thread-Bluestem Plant Community (1.1).

#### Conservation practices

Prescribed Grazing
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### Pathway 1.3B

## Community 1.3 to 1.2

Prescribed grazing with adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Prairie Sandreed-Needle and Thread-Blue Grama Plant Community Plant Community (1.2).

### Conservation practices

Prescribed Grazing
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## State 2

### Shortgrass Sod State

The Shortgrass State is dominated by shortgrass species and upland sedges. The State is the result of grazing management that did not provide adequate recovery time for mid- and tall-statured warm-season grasses and mid-statured cool-season grasses. The hydrologic function of this state is altered. Runoff is higher and infiltration is lower than the Reference State. This State is very resistant to change through grazing management alone.

## Community 2.1

### Blue Grama-Sand Dropseed/Threadleaf Sedge/Fringed Sagewort

This plant community typically develops under continuous season-long grazing over a period of many years. It is made up of short, grazing tolerant species. The potential vegetation is about 80 percent grasses or grass-likes, 10 percent forbs, and 10 percent shrubs. The dominant species are blue grama, sand dropseed, and threadleaf sedge. Some needle and thread and western wheatgrass may be present in the plant community. Dominant forbs include Cuman ragweed, scurfpea, annual eriogonum, and white sagebrush. Dominant shrubs are fringed sagewort, broom snakeweed, tarragon (green sagewort), and cactus. Compared to the Reference Plant Community (1.1), blue grama sand dropseed, and threadleaf sedge have increased creating sod bound conditions. Little bluestem and sand bluestem are absent. Prairie sandreed is limited to a few sparse colonies. Sand and silver sagebrush may also be increasing. This plant community is fairly resistant to change. Soil erosion is low. The water cycle is reduced because of the lack of surface litter. Infiltration is moderate due to soil texture, which can help to reduce runoff, but offsite gully erosion can be a concern. Forage production, species diversity, and ground cover are declining.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	471	807	1031
Shrub/Vine	45	101	157
Forb	45	101	157
<b>Total</b>	<b>561</b>	<b>1009</b>	<b>1345</b>

Figure 17. Plant community growth curve (percent production by month). NE6404, Pine Ridge/Badlands, 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
		5	8	15	24	23	15	5	5		

## State 3

### Early Seral State

The Early Seral State is dominated by weedy annuls and biennials, sand dropseed, threeawn, and tarragon (green sagewort). This State is the result of heavy disturbance such as, frequent and severe defoliation, and/or heavy livestock concentrations coupled with grazing management that does not provide adequate time for recover. The hydrologic function is also likely to be dramatically altered. Runoff is high and infiltration is low. This State is very resistant to change through grazing management alone.

### Community 3.1

#### Sand Dropseed-Threawn/Field Sagewort/Annuals and/or Biennials

This plant community develops where the rangeland is grazed year-round, at high stock densities and/or occupation by prairie dogs. The plant composition is made up of annuals with a few species of perennial forbs and grasses that are tolerant to frequent and severe defoliation. Dominant species are, sand dropseed, threawn, and blue grama. Most of the mid-statured grasses have been eliminated or severely reduced. Cheatgrass has invaded the site. Perennial forbs are Cuman ragweed, rush skeleton plant, curlycup gumweed, and hairy goldaster. Tarragon (green sagewort), broom snakeweed, and cactus can be abundant. This plant community is resistant to change due to the lack of perennial species present and the amount of annuals and invaders occupying the site. Soil erosion is high due to the increased bare ground. Infiltration is low and runoff is high from the lack of litter and viable plant population.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	263	406	661
Shrub/Vine	22	71	118
Forb	50	84	118
<b>Total</b>	<b>335</b>	<b>561</b>	<b>897</b>

Figure 19. Plant community growth curve (percent production by month). NE6404, Pine Ridge/Badlands, 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
		5	8	15	24	23	15	5	5		

### State 4

#### Native/Invaded State

This State has been invaded by cheatgrass, field brome, smooth brome, Kentucky bluegrass, and/or crested wheatgrass, but not at the levels where the plant community is dominated by these species. The majority of species are native to this site including; cool-season mid-grasses, warm-season mid- and tall grasses, and warm-season shortgrasses. Forbs will be common and diverse, and shrubs will be present in varying amounts. This State is the result of long-term non-use, in combination with above average precipitation, or through continuous seasonal grazing or continuous season-long grazing. Because of the invasion and persistence of non-native cool-season grasses it is unlikely to return to the Reference State (1.0).

