

Ecological site R064XY011NE **Sandy 14-17" PZ**

Last updated: 12/16/2024
 Accessed: 05/11/2025

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.

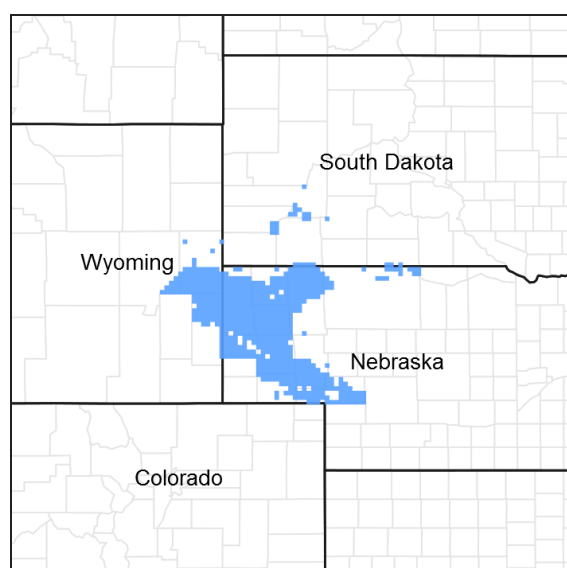


Figure 1. Mapped extent

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

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

The following areas of special interest are in this MLRA: Agate Fossil Beds National Monument, Chadron State Park, Fort Robinson State Park, and the Pine Ridge Indian Reservation; parts of the Oglala and Buffalo Gap National Grasslands, which are in the Nebraska National Forest; and nearly all of Badlands National Park. The Badlands are internationally renowned for their Oligocene vertebrate fossils.

The northern section of the MLRA consists of 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 to 5,073 feet from east to west. The main drainageway through Badlands National Park is the White River. The headwaters of both the White and Niobrara Rivers are in MLRA 64. The Pine Ridge escarpment is 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. They are loamy or sandy. The Badlands consist of stream-laid layers of silt, clay, and sand mixed with layers of volcanic ash.

Average annual precipitation for the area is 14 to 20 inches. Most of the rainfall occurs as frontal storms in the spring and early summer. 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 grows 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 Ogala National Grassland in Nebraska.

Sixty percent of the MLRA is grassland, 11 percent of which is under Federal management. Twenty-two percent of the area is used as cropland, and 4 percent is forested. Major resource concerns include wind erosion, 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 per year and 17 to 20 inches per year. The wetter 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. The drier zone extends from Wyoming eastward to Alliance and Oshkosh, Nebraska, south of the Pine Ridge Escarpment. MLRA 64 stops at the western edge of the Nebraska Sand Hills (MLRA 65).

A unique geologic area known as the Hartville Uplift is in the far southwest corner of the 14 to 17 inch precipitation zone. The Hartville Uplift is an elongated, north-northwest-oriented, broad domal arch of Laramide age (70-50 million years ago). It extends approximately 45 miles between Guernsey and Lusk, Wyoming, and is 15 miles wide at its widest point. Erosion has exposed a core of granite and Precambrian metasedimentary and metavolcanic rocks (Steele et al., 2018). In addition to the ecological sites in the 14 to 17 inch precipitation zone of MLRA 64, three unique ecological site descriptions were developed to describe the soils and plant community dynamics in the Hartville Uplift.

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

U.S. 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.
Sandy and Silty Tablelands—25g.
Northwestern Great Plains—43:
White River Badlands—43h.
Keya Paha Tablelands—43i.

USDA Forest Service
Ecological Subregions: Sections and Subsections of Conterminous United States:
Great Plains and Palouse Dry Steppe Province—331:
Western Great Plains Section—331F:
Subsections:
Shale Scablands—331Fb.
White River Badlands—331Fh.
Pine Ridge Escarpment—331Fj.
High Plains—331Fk.
Hartville Uplift—331Fm.
Western Nebraska Sandy and Silty Tablelands—331Fn.
Keya Paha Tablelands—331Ft.

Powder River Basin Section—331G:
Subsection: Powder River Basin—331Ge.

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 loam.

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 sagebrush. 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	Sands The Sands ecological site can be located adjacent to the Sandy 14-17" PZ site.
R064XY029NE	Sandy Lowland The Sandy Lowland ecological site can be found along drainageways adjacent to the Sandy 14-17" PZ site.

