USDA Natural Resources Conservation Service

Ecological site GX064X01X028
Loamy Terrace

Last updated: 6/06/2019
Accessed: 05/18/2024

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

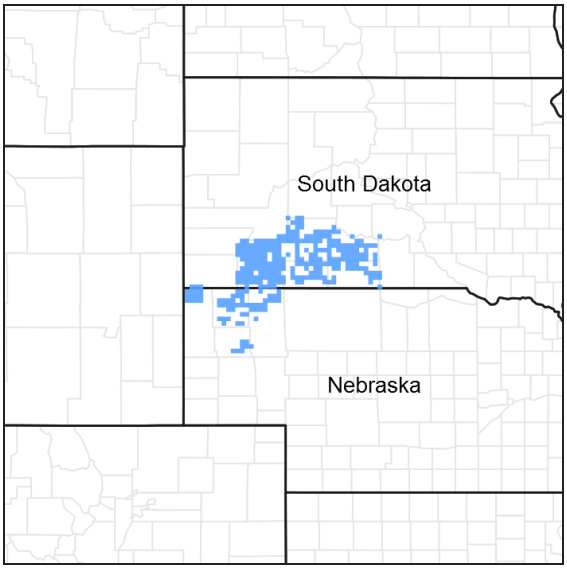


Figure 1. Mapped extent

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 almost equally shared between South Dakota (42 percent) and Nebraska (41 percent), with a small portion in Wyoming (17 percent). The MLRA is 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.

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 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 feet to 5,073 feet from 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, 11 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 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. The drier zone, 14 to 17 inches, 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).

In the far southwest corner of the 14 to 17-inch PZ, there is a unique geologic area known as the Hartville Uplift. The Hartville Uplift is an elongated, north-northwest-oriented, broad domal arch of Laramide age (70-50 Ma). 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 that occur in the 14-17-inch PZ of MLRA 64, three unique ecological site descriptions were developed to help describe the soils and plant community dynamics that occur 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

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

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, Keye Paha Tablelands - 331Ft
Powder River Basin Section - 331G, Subsection: Powder River Basin - 331Ge

Ecological site concept

The Loamy Terrace ecological site occurs throughout MLRA 64. It is located on old, nearly level stream terraces adjacent to overflow and lowland sites. This site does not typically receive additional moisture from overflow, however, runoff from adjacent upland sites may provide some additional moisture. Soils are deep with a surface layer 3 to 25 inches thick and textures ranging from very fine sandy loam to silty clay. This site can have similar vegetative characteristics as the overflow or lowland sites, especially when looking at the woody components. Regeneration of trees is unlikely to occur on the terrace landscape. Vegetation in the Reference State consists of a mix of cool- and warm-season grasses, however, mid-statured, cool-season grasses tend to be the dominant group. Rhizomatous wheatgrass and needle and thread are the dominant cool-season grasses. Forbs are common and

diverse. Silver sagebrush is almost always present, western snowberry and rose are common. In the western, 14 to 17-inch Precipitation Zone (PZ), Wyoming big sagebrush is likely to occur. Remnant trees can include green ash and plains cottonwood, but in minor amounts, with little if any regeneration. This ecological site is susceptible to invasion of non-native cool-season grasses.

Associated sites

GX064X01X036	**Loamy 17-20" PZ** The Loamy 17-20” PZ ecological site can be found on landscapes above the Loamy Terrace site.
R064XY029NE	**Sandy Lowland** The Sandy Lowland ecological site can be found on the stream terrace just below the Loamy Terrace site.
GX064X01X015	**Loamy 14-17" PZ** The Loamy 14-17” PZ ecological site can be found on landscapes above the Loamy Terrace site.
R064XY026NE	**Loamy Overflow** The Loamy Overflow ecological site can be found on lower landscapes adjacent to the stream channel.

Similar sites

R064XY026NE	**Loamy Overflow** The Loamy Overflow ecological site will occur adjacent to the stream channel below the Loamy Terrace site. The plant community will have more big The Loamy Overflow ecological site will occur adjacent to the stream channel below the Loamy Terrace site. The plant community will have more big bluestem and higher forage production than the Loamy Terrace site.
R064XY029NE	**Sandy Lowland** The Sandy Lowland ecological site will occur on the stream terrace directly below the Loamy Terrace sites. The plant community will have more big bluestem, more forage production, and greater potential for woody regeneration than the Loamy Terrace site.
GX064X01X036	**Loamy 17-20" PZ** The Loamy 17-20” PZ sites will have less big bluestem and lower production than the Loamy Terrace site.
GX064X01X015	**Loamy 14-17" PZ** The Loamy 14-17” sites will have less big bluestem and lower production than the Loamy Terrace site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia cana*
Herbaceous	(1) *Pascopyrum smithii* (2) *Hesperostipa comata ssp. comata*

Legacy ID

R064XY028NE

Physiographic features

The Loamy Terrace ecological site occurs on nearly level to gently sloping alluvial fans and low terraces.

Table 2. Representative physiographic features

Landforms	(1) River valley > Alluvial fan (2) Stream terrace
Runoff class	Negligible to high
Flooding duration	Very brief (4 to 48 hours)

Flooding frequency	None to rare
Ponding frequency	None
Elevation	884–1,524 m
Slope	0–3%
Water table depth	203 cm
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 20 inches per year. The normal average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 21°F (Wood, SD) to about 25°F (Hemingford, NE). July is the warmest month with temperatures averaging from about 70°F (Keeline 3 W, WY – 1953-1986) to about 76°F (Wood, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 55°F. This large annual range attests to the continental nature of the climate of this area. Hourly winds average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about ten 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 (characteristic range)	92-120 days
Freeze-free period (characteristic range)	119-139 days
Precipitation total (characteristic range)	406-483 mm
Frost-free period (actual range)	87-122 days
Freeze-free period (actual range)	110-149 days
Precipitation total (actual range)	381-508 mm
Frost-free period (average)	107 days
Freeze-free period (average)	130 days
Precipitation total (average)	432 mm