### Community 4.1

#### Prairie Sandreed-Needle and Thread-Western Wheatgrass-Non-Native Annual and/or Perennial Cool-Season

This plant community is the result of invasion of non-native cool-season grasses, long-term non-use, or continuous seasonal grazing or continuous season-long grazing. Non-native species include; cheatgrass, field brome, smooth brome, Kentucky bluegrass, and/or crested wheatgrass. Typically they do not occur at a level where they dominate the site in the 14-17 inch precipitation zone. The potential vegetation is about 90 percent grasses or grass-likes, 5 percent forbs, and 5 percent shrubs. Native species will include; needle and thread, blue grama, western wheatgrass, threadleaf sedge, sand dropseed, and small areas of prairie sandreed, and little bluestem. Forbs commonly found in this plant community include gayfeather, penstemon, prairie coneflower, white sagebrush, Cuman ragweed, and spiderwort. Shrubs in this community include rose, sagebrush, fringed sagewort, and broom snakeweed. This plant community has the potential to transition to a predominantly non-native cool-season grass community but is not as common in the 14-17" PZ portion of MLRA 64. This plant community is resistant to change due to the present of non-native cool-season grasses. Soil erosion is low to moderate. The water cycle is functioning but infiltration is moderate, and runoff has increased.

Table 10. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	751	1190	1401
Shrub/Vine	11	74	140
Forb	22	81	140
<b>Total</b>	<b>784</b>	<b>1345</b>	<b>1681</b>

Figure 21. Plant community growth curve (percent production by month).  
NE6403, Pine Ridge/Badlands, cool-season/warm-season co-dominant.  
Cool-season, warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	10	20	25	20	10	5	5		

## State 5 Disturbed State

Any plant community can transition to the Disturbed State. The two separate vegetative plant communities found in this State are highly variable in nature. They are derived through different management scenarios, and are not related successional. Infiltration, runoff, and soil erosion vary depending upon the vegetation present on the site.

### 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 are annual grasses and forbs, later replaced by both native and introduced perennials. The vegetation in this plant community can vary greatly, sometimes it is dominated by threeawn, dropseed, annual brome, crested wheatgrass, smooth brome, broom snakeweed, sweetclover, and non-native thistles. Other plants that commonly occur on the site can include western wheatgrass, deathcamas, prickly lettuce, mare's tail, kochia, squirreltail, foxtail, and annual sunflower. Bare ground is prevalent due to the loss of organic matter and lower overall soil health.

### Community 5.2 Seeded

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

### Transition T1A State 1 to 2

Continuous seasonal grazing will move toward the Shortgrass State (2.0). This would be typical of calving/lambing pastures where the unit is continuously utilized during the late winter through spring. This transition will result in decreases in both forage production and plant species diversity. Continuous season-long grazing will also move this plant community toward the Shortgrass State (2.0) as will heavy grazing in combination with expended periods of drought. During this transition, the plant community can have the appearance of a mosaic, with sod and mixed grass communities intermingled. As the plant community becomes dominated by shortgrasses, runoff will increase, and infiltration will decrease.

### Transition T1C State 1 to 3

Frequent and severe defoliation and/or heavy disturbance including livestock feeding areas, prairie dog towns, and

calving pastures will transition this the Reference State (1.0) to the Early Seral State (3.0).

### **Transition T1B** **State 1 to 4**

Invasion of non-native cool-season grasses, continuous seasonal grazing, or continuous season-long grazing will result in a transition from the Reference State (1.0) to the Native/Invaded State (4.0).

### **Transition T6A** **State 1 to 5**

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

### **Restoration pathway R2A** **State 2 to 1**

Long-term prescribed grazing in combination with adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Reference State (1.0). This transition will not be fast and in the end may not meet management objectives.

#### **Conservation practices**

Prescribed Grazing

### **Transition T2A** **State 2 to 3**

Frequent and severe defoliation and/or heavy disturbance including livestock feeding areas, prairie dog towns, and calving pastures will cause a transition to the Early Seral State (3.0).