Similar sites

R064XY012NE	Sands The Sands ecological site will be found on rolling landscapes and will have more sand bluestem.
R064XY032NE	Sandy 17-20" PZ The Sandy 17-20" PZ ecological site will occur on similar landscapes, have more sand and little bluestem, and will have higher forage production.
R064XY029NE	Sandy Lowland The Sandy Lowland ecological site will be found on lower landscape positions adjacent to drainageways. 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
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None

Elevation	2,900–5,000 ft
Slope	0–30%
Aspect	Aspect is not a significant factor

Climatic features

MLRA 64 has a continental climate consisting of cold winters and hot summers, low humidity, light rainfall, and ample sunshine. Extremes in temperature are common in some years. The climate results from MLRA 64 being near the geographic center of North America. There are few natural barriers on the Northern Great Plains. Air masses move freely across the plains and account for rapid changes in temperature.

Average 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 average temperatures ranging 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 the climate of this area. 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. Daytime winds are generally stronger than nighttime winds. Occasionally, strong 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)	85-121 days
Freeze-free period (characteristic range)	106-131 days
Precipitation total (characteristic range)	15-16 in
Frost-free period (actual range)	62-123 days
Freeze-free period (actual range)	93-139 days
Precipitation total (actual range)	15-17 in
Frost-free period (average)	98 days
Freeze-free period (average)	120 days
Precipitation total (average)	16 in

Climate stations used

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

Influencing water features

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

Wetland description

Not Applicable.

Soil features

The soils in the Sandy 14-17" PZ ecological 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: 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 or 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—calcareous sandstone (2) Eolian sands—sandstone (3) Residuum—sandstone and siltstone
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	20–80 in
Available water capacity (0-40in)	3–7 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–8.4

Ecological dynamics

The Sandy 14-17" 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 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 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