Climate stations used

- (1) HARRISON 20 SSE [USW00094077], Harrison, NE
- (2) CHADRON 3NE [USC00251578], Chadron, NE
- (3) ALLIANCE 1WNW [USC00250130], Alliance, NE
- (4) HARRISON [USC00253615], Harrison, NE
- (5) HEMINGFORD [USC00253755], Hemingford, NE
- (6) INTERIOR 3 NE [USC00394184], Interior, SD
- (7) MARTIN [USC00395281], Martin, SD
- (8) WOOD [USC00399442], Wood, SD
- (9) LUSK 2 SW [USC00485830], Lusk, WY
- (10) TORRINGTON 29N [USC00488997], Jay Em, WY

Influencing water features

The Loamy Terrace ecological site occurs adjacent to lowland and overflow sites along stream corridors.
Stream Type: B6, C6 (Rosgen System)

Soil features

The soils in this site are well-drained and formed in alluvium with slopes that range from zero to three percent. Soils are deep with a very fine sandy loam to silty clay surface layer, 3 to 25 inches thick. Subsurface textures range from very fine sandy loam to silty clay. The soils have slow to moderate infiltration rates. This site should show no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow patterns are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

Soils correlated to the Loamy Terrace site: Bigbend, Bridgeport, Craft, Haverson, Lohmiller, and McCook.

Soils with multiple ecological site correlations including Loamy Terrace: Haverson, Lohmiller, and McCook.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer on this site can result in a shift in species composition and production.

More information can be found in the various soil survey reports. Contact the local USDA Service Center or use Web Soil Survey online for soil survey reports that include more detail specific to your area of interest.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam (2) Loam (3) Clay loam (4) Very fine sandy loam (5) Silty clay
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	203 cm
Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	3–25%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–10
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The Loamy Terrace 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 will occur in the plant communities due to short-term weather variations, impacts of native and 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 species composition.

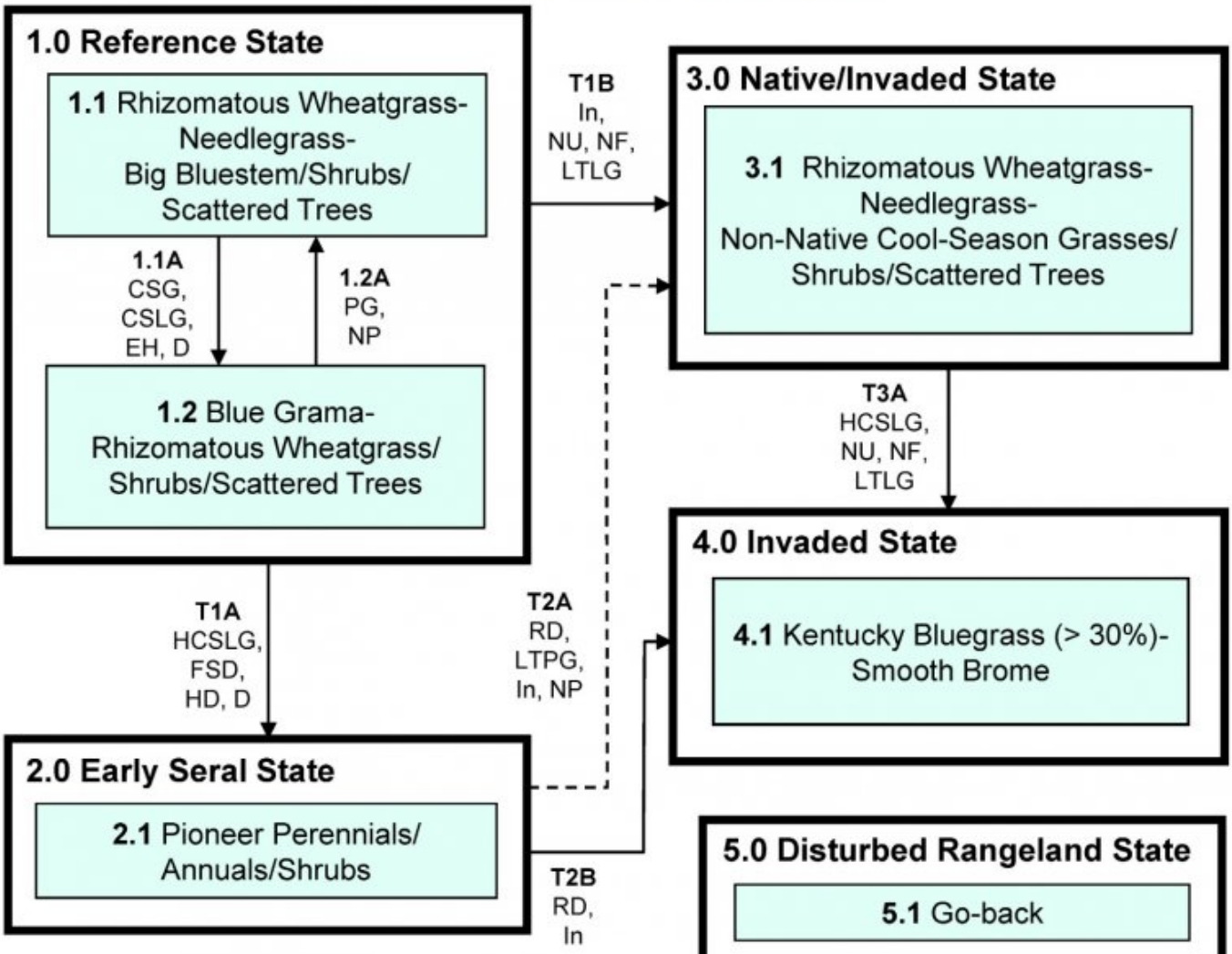
This site is located on old floodplain terraces that are no longer susceptible to flooding except under extreme events. On many sites, old remnant cottonwood galleries or ash/shrub overstory communities still exist; however, little, if any, regeneration is present.