### **Transition T2B** **State 2 to 4**

Long-term prescribed grazing in combination with adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Native/Invaded State (4.0). Management follows invasion of non-native cool-season grasses, including one or more of the following species; cheatgrass, field brome, smooth brome, Kentucky bluegrass, and crested wheatgrass.

### **Transition T6A** **State 2 to 5**

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

### **Restoration pathway R3A** **State 3 to 2**

Removal of management induced disturbance, followed by long-term prescribed grazing in combination with adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Shortgrass State (2.0).

#### **Conservation practices**

Prescribed Grazing

## Transition T3A State 3 to 4

Removal of management induced disturbance, followed by long-term prescribed grazing in combination with adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Native/Invaded State (4.0). Management follows invasion of non-native cool-season grasses, including one or more of the following species; cheatgrass, field brome, smooth brome, Kentucky bluegrass, and crested wheatgrass. Management may take an extended period of time and may not meet management objectives.

## Transition T6A State 3 to 5

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

## Transition T4A State 4 to 2

Continuous season-long grazing will also move this plant community toward the Shortgrass State 2.0 as will heavy grazing in combination with expended periods of drought. During this transition, the plant community can have the appearance of a mosaic, with sod and mixed grass communities intermingled. As the plant community becomes dominated by shortgrasses, runoff will increase, and infiltration will decrease.

## Transition T4B State 4 to 3

Frequent and severe defoliation and/or heavy disturbance including livestock feeding areas, prairie dog towns, and calving pastures will result in a transition to the Early Seral State (3.0).

## Transition T6A State 4 to 5

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

## Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall &amp; Mid Warm-Season Grasses</b>			359–807	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	359–538	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	90–448	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	90–269	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–179	–
2	<b>Mid Cool-Season</b>			269–717	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	179–628	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	90–269	–
3	<b>Short Warm-Season</b>			90–269	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	90–269	–
4	<b>Native Grasses and Grass-likes</b>			18–269	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–179	–

	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0-90	-
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0-90	-
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0-90	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-36	-
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-36	-
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0-36	-
5	<b>Non-Native Cool-Season Grasses (P)</b>			-	-
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	-	-
6	<b>Non-Native Cool-Season Grasses (A)</b>			-	-
	cheatgrass	BRTE	<i>Bromus tectorum</i>	-	-
<b>Forb</b>					
7	<b>Forbs</b>			90-179	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0-36	-
	beardtongue	PENST	<i>Penstemon</i>	0-36	-
	scurfpea	PSORA2	<i>Psoraleidum</i>	0-36	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-36	-
	spiderwort	TRADE	<i>Tradescantia</i>	0-36	-
	vervain	VERBE	<i>Verbena</i>	0-18	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-18	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-18	-
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0-18	-
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0-18	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-18	-
	thistle	CIRSI	<i>Cirsium</i>	0-18	-
	Texas croton	CRTE4	<i>Croton texensis</i>	0-18	-
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-18	-
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0-18	-
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-18	-
	blazing star	LIATR	<i>Liatris</i>	0-18	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-18	-
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0-18	-
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			18-179	
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-90	-
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-90	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-90	-
	rose	ROSA5	<i>Rosa</i>	0-90	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-36	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-36	-
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0-36	-
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0-18	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-18	-
	broom snakeweed	CHISA2	<i>Crotalaria serotina</i>	0-18	-



Table 12. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall</b>			314–471	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	235–471	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	78–314	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0–235	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–78	–
2	<b>Mid Cool-Season</b>			392–706	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	235–471	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	78–235	–
3	<b>Short Warm-Season</b>			78–314	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	78–314	–
4	<b>Native Grasses and Grass-likes</b>			31–157	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–157	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–78	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0–78	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–78	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–31	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–31	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–31	–
5	<b>Non-Native Cool-Season Grasses (P)</b>			0–78	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–78	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–78	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–78	–
6	<b>Non-Native Cool-Season Grasses (A)</b>			0–78	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–78	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–31	–
<b>Forb</b>					
7	<b>Forbs</b>			78–157	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	16–36	–
	beardtongue	PENST	<i>Penstemon</i>	0–36	–
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	16–36	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–36	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–36	–
	vervain	VERBE	<i>Verbena</i>	0–18	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–18	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–18	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0–18	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–18	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–18	–