Sandy 14-17" PZ – R064XY011NE 2/13/19

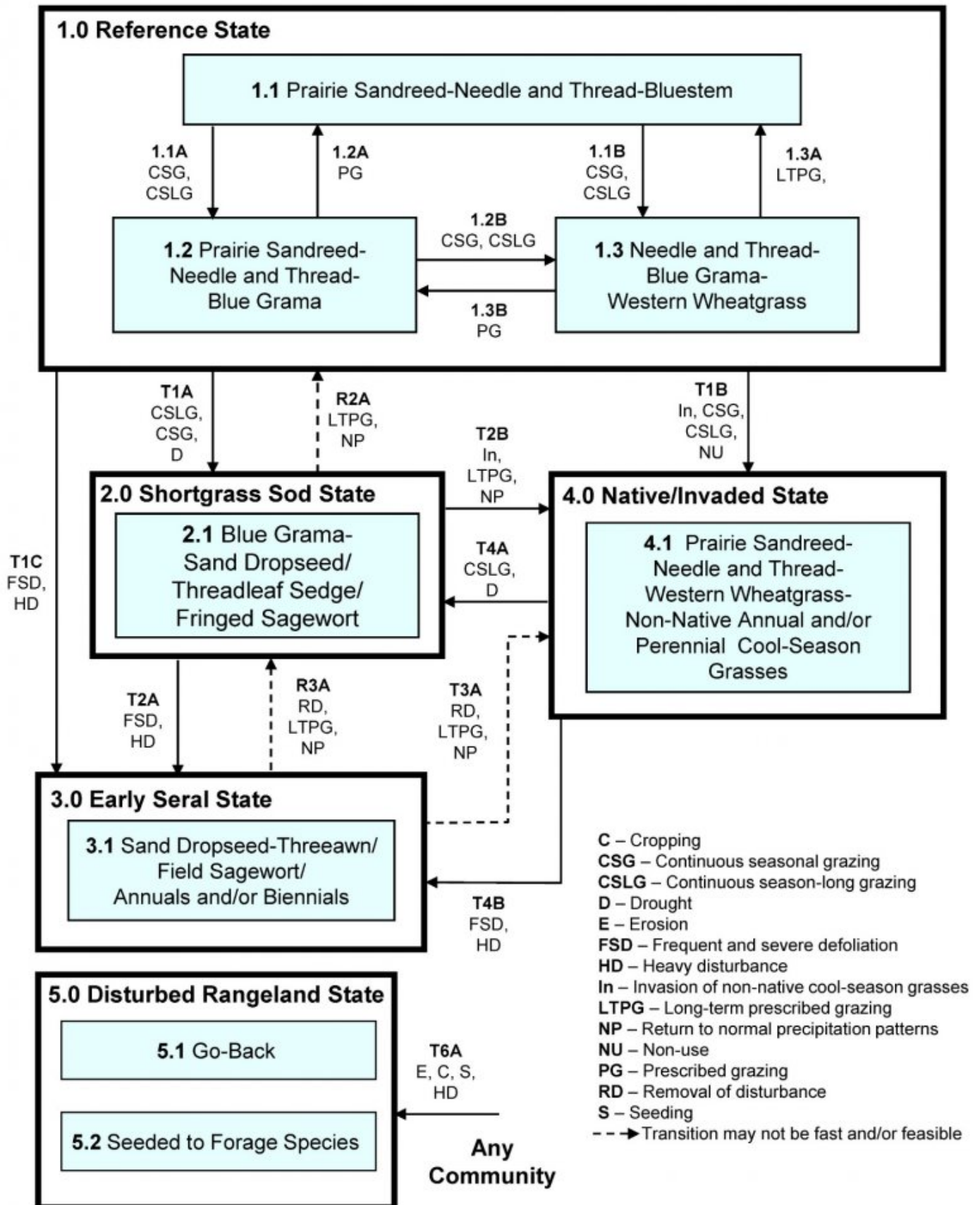


Diagram Legend - Sandy 14-17" PZ - R064XY011NE

T1A	1.0 to 2.0	Continuous season-long grazing or heavy grazing in combination with drought.
T1B	1.0 to 4.0	Invasion of non-native cool-season grasses, continuous seasonal grazing, or continuous season-long grazing, or extended periods of non-use.
T1C	1.0 to 3.0	Frequent and severe defoliation and/or heavy disturbance.
T2A	2.0 to 3.0	Frequent and severe defoliation and/or heavy disturbance.
T2B	2.0 to 4.0	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	3.0 to 4.0	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	4.0 to 2.0	Continuous season-long grazing or heavy grazing in combination with drought.
T4B	4.0 to 3.0	Frequent and severe defoliation and/or heavy disturbance.
T6A	Any State to 6.0	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	2.0 to 1.0	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	3.0 to 2.0	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.
1.1A	1.1 to 1.2	Continuous seasonal grazing (spring), winter grazing, continuous season-long grazing, or heavy grazing in combination with drought.
1.1B	1.1 to 1.3	Continuous season-long grazing, or heavy grazing in combination with drought.
1.2A	1.2 to 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.
1.2B	1.2 to 1.3	Continuous seasonal grazing (spring), winter grazing, continuous season-long grazing, or heavy grazing in combination with drought.
1.3A	1.3 to 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.
1.3B	1.3 to 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.

State 1

Reference State

The Reference State represents the best estimate of the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This Sandy 14-17" PZ ecological site in the Reference State (1.0), will be dominated by warm- and cool-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). Invasion of non-native cool-season perennial or annual grasses will result in a transition to the Native/Invaded State (4.0). In the western portion of the 14-17" PZ, the plant community pathways within the Reference State will more likely go from 1.1 to 1.3. In the eastern portion, 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. The western portion of the PZ receives approximately 1.4 inches less moisture in May and June than does eastern portion of the PZ. As a result, this site in western-side will express more cool-season mid-grasses and drought-tolerant warm-season shortgrasses. In eastern-side the same site, with slightly more precipitation in May and June, will express more tall- and mid-statured 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 that receive occasional short periods of rest. The potential vegetation consists of 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 and water cycles, and energy flow are functioning at the potential for the site. Plant litter is properly distributed with some movement off-site and natural plant mortality is low. The high plant diversity allows for high tolerance for drought.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	910	1392	1670
Forb	75	120	165
Shrub/Vine	15	88	165
Total	1000	1600	2000

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 consists of 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. Other grasses and grass-likes include western wheatgrass, sand dropseed, and threadleaf sedge. Forbs commonly found in this plant community include dotted 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, and 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	825	1218	1510
Forb	65	105	145
Shrub/Vine	10	77	145
Total	900	1400	1800

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, 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 scurfspea, and white sagebrush. Compared to the Reference Plant Community (1.1), blue grama, needle and thread, and threadleaf sedge 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	715	973	1030
Forb	65	125	185
Shrub/Vine	20	102	185
Total	800	1200	1400

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 will bring about this pathway. 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 will develop this pathway. 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 Plant Community (1.1).

Conservation practices

Prescribed Grazing

Pathway 1.2B

Community 1.2 to 1.3

Continuous seasonal grazing (spring or winter grazing), or continuous season-long grazing, 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 Plant Community (1.1).