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 Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees Plant Community (1.1). Species such as blue grama will initially increase. Big bluestem, needle and thread, and rhizomatous wheatgrass will decrease in frequency and production. Extended periods of non-use and lack of fire will result in a plant community that has high litter levels, which favors an increase in Kentucky bluegrass and annual bromegrass. Extended periods of heavy, continuous grazing without adequate recovery periods will also favor an increase of Kentucky bluegrass and annual bromegrass. Tree species such as green ash, hackberry, boxelder and shrub species such as American plum and chokecherry will eventually disappear over time because of lack of regeneration. Cottonwood will tend to persist but will eventually die out. Silver sagebrush, snowberry, and rose will continue to be a component in the plant communities.
This site is often used for hay production or is in some type of cropping rotation because of high soil productivity. Continuous haying will result in the plant community becoming dominated by shortgrass species. The Loamy Terrace site also is located in good winter livestock areas and are used as calving and feeding areas. Very few areas exist that have not had some type of soil disturbance.
Interpretations are primarily based on the Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees Plant Community (1.1). It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a State-and-Transition diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Loamy Terrace – R064XY028NE 2/13/19



C – Cropping
CSG – Continuous seasonal grazing
CSLG – Continuous season-long grazing
D – Drought
Er – Erosion
FSD – Frequent and severe defoliation
EH – Excessive haying
HCSLG – Heavy, continuous season-long grazing
HD – Heavy disturbance
In – Invasion of non-native cool-season grasses
LTLG – Long-term light grazing
LTPG – Long-term prescribed grazing
NF – No fire
NP – Normal precipitation
NU – No use
PG – Prescribed grazing
RD – Removal of disturbances
S - Seeding
T – Tillage
- - → Transition may not be fast or feasible

Diagram Legend - Loamy Terrace - R064XY028NE

T1A	Heavy, continuous season-long grazing, or frequent and severe defoliation, or heavy disturbance, or grazing in combination with drought.
T1B	Invasion of non-native cool-season grasses, no use and no fire, or long-term light grazing.
T2A	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. Invasion and establishment of non-native cool-season grasses.
T2B	Removal of disturbance, invasion and establishment of non-native cool-season grasses.
T3A	Heavy, continuous season-long grazing, no use and no fire or long-term light grazing.
T6A	Heavy disturbance such as tillage, cropping, abandonment of cropland, soil erosion, invasion of non-native weedy species, or seeding to perennial forage species.

1.1A	1.1 - 1.2	Continuous seasonal grazing (spring or winter) or continuous season-long grazing, without adequate recovery, grazing in combination with drought or excessive haying.
1.2A	1.2 - 1.1	Prescribed grazing with proper stocking, change in season of use, adequate recovery time, and a return to normal precipitation following drought.

State 1
Reference State

The Reference State represents what is believed to show the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This site is dominated by cool- and warm-season grasses. In pre-European times the primary disturbances included fire and grazing by large ungulates, small mammals, and insects. Favorable growing conditions occurred during the spring and the warm months of June through August. The Reference State can be found on areas with a history of proper grazing management, including adequate recovery periods between grazing events.

Community 1.1
Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees

Interpretations are based primarily on the Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees Plant Community. This is also considered to be Reference Plant Community. This community evolved with grazing by large herbivores and occasional prairie fire and can be found on areas that are properly managed with prescribed grazing. The potential vegetation is about 80 percent grasses and grass-like plants, 10 percent forbs, 10 percent shrubs, and trees. Major grasses include western wheatgrass, needle and thread, and big bluestem. Other grasses occurring on this community include prairie sandreed, green needlegrass, blue grama, and sedges. Major forbs and shrubs include cudweed sagewort (white sagebrush), American vetch, American licorice, heath aster, western yarrow, silver sagebrush, western snowberry, wild rose, and fringed sagewort. Scattered plains cottonwood, green ash, and other tree species may occur. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending upon growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient and water cycles, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for high tolerance to drought. Runoff from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1508	2200	2707
Shrub/Vine	140	291	476
Forb	230	335	476
Tree	28	87	151
Total	**1906**	**2913**	**3810**

Figure 9. Plant community growth curve (percent production by month). NE6402, Pine Ridge/Badlands, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm season, sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	10	25	30	15	5	5	5		

Community 1.2
Blue Grama-Rhizomatous Wheatgrass-Grama/Shrubs/Scattered Trees

This plant community can develop from the adverse effects of continuous grazing without adequate recovery periods between each grazing event during the growing season, or from excessive haying. Blue grama and western wheatgrass are the dominant species. Needle and thread, big bluestem, and sideoats grama have been greatly reduced. Common forb species include western yarrow, asters, prairie coneflower, silverleaf scurfpea, wavyleaf thistle, and western salsify. Shrub species can be reduced in composition especially with native haying operations. Regeneration of shrubs would be greatly reduced while mature plants would tend to be heavily browsed. This plant community is relatively stable but less productive than the Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrub/Scattered Trees Plant Community. Reduction of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, increased runoff, and high evapotranspiration rates. This plant community can occur throughout the site, on spot-grazed areas, and around water sources where season-long grazing patterns occur. Soil erosion will be minimal due to the sod-forming habit of blue grama and sedges.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1177	1435	1681
Forb	84	179	280
Shrub/Vine	84	135	185
Tree	–	45	95
Total	**1345**	**1794**	**2241**

Figure 11. 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		

Pathway 1.1A
Community 1.1 to 1.2

Continuous seasonal (i.e. spring) grazing, continuous season-long grazing, or excessive haying in combination with drought will convert this Plant Community to the Blue Grama-Rhizomatous Wheatgrass/Shrubs/Scattered Trees Plant Community (1.2).