	thistle	CIRSI	<i>Cirsium</i>	0-18	-
	Texas croton	CRTE4	<i>Croton texensis</i>	0-18	-
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-18	-
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0-18	-
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-18	-
	blazing star	LIATR	<i>Liatris</i>	0-18	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-18	-
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0-18	-
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			16-157	
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-78	-
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-78	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	16-78	-
	rose	ROSA5	<i>Rosa</i>	0-78	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-36	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-31	-
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0-31	-
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0-16	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-16	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-16	-

Table 13. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall</b>			135-269	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	67-202	-
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	13-135	-
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0-67	-
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-27	-
2	<b>Mid Cool-Season</b>			269-673	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	202-605	-
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	67-202	-
3	<b>Short Warm-Season</b>			135-269	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	135-269	-
4	<b>Native Grasses and Grass-likes</b>			135-202	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	67-135	-
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0-135	-
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	27-67	-
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0-67	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-27	-
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-27	-
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0-27	-
	threeawn	ARIST	<i>Aristida</i>	0-22	-

	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	0-10	-
5	<b>Non-Native Cool-Season Grasses (P)</b>			0-67	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0-67	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-67	-
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0-67	-
6	<b>Non-Native Cool-Season Grasses (A)</b>			0-67	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0-67	-
	field brome	BRAR5	<i>Bromus arvensis</i>	0-27	-
<b>Forb</b>					
7	<b>Forbs</b>			78-202	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-30	-
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0-30	-
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	13-27	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-27	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	13-27	-
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0-27	-
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0-27	-
	spiderwort	TRADE	<i>Tradescantia</i>	0-21	-
	vervain	VERBE	<i>Verbena</i>	0-20	-
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-20	-
	thistle	CIRSI	<i>Cirsium</i>	0-20	-
	Rocky Mountain beehplant	CLSE	<i>Cleome serrulata</i>	0-20	-
	Texas croton	CRTE4	<i>Croton texensis</i>	0-20	-
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0-20	-
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-13	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-13	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-13	-
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0-10	-
	blazing star	LIATR	<i>Liatris</i>	0-10	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-10	-
	beardtongue	PENST	<i>Penstemon</i>	0-10	-
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			27-202	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	27-135	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-81	-
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-81	-
	rose	ROSA5	<i>Rosa</i>	0-67	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-27	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-27	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-20	-
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0-20	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-13	-

	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0-13	-
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Table 14. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall</b>			20-151	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	10-151	-
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-101	-
	sand bluestem	ANHA	<i>Andropogon hallii</i>	11-101	-
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-50	-
2	<b>Mid Cool-Season</b>			50-202	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	22-101	-
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	11-50	-
3	<b>Short Warm-Season</b>			101-202	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	101-202	-
4	<b>Native Grasses and Grass-likes</b>			101-202	
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	50-151	-
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	50-151	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-50	-
	threeawn	ARIST	<i>Aristida</i>	0-50	-
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-22	-
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	0-11	-
5	<b>Non-Native Cool-Season Grasses (P)</b>			0-202	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0-112	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-112	-
6	<b>Non-Native Cool-Season Grasses (A)</b>			0-101	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0-101	-
	field brome	BRAR5	<i>Bromus arvensis</i>	0-50	-
<b>Forb</b>					
7	<b>Forbs</b>			50-151	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0-56	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	10-50	-
	vervain	VERBE	<i>Verbena</i>	0-50	-
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	10-45	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-28	-
	thistle	CIRSI	<i>Cirsium</i>	0-28	-
	Rocky Mountain beeplant	CLSE	<i>Cleome serrulata</i>	0-28	-
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	6-28	-
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0-28	-
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-28	-
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	11-28	-
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0-28	-