Conservation practices

Prescribed Grazing

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

State 2

Shortgrass Sod State

The Shortgrass State is dominated by shortgrass species and upland sedges. The Shortgrass 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, field sagewort (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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	420	720	920
Forb	40	90	140
Shrub/Vine	40	90	140
Total	500	900	1200

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 Successional State

The Early Successional State is dominated by weedy annuals and biennials, sand dropseed, threeawn, and field sagewort (green sagewort). This State is the result of heavy disturbance such as frequent and severe defoliation or heavy livestock concentrations coupled with grazing management that does not provide adequate time for recovery. 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-Threeawn/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, threeawn, 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 false hairy goldenaster. Field sagewort (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.

Figure 18. 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 4
Native/Invaded State

The Native/Invaded State has been invaded by cheatgrass, field brome, smooth brome, Kentucky bluegrass, or crested wheatgrass, but not at the levels to which 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 tallgrasses, and warm-season shortgrasses. Forbs will be common and diverse, and shrubs will be present in varying amounts. The Native/Invaded 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, this State is unlikely to return to the Reference State (1.0).

Community 4.1
Prairie Sandreed-Needle and Thread-Western Wheatgrass- Non-Native Annual and Perennial Cool-Season Grasses

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 crested wheatgrass. Typically, they do not occur at a level at which 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 dotted 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.

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 successionally. 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 in the Go-back Community Phase 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 the Sandy 14-17" PZ ecological site 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 extended 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 or heavy disturbance including livestock feeding areas, prairie dog towns, and calving pastures will transition the Reference State (1.0) to the Early Successional 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 or heavy disturbance including livestock feeding areas, prairie dog towns, and calving pastures will cause a transition to the Early Successional 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. Changes due to 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 or heavy disturbance including livestock feeding areas, prairie dog towns, and calving pastures will result in a transition to the Early Successional 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 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall & Mid Warm-Season Grasses			320–720	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	320–480	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	80–400	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	80–240	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–160	–
2	Mid- Cool-Season Grasses			400–640	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	160–560	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	80–240	–
3	Short Warm-Season Grasses			80–240	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	80–240	–
4	Other Native Grasses and Grass-like			16–240	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–160	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–80	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0–80	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–80	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–32	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–32	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–32	–
5	Non-Native Cool-Season Grasses (P)			0	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0	–
6	Non-Native Cool-Season Grasses (A)			0	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0	–
Forb					
7	Forbs			80–160	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–32	–
	beardtongue	PENST	<i>Penstemon</i>	0–32	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–32	–
	slimflower scurfpea	PSTE5	<i>Psoralidium tenuiflorum</i>	0–32	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–32	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–32	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–16	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–16	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–16	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0–16	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–16	–
	thistle	CIRSI	<i>Cirsium</i>	0–16	–
	vervain	VERBE	<i>Verbena</i>	0–16	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–16	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–16	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–16	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0–16	–

	common sunflower	HEAN3	<i>Helianthus annuus</i>	0–16	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–16	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0	–
	Rocky Mountain beepplant	CLSE	<i>Cleome serrulata</i>	–	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	–	–
Shrub/Vine					
8	Shrubs			16–160	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–80	–
	rose	ROSA5	<i>Rosa</i>	0–80	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–80	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–80	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–32	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–32	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–32	–
	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	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall & Mid Warm-Season Grasses			280–420	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	210–420	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	70–280	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0–210	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–70	–
2	Mid Cool-Season Grasses			350–630	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	210–420	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	70–210	–
3	Short Warm-Season Grasses			70–280	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	70–280	–
4	Other Native Grasses and Grass-like			28–140	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–140	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–70	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–70	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0–70	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–28	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–28	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–28	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	–	–
	threeawn	ARIST	<i>Aristida</i>	–	–

5	Non-Native Cool-Season Grasses (P)			0–70	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–70	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–70	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–70	–
6	Non-Native Cool-Season Grasses (A)			0–70	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–70	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–28	–
Forb					
7	Forbs			70–140	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–28	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0–28	–
	beardtongue	PENST	<i>Penstemon</i>	0–28	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–28	–
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	14–28	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–28	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	14–28	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–14	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–14	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–14	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0–14	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–14	–
	thistle	CIRSI	<i>Cirsium</i>	0–14	–
	vervain	VERBE	<i>Verbena</i>	0–14	–
	Rocky Mountain beeplant	CLSE	<i>Cleome serrulata</i>	0–14	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–14	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–14	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–14	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–14	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0–14	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0–14	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0	–
Shrub/Vine					
8	Shrubs			14–140	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	14–70	–
	rose	ROSA5	<i>Rosa</i>	0–70	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–70	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–70	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–28	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–28	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–28	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0–14	–