Pathway 1.2A

Community 1.2 to 1.1

Prescribed grazing that included proper stocking rates, change in season of use, and adequate time for plant recovery will convert this plant community to the Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees Plant Community (1.1). A return to normal precipitation patterns will aid in this community shift.

State 2
Early Seral State

The Early Seral State is the result of heavy, continuous season-long grazing, frequent and severe defoliation or concentrated disturbance such as rodent activity, or heavy use area. This State can also develop as a result of invasion by highly competitive weed species. Extended periods of drought accompanied by heavy grazing can also push an ‘At Risk’ plant community phase to this State. In most cases, this phase is dominated by pioneer perennial and annual grasses, and forb species. Bare ground is also much higher in the Early Seral State than on any other plant community phase in the Loamy Terrace ecological site.

Community 2.1
Pioneer Perennials/Annuals/Shrubs

This plant community developed under continuous heavy grazing or heavy disturbance. The potential plant community is made up of approximately 50 percent grasses and grass-like species, 40 percent forbs, and 10 percent shrubs. The dominant grasses include threeawn, blue grama, sedge, and cheatgrass. Other grasses may include western wheatgrass, buffalograss, sand dropseed, and inland saltgrass. The dominant forbs include green sagewort, cudweed sagewort (white sagebrush), western ragweed, pussytoes, verbena, and a number of invader species. This plant community is susceptible to invasion of Canada thistle and other non-native species because of the relatively high percentage of bare ground. Compared to the Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees Plant Community, threeawn, cheatgrass, and the percentage of bare ground have increased. Western wheatgrass, needlegrasses, and other cool-season grasses have decreased as have the warm-season species including big bluestem, sideoats grama, and prairie sandreed. Remnant shrubs and trees may persist in this plant community. This plant community is difficult to return back to the Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees Plant Community (1.1) because of the loss of plant diversity and overall soil disturbance. It is very susceptible to invasion of non-native plant species and overall plant diversity is low. Soil erosion is potentially very high because of the bare ground and shallow-rooted herbaceous plant community. Water runoff will increase, and infiltration will decrease due to animal-related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank) within the existing plant community, and the plant communities on adjacent sites.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	235	585	880
Forb	196	353	560
Shrub/Vine	17	61	106
Tree	–	10	22
Total	**448**	**1009**	**1568**

Figure 13. 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 3
Native/Invaded State

The Native/Invaded State has been invaded by Kentucky bluegrass, smooth brome, and annual bromes, but not at the level to which the plant community is dominated by these species. The plant community in this State looks very similar to the Reference Plant Community (1.1) and it functions very much like the Reference State. It is ‘At Risk’ of transitioning to the Invaded State (4.0), which is dominated by Kentucky bluegrass and smooth brome.

Community 3.1
Rhizomatous Wheatgrass-Needlegrass-Non-Native-Cool-Season Grasses/Shrubs/Scattered Trees

This plant community develops when Kentucky bluegrass and smooth brome invade and become established on the site. This is due to the close proximity to seed sources or expansion from road ditches, seeded pastures, or other invaded sites. Non-use and no fire, or very light stocking rates for long periods of time will allow these non-native, cool-season grasses to increase in the plant community. With non-use, plant litter accumulates in large amounts when this community first develops. Litter buildup reduces mature native plant vigor and density, and seedling recruitment declines. Eventually litter levels become high enough that plant density decreases. The potential vegetation is 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs and trees. The dominant grasses will be rhizomatous wheatgrass, needlegrass, and non-native cool-season grasses, primarily, Kentucky bluegrass and smooth brome. Forbs will be diverse but not dominant. Shrubs and trees will occur in similar amounts as in the Reference Plant Community (1.1).

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1317	2031	2606
Forb	213	309	420
Shrub/Vine	129	269	420
Tree	22	81	140
Total	**1681**	**2690**	**3586**

Figure 15. Plant community growth curve (percent production by month). NE6402, Pine Ridge/Badlands, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm season, sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	10	25	30	15	5	5	5		

State 4
Invaded State

The Invaded State is the result of invasion of introduced cool-season grass species. This state is characterized by the dominance of Kentucky bluegrass and smooth brome, and an increasing thatch layer that effectively blocks introduction of other plants into the system. Plant litter accumulation tends to favor the more shade-tolerant introduced grass species. The nutrient cycle is also impaired, the result is typically a higher level of nitrogen, which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns, thereby shifting competitive advantage to shade-tolerant, introduced grass species. Studies indicate that soil biological activity is altered, and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in the invasive grass dominance. Preliminary studies indicate this threshold may exist when Kentucky bluegrass exceeds 30 to 35 percent of the plant community and native grasses represent less than 40 percent of the plant community composition. Plant communities dominated by Kentucky bluegrass have significantly less cover and diversity of native grasses and forb species (Toledo, D. et al., 2014).

Community 4.1
Kentucky Bluegrass (> 30%)-Smooth Brome

This plant community develops after an extended period of non-use and exclusion of fire. Eventually litter levels become high enough to reduce native grass vigor, diversity, and density. Kentucky bluegrass dominates this plant community. Common forbs include cudweed sagewort (white sage), green sagewort, and Cuman ragweed. Shrubs such as western snowberry and silver sagebrush, along with remnant trees, will persist in the plant community. This plant community is very resistant to change. Runoff and soil erosion are low.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	611	925	2018
Forb	118	185	252
Shrub/Vine	56	92	129
Tree	–	31	67
Total	**785**	**1233**	**2466**

Figure 17. Plant community growth curve (percent production by month). NE6401, Pine Ridge/Badlands, cool-season dominant. Cool-season dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	15	28	30	10	2	5	5		

State 5
Disturbed Rangeland State

Any plant community can transition to the Disturbed Rangeland State. The two plant communities, Go-back and Seeded to Forage Species, 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 a severe mechanical disturbance occurs (e.g., tilled and abandoned land). During the early successional stages, the species that mainly dominate are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes dominated by threeawn, bluegrass, smooth brome, annual bromegrass, crested wheatgrass, buffalograss, broom snakeweed, sweetclover, and non-native thistles. Other plants that commonly occur on the site include western wheatgrass, deathcamas, prickly lettuce, horseweed, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health.