	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0-20	-
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-17	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	6-17	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-11	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-11	-
	Texas croton	CRTE4	<i>Croton texensis</i>	0-11	-
	spiderwort	TRADE	<i>Tradescantia</i>	0-6	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-6	-
	blazing star	LIATR	<i>Liatris</i>	0-6	-
	beardtongue	PENST	<i>Penstemon</i>	0-6	-
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			50-151	
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-62	-
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-56	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	28-50	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20-50	-
	pricklypear	OPUNT	<i>Opuntia</i>	11-50	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-22	-
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0-20	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-20	-
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0-20	-
	rose	ROSA5	<i>Rosa</i>	0-6	-

Table 15. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall &amp; Mid Warm-Season</b>			0-28	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-28	-
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0-28	-
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-11	-
2	<b>Mid Cool-Season</b>			6-56	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	6-56	-
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-28	-
3	<b>Short Warm-Season</b>			84-168	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	84-168	-
4	<b>Native Grasses and Grass-likes</b>			56-168	
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	28-112	-
	threeawn	ARIST	<i>Aristida</i>	0-84	-
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	28-56	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-28	-
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	0-11	-
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-11	-
5	<b>Non-Native Cool-Season Grasses (B)</b>			0-112	

3	Non-Native Cool-Season Grasses (F)			0-112	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	6-56	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-11	-
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0-11	-
6	Non-Native Cool-Season Grasses (A)			6-112	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	6-112	-
	field brome	BRAR5	<i>Bromus arvensis</i>	6-28	-
<b>Forb</b>					
7	<b>Forbs</b>			56-112	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	11-56	-
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	11-28	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-28	-
	thistle	CIRSI	<i>Cirsium</i>	0-28	-
	Rocky Mountain beeplant	CLSE	<i>Cleome serrulata</i>	0-28	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-28	-
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0-28	-
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-28	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	11-28	-
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0-28	-
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	0-28	-
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0-28	-
	vervain	VERBE	<i>Verbena</i>	0-28	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	6-17	-
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-17	-
	Texas croton	CRTE4	<i>Croton texensis</i>	0-11	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-6	-
	spiderwort	TRADE	<i>Tradescantia</i>	0-6	-
	beardtongue	PENST	<i>Penstemon</i>	0-6	-
	blazing star	LIATR	<i>Liatris</i>	0-6	-
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			28-112	
	pricklypear	OPUNT	<i>Opuntia</i>	0-84	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	17-56	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-56	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-17	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-11	-
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0-11	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-11	-
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-11	-
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0-6	-
	rose	ROSA5	<i>Rosa</i>	0-6	-

Table 16. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall</b>			202–471	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	202–336	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	67–202	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–73	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–67	–
2	<b>Mid Cool-Season</b>			202–404	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	135–269	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	28–135	–
3	<b>Short Warm-Season</b>			28–106	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	28–106	–
4	<b>Native Grasses and Grass-likes</b>			67–202	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	28–106	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–62	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–62	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–37	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–37	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–28	–
	threeawn	ARIST	<i>Aristida</i>	0–12	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–12	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	0–12	–
5	<b>Non-Native Cool-Season Grasses (P)</b>			67–135	
	smooth brome	BRIN2	<i>Bromus inermis</i>	28–135	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	28–135	–
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–67	–
6	<b>Non-Native Cool-Season Grasses (A)</b>			28–135	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	28–123	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–67	–
<b>Forb</b>					
7	<b>Forbs</b>			28–135	
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0–62	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0–49	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–27	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–25	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–25	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–25	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–13	–
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	0–12	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–12	–
	vervain	VERBE	<i>Verbena</i>	0–12	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–12	–
	thistle	CIBSI	<i>Cirsium</i>	0–12	–

	Common Name	Code	Scientific Name	Height	Notes
	Texas croton	CRTE4	<i>Croton texensis</i>	0-12	-
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0-12	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-12	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-12	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-12	-
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			13-135	
	rose	ROSA5	<i>Rosa</i>	0-62	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-27	-
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-25	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-25	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-25	-
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0-13	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-13	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-12	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-12	-
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0-12	-

## Animal community

### Wildlife Interpretations

MLRA 64 lies within the drier portion of 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/shrub land habitats interspersed with varying densities of depressional, instream wetlands, and woody riparian corridors. These habitats provided critical life cycle components for many of its 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 wolf, mountain lion, and grizzly bear, as well as 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 have been extirpated 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.