			<i>wyomingensis</i>		
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–14	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–14	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall & Mid Warm-Season Grasses			120–240	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	60–180	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	12–120	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0–60	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–24	–
2	Mid Cool-Season Grasses			240–600	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	180–540	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	60–180	–
3	Short Warm-Season Grasses			120–240	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	120–240	–
4	Other Native Grasses and Grass-like			120–180	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–120	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	60–120	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	24–60	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–60	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–24	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–24	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–24	–
	threeawn	ARIST	<i>Aristida</i>	–	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	–	–
5	Non-Native Cool-Season Grasses (P)			0–60	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–60	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–60	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–60	–
6	Non-Native Cool-Season Grasses (A)			0–60	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–60	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–24	–
Forb					
7	Forbs			70–180	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–24	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0–24	–
	beardtongue	PENST	<i>Penstemon</i>	0–24	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–24	–
	slimflower scurfpea	PSTE5	<i>Psoralidium tenuiflorum</i>	12–24	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–24	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–24	–

	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	12–24	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–12	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0–12	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–12	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0–12	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–12	–
	thistle	CIRSI	<i>Cirsium</i>	0–12	–
	vervain	VERBE	<i>Verbena</i>	0–12	–
	Rocky Mountain beepplant	CLSE	<i>Cleome serrulata</i>	0–12	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–12	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–12	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0–12	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–12	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–12	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0	–
Shrub/Vine					
8	Shrubs			24–180	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	24–120	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–72	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–72	–
	rose	ROSA5	<i>Rosa</i>	0–60	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–24	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–24	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–24	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–24	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0–12	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–12	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall & Mid Warm-Season Grasses			18–135	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	9–135	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–90	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	9–90	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–45	–
2	Mid Cool-Season Grasses			45–180	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	18–90	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	9–45	–
3	Short Warm-Season Grasses			90–180	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	90–180	–

4	Other Native Grasses and Grass-like			90–180	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	45–135	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	45–135	–
	threeawn	ARIST	<i>Aristida</i>	0–45	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–45	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–18	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	0–9	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0	–
5	Non-Native Cool-Season Grasses (P)			0–180	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–90	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–90	–
6	Non-Native Cool-Season Grasses (A)			0–90	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–90	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–45	–
Forb					
7	Forbs			45–135	
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0–45	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	9–45	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	9–45	–
	vervain	VERBE	<i>Verbena</i>	9–45	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–45	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	9–45	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0–27	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0–27	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–27	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0–18	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–18	–
	slimflower scurfpea	PSTE5	<i>Psoralidium tenuiflorum</i>	9–18	–
	Rocky Mountain beepplant	CLSE	<i>Cleome serrulata</i>	0–18	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–18	–
	thistle	CIRSI	<i>Cirsium</i>	0–18	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–9	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–9	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–9	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–9	–
	beardtongue	PENST	<i>Penstemon</i>	0–9	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–9	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–9	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–9	–
Shrub/Vine					
8	Shrubs			45–135	

	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–54	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–54	–
	pricklypear	OPUNT	<i>Opuntia</i>	9–45	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	27–45	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	18–45	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–18	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0–18	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–18	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–18	–
	rose	ROSA5	<i>Rosa</i>	0–9	–

Animal community

Wildlife Interpretations:

MLRA 64 is in the drier areas of a northern mixed-grass prairie ecosystem in which sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this MLRA consisted of diverse grassland 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, and 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 species of small mammals and insects, were the primary consumers linking the grassland resources to large predators, such as the wolf, mountain lion, and grizzly bear, and to smaller carnivores, such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant and remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox are associated with prairie dog complexes.

Historically, the northern mixed-grass prairie was a disturbance-driven ecosystem in which fire, herbivory, and climate functioned 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 affected plant and animal communities. The bison was a historical keystone species but has been extirpated in this area as a free-ranging herbivore. The loss of the bison and the 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 reduced habitat quality for area-sensitive species.