Community 5.2
Seed to Forage Species

The Seeded Plant Community normally consists of those areas seeded to pubescent or intermediate wheatgrass, alfalfa, crested wheatgrass, or other introduced forage species. Refer to the Field Office Tech Guide for the appropriate Forage Suitability Group description and adapted species.

Transition T1A
State 1 to 2

Heavy, continuous season-long grazing, frequent and severe defoliation, or heavy disturbance combined with drought, will transition this state to the Early Seral State (2.0).

Transition T1B
State 1 to 3

Non-use and lack of fire for extended periods of time, long-term light grazing, and invasion of non-native cool-season grasses, will transition the Reference State to the Native/Invaded State (3.0).

Transition T6A
State 1 to 5

Heavy disturbance including tillage, cropping, abandoning cropland, erosion, or seeding to improved pasture species result in a transition to the Disturbed Rangeland State (5.0).

Transition T2A
State 2 to 3

If the disturbance causing severe defoliation is removed and long-term prescribed grazing is initiated and includes adequate rest periods, and normal precipitation patterns return, this plant community may transition to the Native/Invaded State (3.0). With the presence of non-native, cool-season grasses in local plant communities, it is assumed the Early Seral State will be invaded, to a certain extent, by non-native cool-season grasses. Therefore, a restoration pathway to the Reference State (1.0) is unlikely. This pathway will take an extended period of time and may not meet management objectives.

Transition T2B
State 2 to 4

If the disturbance causing the severe defoliation is removed and the plant community is invaded by non-native cool-season grasses, this plant community is likely to transition to the Invaded State (4.0).

Transition T6A
State 2 to 5

Heavy disturbance including tillage, cropping, abandoning cropland, erosion, or seeding to improved pasture species result in a transition to the Disturbed Rangeland State (5.0).

Transition T3A
State 3 to 4

Heavy, continuous season-long grazing, or non-use and no fire, or long-term light grazing will cause a transition of the Native/Invaded State to the Invaded State (4.0). The ecological threshold can be identified by the percentage of non-native cool-season species in the Plant Community. Preliminary studies tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 to 35 percent of the plant community and native grasses represent less than 40 percent of the plant community composition (Toledo, D. et al., 2014). Smooth brome is assumed to follow a similar ecological threshold, but this is not documented scientifically.

Transition T6A
State 3 to 5

Heavy disturbance including tillage, cropping, abandoning cropland, erosion, or seeding to improved pasture species result in a transition to the Disturbed Rangeland State (5.0).

Transition T6A
State 4 to 5

Heavy disturbance including tillage, cropping, abandoning cropland, erosion, or seeding to improved pasture species results in a transition to the Disturbed Rangeland State (5.0).

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatious Wheatgrass**			729–1166	
	western wheatgrass	PASM	*Pascopyrum smithii*	729–1166	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–437	–
2	**Needlegrass**			291–729	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	291–583	–
	green needlegrass	NAVI4	*Nassella viridula*	58–233	–
3	**Tall- Warm-Season Grasses**			146–729	
	big bluestem	ANGE	*Andropogon gerardii*	58–437	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	58–291	–
	switchgrass	PAVI2	*Panicum virgatum*	0–58	–
4	**Short- Warm-Season**			146–291	
	blue grama	BOGR2	*Bouteloua gracilis*	58–146	–
	buffalograss	BODA2	*Bouteloua dactyloides*	29–146	–
5	**Other Native Grasses**			146–437	
	sideoats grama	BOCU	*Bouteloua curtipendula*	29–233	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	58–146	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–87	–
	Grass, perennial	2GP	*Grass, perennial*	29–87	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	29–87	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–58	–
	saltgrass	DISP	*Distichlis spicata*	0–58	–
	threeawn	ARIST	*Aristida*	–	–
6	**Grass-Likes**			146–291	
	sedge	CAREX	*Carex*	146–291	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–29	–
Forb					
8	**Forbs**			233–437	
	white sagebrush	ARLU	*Artemisia ludoviciana*	58–146	–
	white heath aster	SYER	*Symphyotrichum ericoides*	29–146	–
	false boneset	BREU	*Brickellia eupatorioides*	0–87	–
	goldenrod	SOLID	*Solidago*	0–58	–
	purple prairie clover	DAPU5	*Dalea purpurea*	29–58	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–58	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	29–58	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–58	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	29–58	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	29–58	–

	American licorice	GLLE3	*Glycyrrhiza lepidota*	29–58	
	American vetch	VIAM	*Vicia americana*	29–58	–
	deathcamas	ZIGAD	*Zigadenus*	0–29	–
	dotted blazing star	LIPU	*Liatris punctata*	0–29	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–29	–
	Forb, perennial	2FP	*Forb, perennial*	0–29	–
	western wallflower	ERAS2	*Erysimum asperum*	0–29	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–29	–
	textile onion	ALTE	*Allium textile*	0–29	–
	vervain	VERBE	*Verbena*	0–29	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–29	–
	pussytoes	ANTEN	*Antennaria*	0–29	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–29	–
	field sagewort	ARCA12	*Artemisia campestris*	0–29	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–29	–
	beardtongue	PENST	*Penstemon*	0–29	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–29	–
	Canadian horseweed	COCA5	*Conyza canadensis*	–	–
	mullein	VERBA	*Verbascum*	–	–
	goatsbeard	TRAGO	*Tragopogon*	–	–
	Forb, annual	2FA	*Forb, annual*	–	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	–	–
Shrub/Vine					
9	**Shrubs**			146–437	
	silver sagebrush	ARCA13	*Artemisia cana*	29–291	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	58–291	–
	American plum	PRAM	*Prunus americana*	29–87	–
	chokecherry	PRVI	*Prunus virginiana*	29–87	–
	prairie sagewort	ARFR4	*Artemisia frigida*	29–87	–
	rose	ROSA5	*Rosa*	29–87	–
	leadplant	AMCA6	*Amorpha canescens*	0–58	–
	golden currant	RIAU	*Ribes aureum*	0–58	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–58	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–58	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–29	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–29	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	–	–
Tree					
10	**Trees**			29–146	
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	29–87	–
	green ash	FRPE	*Fraxinus pennsylvanica*	29–58	–
	common hackberry	CEOC	*Celtis occidentalis*	0–29	–
	American elm	ULAM	*Ulmus americana*	0–29	–