### Grazing Interpretations:

The following table lists 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 ESD). Because of this, 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 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. An AUM is defined as the equivalent amount of forage required by a 1,000 pound cow with calf up to 6 months of age for one month (refer to USDA NRCS, National Range and Pasture Handbook).

Plant Community: Prairie Sandreed-Needle and Thread-Bluestem (1.1)

Average Production (lbs./acre, air-dry): 1,600

Stocking Rate (AUM/acre): 0.44

Plant Community: Prairie Sandreed-Needle and Thread-Blue Grama (1.2)

Average Production (lbs./acre, air-dry): 1,400

Stocking Rate (AUM/acre): 0.38

Plant Community: Needle and Thread-Blue Grama-Western Wheatgrass (1.3)

Average Production (lbs./acre, air-dry): 1,200

Stocking Rate (AUM/acre): 0.33

Plant Community: Blue Grama-Sand Dropseed/Threadleaf Sedge/Fringed Sagewort (2.1)

Average Production (lbs./acre, air-dry): 900

Stocking Rate (AUM/acre): 0.25

\*Plant Community: Sand Dropseed-Threawn/Field Sagewort/Annuals and/or Biennials (3.1)

Average Production (lbs./acre, air-dry): Variable

Stocking Rate (AUM/acre): Variable

Plant Community: Prairie Sandreed-Needle and Thread-Western Wheatgrass-Non-Native Cool-Season Grasses (4.1)

Average Production (lbs./acre, air-dry): 1,400

Stocking Rate (AUM/acre): 0.38

\*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 on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may have been 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. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow 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 group B, with localized areas in group A. Infiltration ranges from high to very high. Runoff potential for this site varies from very low to low 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 short grasses form a strong sod and dominate the site. 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 for hydrologic soil groups, runoff quantities, and hydrologic curves, Part 630.).

## Recreational uses

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

## Wood products

No appreciable wood products are present on the site.

## Other products

Seed harvest of native plant species can provide additional income on this site.

## Other information

Revision Notes: "Previously Approved" Provisional

This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site description. This is an updated "Previously Approved" ESD that represents a first-generation tier of documentation that, prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirements as an "Approved" ESD as laid out in the 1997 (rev.1, 2003) National Range and Pasture Handbook (NRPH). The document fully described the Reference State and Community Phase in the State-and-Transition model. All other alternative states are 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 does not contain all tabular and narrative entries as required in the current "Approved" level of documentation, but it is expected that the "Previously Approved" ESD will continue refinement toward an "Approved" status.

Site Development and Testing Plan:

Future work, as described in a Project Plan, is necessary to validate the information in this Provisional Ecological Site Description. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. The final field review, peer review, quality control, and quality assurance reviews of the ESD will be required to produce the final document.

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## 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; Jill Epley, Range Management Specialist, NRCS; Rick Peterson, Range Management Specialist, NRCS; David Steffen, Range Management Specialist, NRCS; Jeff Vander Wilt; Range Management Specialist, NRCS; and Phil Young, Soil Scientist, NRCS.

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## Contributors

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Rick L. Peterson

## Acknowledgments

ESD updated by Rick L. Peterson on 5/17/18. Editorial Review by Carla Green Adams.

## 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, stanley.boltz@sd.usda.gov, 605-352-1236
Date	03/31/2004
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

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

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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:** Typically non-existent, but steeper areas may have limited pedestalling of bunchgrasses. No exposed roots should be 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 less than 10 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):** Litter should fall in place. Slight amount of movement of smallest size class litter is possible, but not normal.  

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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 ratings should typically be 5 to 6, normally 6. Surface organic matter adheres to the soil surface.  

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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 5 to 10 inches deep. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.  

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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.  

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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):** No compaction layer should be present.
- 

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: Tall and mid, warm-season grasses >>

Sub-dominant: Mid, cool-season grasses >

Other: Short, warm-season grasses = forbs = shrubs

Additional: Other grasses occur in other functional groups in minor amounts.

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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):** 75 to 85 percent plant litter cover, roughly 0.25 to 0.5 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 1,000 to 2,000 pounds/acre. Reference value is 1,600 pounds/acre (air-dry weight basis).
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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:** Refer to State and Local Noxious Weed List.
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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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