Within MLRA 64, the Sandy 14-17" PZ Ecological Site provides upland grassland cover with an associated forb and shrub component. It was typically part of an expansive grassland landscape that included combinations of Badlands, Thin Breaks, Clayey, Claypan, Dense Clay, Loamy, Saline, Sandy, Shallow, Overflow, Subirrigated, and Terrace ESs. This Sands site provided 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 in this ES include free-ranging American bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of this ecological site remains 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 cheatgrass have impacted the biological integrity of the site for some grassland birds. Changes in historic fire regime and domestic grazing have impacted the percentages of forbs, shrubs, and grasses. 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.

Reference State (1.0): The predominance of grasses plus high diversity of forbs and shrubs in these communities favors grazers and mixed-feeders such as deer and pronghorn. Insects, such as pollinators, play a large role in

maintaining the forb community and provide a forage base for grassland birds and other species. The complex plant structural diversity provides habitat for a wide array of migratory and resident birds. Grasshopper sparrow, lark bunting, western meadowlark, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides. Diverse prey populations are available for grassland raptors such as ferruginous hawk, Swainson's hawk, golden eagle, and prairie falcon.

The diversity of grasses, forbs, and shrubs provide high nutrition levels for small and large herbivores including voles, mice, spotted ground squirrel, white-tailed and black-tailed jackrabbit, and deer. The higher stature of this plant community provides thermal, protective, and escape cover for herbivores and grassland birds. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel. This plant community provides limited habitat for amphibians, mostly toads (i.e., Great Plains, Woodhouse's, and plains spadefoot). Prey abundance and shade opportunities may attract multiple reptile species such as gopher snake, milk snake, prairie rattlesnake, and western ornate box turtle to this site. Several species of sand-loving lizards such as the lesser earless lizard, prairie lizard, many-lined skink, and six-lined racerunner utilize this site.

Resulting from continuous season-long grazing, the shift to a community of needle and thread and prairie sandreed occurs. The forb and shrub diversity has not substantially decreased. The shift from the Reference Plant Community (1.1) to the Prairie Sandreed-Needle and Thread-Blue Grama Community (1.2), and the Needle and Thread-Blue Grama-Western Wheatgrass Community (1.3), does not result in a significant change to the wildlife community.

Shortgrass State (2.0): Blue grama and upland sedges will dominate. Forb and shrub abundance increases. This increase along with the abundance of Cuman ragweed and dropseed provide a substantial high-quality seed source for small herbivores including voles, mice, and spotted ground squirrels.

A shift to shorter plant structure will favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, tiger salamander, and swift fox. Species such as horned lark, long-billed curlew, upland sandpiper, and white-tailed and black-tailed jackrabbit will increase due to the loss of the tall grass component. Reptile species such as gopher snake, milk snake, prairie rattlesnake, western ornate box turtle, lesser earless lizard, prairie lizard, many-lined skink, and six-lined racerunner will continue to utilize this site.

The short stature of these plant communities limits thermal, protective, and escape cover. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel.

Sand Dropseed-Threeawn/Field Sagewort/Annuals and Biennials (3.1): This plant community develops under severe disturbance or excessive defoliation. This can result from heavy livestock or prairie dog concentration or via crop abandonment (go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to invasion of cheatgrass or field brome, crested wheatgrass, and other non-native species due to severe soil disturbances and relatively high percentage of bare ground.

The potential for soil erosion is high, impacting offsite aquatic habitats through increased runoff, nutrient, and sediment loads. Reduced surface cover, low plant density and vigor, loss of root biomass, and soil compaction all contribute to decreased wildlife abundance and diversity.

Since secondary succession is highly variable, plant and wildlife species will vary. This plant community provides habitat for generalist or early successional species.

Grazing Interpretations:

The following list suggests annual, initial stocking rates for average growing conditions. These estimates are conservative and should be used only as guidelines in the initial stages of conservation planning. Commonly, 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 estimates of carrying capacity 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. In consultation with the land manager, a more intensive grazing management program that results in improved harvest efficiencies and increased carrying capacity may be developed.

The following suggested initial stocking rates are based on 912 lb/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: Prairie Sandreed-Needle and Thread-Bluestem (1.1)

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

Stocking Rate (AUM/acre): 0.44

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

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

Stocking Rate (AUM/acre): 0.38

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

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

Stocking Rate (AUM/acre): 0.25

*Plant Community: Sand Dropseed-Threeawn/Field Sagewort/Annual and Biennials (3.1)

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

Stocking Rate (AUM/acre): 0.38

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

* Total annual production and stocking rates are highly variable and require onsite sampling.