	boxelder	ACNE2	*Acer negundo*	0–29	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–29	–
	Tree	2TREE	*Tree*	0–29	–
	eastern redcedar	JUVI	*Juniperus virginiana*	–	–

Table 11. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			179–448	
	western wheatgrass	PASM	*Pascopyrum smithii*	179–448	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–90	–
2	**Needlegrass**			36–179	
	green needlegrass	NAVI4	*Nassella viridula*	36–143	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–90	–
3	**Tall- Warm-Season Grasses**			36–90	
	big bluestem	ANGE	*Andropogon gerardii*	18–54	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	18–54	–
	switchgrass	PAVI2	*Panicum virgatum*	0–18	–
4	**Short- Warm-Season Grasses**			359–717	
	blue grama	BOGR2	*Bouteloua gracilis*	269–628	–
	buffalograss	BODA2	*Bouteloua dactyloides*	143–359	–
5	**Other Native Grasses**			90–359	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	36–90	–
	threeawn	ARIST	*Aristida*	18–90	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	18–90	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	18–72	–
	Grass, perennial	2GP	*Grass, perennial*	0–72	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	18–54	–
	saltgrass	DISP	*Distichlis spicata*	0–36	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–36	–
6	**Grass-Likes**			90–269	
	sedge	CAREX	*Carex*	90–179	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
7	**Non-Native Cool-Season Grasses**			18–179	
	Kentucky bluegrass	POPR	*Poa pratensis*	18–90	–
	smooth brome	BRIN2	*Bromus inermis*	0–90	–
	cheatgrass	BRTE	*Bromus tectorum*	0–90	–
	field brome	BRAR5	*Bromus arvensis*	0–18	–
Forb					
8	**Forbs**			90–269	
	Forb, annual	2FA	*Forb, annual*	18–179	–
	white heather aster	SYER	*Symphyotrichum ericoides*	18–90	

	white heath aster	SYER	*Symphyotrichum ericoides*	18–90	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	18–54	–
	goatsbeard	TRAGO	*Tragopogon*	18–54	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	18–54	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–54	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	18–54	–
	vervain	VERBE	*Verbena*	18–54	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	18–54	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–36	–
	pussytoes	ANTEN	*Antennaria*	18–36	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	18–36	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	18–36	–
	Forb, perennial	2FP	*Forb, perennial*	0–36	–
	goldenrod	SOLID	*Solidago*	0–36	–
	field sagewort	ARCA12	*Artemisia campestris*	18–36	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	18–36	–
	Canadian horseweed	COCA5	*Conyza canadensis*	18–36	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–18	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–18	–
	deathcamas	ZIGAD	*Zigadenus*	0–18	–
	dotted blazing star	LIPU	*Liatris punctata*	0–18	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–18	–
	American vetch	VIAM	*Vicia americana*	0–18	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–18	–
	textile onion	ALTE	*Allium textile*	0–18	–
	western wallflower	ERAS2	*Erysimum asperum*	–	–
	false boneset	BREU	*Brickellia eupatorioides*	–	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	–	–
	mullein	VERBA	*Verbascum*	–	–
	beardtongue	PENST	*Penstemon*	–	–
Shrub/Vine					
9	**Shrubs**			90–179	
	silver sagebrush	ARCA13	*Artemisia cana*	18–143	–
	prairie sagewort	ARFR4	*Artemisia frigida*	18–90	–
	American plum	PRAM	*Prunus americana*	18–54	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	18–54	–
	chokecherry	PRVI	*Prunus virginiana*	0–54	–
	rose	ROSA5	*Rosa*	18–54	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–54	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–36	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–36	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–36	–

	golden currant	RIAU	*Ribes aureum*	0–36	–
	leadplant	AMCA6	*Amorpha canescens*	0–18	–
	false indigo bush	AMFR	*Amorpha fruticosa*	–	–
Tree					
10	**Trees**			0–90	
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–36	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–36	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–18	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–18	–
	Tree	2TREE	*Tree*	0–18	–
	boxelder	ACNE2	*Acer negundo*	0–18	–
	American elm	ULAM	*Ulmus americana*	–	–
	common hackberry	CEOC	*Celtis occidentalis*	–	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			0–101	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–101	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–50	–
2	**Needlegrass**			0–50	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–50	–
3	**Tall- Warm-Season Grasses**			–	
4	**Short- Warm-Season Grasses**			0–151	
	blue grama	BOGR2	*Bouteloua gracilis*	0–101	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–50	–
5	**Other Native Grasses**			202–353	
	threeawn	ARIST	*Aristida*	202–303	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	10–50	–
	saltgrass	DISP	*Distichlis spicata*	10–30	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–30	–
	Grass, perennial	2GP	*Grass, perennial*	0–20	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	–	–
	Sandberg bluegrass	POSE	*Poa secunda*	–	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	–	–
6	**Grass-LIkes**			0–101	
	sedge	CAREX	*Carex*	0–101	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–30	–
7	**Non-Native Cool-Season Grasses**			20–101	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–50	–
	cheatgrass	BRTE	*Bromus tectorum*	20–50	–
	field brome	BRAR5	*Bromus arvensis*	0–20	–