** Total onsite annual production 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 for livestock. During the dormant period, the forage for livestock likely have 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 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 shortgrasses 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, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Recreational uses

This site provides hunting opportunities for 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 present on the 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 ESD is an updated “Previously Approved” ESD that represented 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 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 may not contain all tabular and narrative entries as required in the current “Approved” level of documentation, but it is expected that it will continue refinement toward an “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 (RMS), NRCS; Jill Epley, RMS, NRCS; Rick Peterson, RMS, NRCS; David Steffen, RMS, NRCS; Jeff Vander Wilt, RMS, NRCS; Phil Young, soil scientist, NRCS; and George Gamblin, RMS, NRCS.

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Contributors

Rick L. Peterson
Stan C. Boltz

Approval

Suzanne Mayne-Kinney, 12/16/2024

Acknowledgments

This ecological site was reviewed and approved at the Approved Level by David Kraft, Regional ESS, Salina, KS on 6/06/2019.

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- (2) fax: (202) 690-7442; or
- (3) email: program.intake@usda.gov.

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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, Mitch Faulkner, Emily Helms, John Hartung, Ryan Murray, George Gamblin, Rick Peterson, Nadine Bishop, Jeff Nichols
Contact for lead author	jeffrey.nichols@usda.gov
Date	12/16/2024
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None. Rills should not be present.

2. **Presence of water flow patterns:** Typically, none. Water flow patterns may be present on slopes of 15% or greater. When present, they will be no longer than 2 to 4 inches (5.1 to 10.2 cm), less than 3 inches (7.6 cm) wide, and discontinuous. Water flow patterns, when present, are often associated with animal activity.

3. **Number and height of erosional pedestals or terracettes:** None. Pedestals or terracettes should not be present..

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically 5 to 10 percent or less, and bare ground patches are less than 2 inches (5.1 cm) in diameter.

5. **Number of gullies and erosion associated with gullies:** None. Gullies should not be present

6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Wind scoured areas and depositional areas should not be present.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement (less than 6 inches or 15 cm) of fine litter from water is possible, but not normal. Litter movement from wind is not expected.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability ratings should typically be 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 3 to 22 inches (7.6 to 50.8 cm) thick. Soil colors range from brown, grayish brown, dark grayish brown to dark gray (values of 4 to 5) when dry and brown, very dark brown, to very dark grayish brown (values of 2 to 4) when moist.

Structure typically is granular. If conditions are other than this, refer to map unit component descriptions for the 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:** Combination of shallow and deep rooted species (mid and tall rhizomatous and tufted perennial cool season grasses) with fine and coarse roots positively influences infiltration. Invasion of introduced cool-season grasses such as annual bromes, Kentucky bluegrass, and crested wheatgrass may have an adverse impact infiltration and runoff.

Relative composition is approximately 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The grass component is composed of C4, tall- and midgrasses (25-55%), C3, bunchgrasses (15-35%), C3, rhizomatous grasses (5-15%), C4, short grasses (5-15%), grass-likes (0-5%).

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. A compaction layer should not occur on this site.

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: Phase 1.1

1. Native, perennial, C4, tall- and midgrasses, 400-880 #/ac, 25-55%, (3 species minimum): prairie sandreed, sand bluestem, big bluestem, switchgrass, little bluestem, sand lovegrass, sand dropseed.

2. Native, perennial, C3, bunchgrass, 240-560 #/ac, 15-35% (1 species minimum): needle and thread, prairie Junegrass, Indian ricegrass.

Phase 1.2

1). Native, perennial, C4, tall- and midgrass, 280-560 #/ac, 20-40% (2 species minimum): prairie sandreed, little bluestem, sand bluestem, big bluestem, switchgrass, sand lovegrass, sand dropseed.

2. Native, perennial, C3, bunchgrass: 350-630 #/ac, 25-45% (2 species minimum): needle and thread, prairie Junegrass,

Indian ricegrass.

Phase 1.3

1. Native, perennial, C3, midgrass, 180-540 #/ac, 55-45% (1 species minimum): needle and thread, prairie Junegrass, Indian ricegrass, western wheatgrass.
2. Native, perennial, C4, tall- and midgrass, 120-300 #/ac, 10-25% (2 species minimum): prairie sandreed, little bluestem, sand bluestem, big bluestem, switchgrass, sand lovegrass, sand dropseed.

Sub-dominant: Phase 1.1

1. Native, perennial, C3, rhizomatous grass, 80-240#/ac, 5-15% (1 species minimum): western wheatgrass, thickspike wheatgrass.
2. Native, perennial, C4, shortgrass, 80-240 #/ac, 5-15% (1 species minimum): blue grama, buffalograss.

Phase 1.2

1. Native perennial, C4, shortgrass, 70-280 #/ac, 5-25% (1 species minimum): blue grama, sandhill muhly, threeawn.
2. Native, perennial, C3, rhizomatous grass, 70-210 #/ac, 5-15%, (1 species minimum): western wheatgrass.

Phase 1.3

1. Native, perennial, C4, shortgrass, 120-240 #/ac, 10-20% (1 species minimum): blue grama, sandhill muhly, threeawn.
2. Native forb, 70-180 #/ac, 5-15% (2 species minimum): Slimflower scurfpea, Cuman ragweed, and other forbs which vary from location to location.
3. Shrub, 24-180 #/ac, 2-15% (1 species minimum): prairie sagewort, and other shrubs which vary from location to location.
4. Native, perennial, C3, rhizomatous grass, 60-180 #/ac, 5-15% (1 species minimum): western wheatgrass.

Other: Minor - Phase 1.1

1. Native forb, 80-160#/ac, 5-10%: forbs present vary from location to location.
2. Shrub, 80-160, 5-10%: shrubs present vary from location to location.
3. Native grass-like, 0-80 #/ac, 0-5%: threadleaf sedge, other grass-likes.

Minor - Phase 1.2

1. Native forb, 70-140 #/ac, 5-10%: Slimflower scurfpea, Cuman ragweed, and other forbs which vary from location to location.
2. Shrub, 14-140 #ac, 1-10%: prairie sagewort, and other shrubs which vary from location to location.
3. Native grass-like, 0-70 #/ac, 0-5%: threadleaf sedge.
4. Non-native, perennial, C3 grass, 0-70 #/ac, 0-5%: crested wheatgrass, smooth brome, Kentucky bluegrass.
5. Non-native, annual, C3 grass, 0-70 #/ac, 0-5%: cheatgrass, field brome.

Minor - Phase 1.3

1. Native grass-like, 60-120 #/ac, 5-10%: threadleaf sedge.
2. Non-native, perennial, C3 grass, 0-60 #/ac, 0-5%: crested wheatgrass, smooth brome, Kentucky bluegrass.
3. Non-native, annual, C3 grass, 0-60 #/ac, 0-5%: cheatgrass, field brome.

Additional: The Reference Community (1.1) or Prairie Sandreed-Needle and Thread-Bluestem community consists of seven F/S groups. These groups, in order of relative abundance, are native, perennial, C4, tall- and midgrass; native, perennial, C3, bunchgrass; native, perennial, C3, rhizomatous grass; native, perennial, C4, shortgrass; native forb; shrub; and native grass-like.

The Prairie Sandreed-Needle and Thread-Blue Grama Community (1.2) consists of nine F/S groups. These groups, in order of relative abundance, are native, perennial, C4, tall- and midgrass; native, perennial, C3, bunchgrass; native, perennial, C4, shortgrass; native, perennial, C3, rhizomatous grass = native forb; shrubs; native grass-like = non-native, perennial, C3 grass = non-native, annual, C3 grass.

The Needle and Thread-Blue Grama-Western Wheatgrass Community (1.3) consists of eight F/S groups. The community is dominated by native, perennial, C3 midgrass and native, perennial, C4 tall- and midgrass.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Bunchgrasses have strong, healthy centers with few (less than 3 percent) dead centers. Shrubs may show some dead branches (less than 5 percent) as plants age.

14. **Average percent litter cover (%) and depth (in):** Plant litter cover is evenly distributed throughout the site and is expected to be 75 to 85 percent and at a depth of 0.25 to 0.50 inch (0.65 to 1.3 cm). Kentucky bluegrass excessive litter can negatively impact the functionality of this site.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** The representative value (RV) for annual production is 1,600 pounds per acre on an air dry weight basis. Low and High production years should yield 1,000 and 2,000 pounds per acre respectively.

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:** No non-native invasive species are present. Annual bromes, Kentucky bluegrass, smooth brome, crested wheatgrass, absinth wormwood, and eastern red cedar are known invasives that have the potential to become dominant or co-dominant on this site. Consult the state noxious weed and state watch lists for potential invasive species. Note: species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants.

17. **Perennial plant reproductive capability:** All perennial species exhibit high vigor relative to recent weather conditions. Perennial grasses should have vigorous rhizomes or tillers; vegetative and reproductive structures are not stunted. All perennial species should be capable of reproducing annually.