	field brome	BRAR5	*Bromus arvensis*	0–20	
	smooth brome	BRIN2	*Bromus inermis*	–	–
Forb					
8	**Forbs**			202–504	
	Forb, annual	2FA	*Forb, annual*	10–101	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–101	–
	field sagewort	ARCA12	*Artemisia campestris*	10–101	–
	Canadian horseweed	COCA5	*Conyza canadensis*	0–101	–
	mullein	VERBA	*Verbascum*	0–101	–
	pussytoes	ANTEN	*Antennaria*	10–50	–
	goatsbeard	TRAGO	*Tragopogon*	10–50	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–50	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–50	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	10–50	–
	Forb, perennial	2FP	*Forb, perennial*	0–50	–
	vervain	VERBE	*Verbena*	10–30	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–30	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–30	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–10	–
	deathcamas	ZIGAD	*Zigadenus*	0–10	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–10	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–10	–
	textile onion	ALTE	*Allium textile*	–	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	–	–
	western wallflower	ERAS2	*Erysimum asperum*	–	–
	dotted blazing star	LIPU	*Liatris punctata*	–	–
	false boneset	BREU	*Brickellia eupatorioides*	–	–
	goldenrod	SOLID	*Solidago*	–	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	–	–
	American vetch	VIAM	*Vicia americana*	–	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	–	–
	beardtongue	PENST	*Penstemon*	–	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	–	–
	purple prairie clover	DAPU5	*Dalea purpurea*	–	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	–	–
Shrub/Vine					
9	**Shrubs**			20–101	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	10–81	–
	prairie sagewort	ARFR4	*Artemisia frigida*	10–50	–
	rose	ROSA5	*Rosa*	0–30	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–20	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–20	–
	Shrub (>5m)	2SHRUB	*Shrub (>5m)*	0–10	

	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–10	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	–	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	–	–
	leadplant	AMCA6	*Amorpha canescens*	–	–
	chokecherry	PRVI	*Prunus virginiana*	–	–
	golden currant	RIAU	*Ribes aureum*	–	–
	false indigo bush	AMFR	*Amorpha fruticosa*	–	–
	American plum	PRAM	*Prunus americana*	–	–
Tree					
10	**Trees**			0–20	
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–10	–
	Tree	2TREE	*Tree*	0–10	–
	eastern redcedar	JUVI	*Juniperus virginiana*	–	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	–	–
	American elm	ULAM	*Ulmus americana*	–	–
	boxelder	ACNE2	*Acer negundo*	–	–
	green ash	FRPE	*Fraxinus pennsylvanica*	–	–
	common hackberry	CEOC	*Celtis occidentalis*	–	–

Table 13. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			538–942	
	western wheatgrass	PASM	*Pascopyrum smithii*	538–942	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–404	–
2	**Needlegrass**			135–538	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	135–538	–
	green needlegrass	NAVI4	*Nassella viridula*	27–135	–
3	**Tall- Warm-Season Grasses**			135–673	
	big bluestem	ANGE	*Andropogon gerardii*	54–404	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	54–269	–
	switchgrass	PAVI2	*Panicum virgatum*	0–54	–
4	**Short- Warm-Season Grasses**			54–269	
	blue grama	BOGR2	*Bouteloua gracilis*	54–135	–
	buffalograss	BODA2	*Bouteloua dactyloides*	27–135	–
5	**Other Native Grasses**			135–404	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	54–135	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–135	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–81	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	27–81	–
	Grass, perennial	2GP	*Grass, perennial*	27–81	–
	saltgrass	DISP	*Distichlis spicata*	0–54	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–54	

	Sandberg bluegrass	POSE	*Poa secunda*	0–54	–
	threeawn	ARIST	*Aristida*	0–27	–
6	**Grass-Likes**			135–269	
	sedge	CAREX	*Carex*	135–269	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–27	–
7	**Non-Native Cool-Season Grasses**			135–404	
	Kentucky bluegrass	POPR	*Poa pratensis*	54–269	–
	smooth brome	BRIN2	*Bromus inermis*	54–135	–
	cheatgrass	BRTE	*Bromus tectorum*	27–135	–
	field brome	BRAR5	*Bromus arvensis*	0–135	–
Forb					
8	**Forbs**			215–404	
	white sagebrush	ARLU	*Artemisia ludoviciana*	54–135	–
	white heath aster	SYER	*Symphyotrichum ericoides*	27–135	–
	goatsbeard	TRAGO	*Tragopogon*	27–81	–
	false boneset	BREU	*Brickellia eupatorioides*	0–81	–
	goldenrod	SOLID	*Solidago*	0–54	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	27–54	–
	American vetch	VIAM	*Vicia americana*	27–54	–
	purple prairie clover	DAPU5	*Dalea purpurea*	27–54	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–54	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	27–54	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–54	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	27–54	–
	Forb, annual	2FA	*Forb, annual*	27–54	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–27	–
	Forb, perennial	2FP	*Forb, perennial*	0–27	–
	textile onion	ALTE	*Allium textile*	0–27	–
	vervain	VERBE	*Verbena*	0–27	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–27	–
	pussytoes	ANTEN	*Antennaria*	0–27	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–27	–
	Canadian horseweed	COCA5	*Conyza canadensis*	0–27	–
	mullein	VERBA	*Verbascum*	0–27	–
	beardtongue	PENST	*Penstemon*	0–27	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–27	–
	field sagewort	ARCA12	*Artemisia campestris*	0–27	–
	deathcamas	ZIGAD	*Zigadenus*	0–27	–
	dotted blazing star	LIPU	*Liatris punctata*	0–27	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	–	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	–	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	–	–

	western wallflower	ERAS2	*Erysimum asperum*	–	–
Shrub/Vine					
9	**Shrubs**			135–404	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	54–269	–
	silver sagebrush	ARCA13	*Artemisia cana*	27–269	–
	rose	ROSA5	*Rosa*	27–81	–
	American plum	PRAM	*Prunus americana*	27–81	–
	chokecherry	PRVI	*Prunus virginiana*	27–81	–
	prairie sagewort	ARFR4	*Artemisia frigida*	27–81	–
	leadplant	AMCA6	*Amorpha canescens*	0–54	–
	golden currant	RIAU	*Ribes aureum*	0–54	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–54	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–54	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–27	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	–	–
Tree					
10	**Trees**			27–135	
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	27–81	–
	green ash	FRPE	*Fraxinus pennsylvanica*	27–54	–
	common hackberry	CEOC	*Celtis occidentalis*	0–27	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–27	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–27	–
	Tree	2TREE	*Tree*	0–27	–
	boxelder	ACNE2	*Acer negundo*	0–27	–
	American elm	ULAM	*Ulmus americana*	–	–

Table 14. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			62–185	
	western wheatgrass	PASM	*Pascopyrum smithii*	62–185	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–62	–
2	**Needlegrass**			12–185	
	green needlegrass	NAVI4	*Nassella viridula*	12–123	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–62	–
3	**Tall- Warm-Season Grasses**			12–62	
	big bluestem	ANGE	*Andropogon gerardii*	0–37	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	12–37	–
	switchgrass	PAVI2	*Panicum virgatum*	0–12	–
4	**Short- Warm-Season Grasses**			12–123	
	blue grama	BOGR2	*Bouteloua gracilis*	12–99	–

	buffalograss	BODA2	*Bouteloua dactyloides*	0–62	–
5	**Other Native Grasses**			62–185	
	Sandberg bluegrass	POSE	*Poa secunda*	0–62	–
	threeawn	ARIST	*Aristida*	12–62	–
	Grass, perennial	2GP	*Grass, perennial*	0–49	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	12–37	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–37	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	12–25	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	12–25	–
	saltgrass	DISP	*Distichlis spicata*	0–12	–
6	**Grass-Likes**			25–123	
	sedge	CAREX	*Carex*	25–123	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–37	–
7	**Non-Native Cool-Season Grasses**			185–616	
	Kentucky bluegrass	POPR	*Poa pratensis*	185–555	–
	smooth brome	BRIN2	*Bromus inermis*	12–185	–
	cheatgrass	BRTE	*Bromus tectorum*	25–123	–
	field brome	BRAR5	*Bromus arvensis*	12–62	–
Forb					
8	**Forbs**			123–247	
	white sagebrush	ARLU	*Artemisia ludoviciana*	12–62	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–62	–
	field sagewort	ARCA12	*Artemisia campestris*	12–62	–
	white heath aster	SYER	*Symphyotrichum ericoides*	12–62	–
	mullein	VERBA	*Verbascum*	0–62	–
	goatsbeard	TRAGO	*Tragopogon*	25–62	–
	vervain	VERBE	*Verbena*	12–62	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	12–62	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	12–62	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	12–37	–
	Canadian horseweed	COCA5	*Conyza canadensis*	12–37	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–25	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	12–25	–
	Forb, perennial	2FP	*Forb, perennial*	0–25	–
	Forb, annual	2FA	*Forb, annual*	12–25	–
	goldenrod	SOLID	*Solidago*	0–25	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–12	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–12	–
	textile onion	ALTE	*Allium textile*	0–12	–
	pussytoes	ANTEN	*Antennaria*	0–12	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–12	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–12	–

	coneflower				
	deathcamas	ZIGAD	*Zigadenus*	0–12	–
	dotted blazing star	LIPU	*Liatris punctata*	0–12	–
	false boneset	BREU	*Brickellia eupatorioides*	0–12	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–12	–
	American vetch	VIAM	*Vicia americana*	0–12	–
	purple prairie clover	DAPU5	*Dalea purpurea*	–	–
	beardtongue	PENST	*Penstemon*	–	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	–	–
	western wallflower	ERAS2	*Erysimum asperum*	–	–
Shrub/Vine					
9	**Shrubs**			62–123	
	silver sagebrush	ARCA13	*Artemisia cana*	12–62	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	12–62	–
	prairie sagewort	ARFR4	*Artemisia frigida*	12–62	–
	chokecherry	PRVI	*Prunus virginiana*	0–37	–
	rose	ROSA5	*Rosa*	25–37	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–37	–
	American plum	PRAM	*Prunus americana*	12–37	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–25	–
	golden currant	RIAU	*Ribes aureum*	0–25	–
	leadplant	AMCA6	*Amorpha canescens*	0–12	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–12	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–12	–
	false indigo bush	AMFR	*Amorpha fruticosa*	–	–
Tree					
10	**Trees**			0–62	
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–37	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–12	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–12	–
	Tree	2TREE	*Tree*	0–12	–
	American elm	ULAM	*Ulmus americana*	–	–
	boxelder	ACNE2	*Acer negundo*	–	–
	green ash	FRPE	*Fraxinus pennsylvanica*	–	–
	common hackberry	CEOC	*Celtis occidentalis*	–	–

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 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 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, and smaller carnivores such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant; however, the species remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox are 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 has been extirpated in this area as a free-ranging herbivore. The loss of the bison and reduction of prairie dog populations and fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development has reduced habitat quality for area-sensitive species.

Within MLRA 64, the Loamy Terrace ecological site provides upland grassland cover with an associated forb, shrub, and tree 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, and Subirrigated ecological sites.
This ecological site can support an abandoned floodplain plant community and may be associated with an adjacent riparian plant community. The abandoned floodplain plant community may be composed of mature cottonwood and various age classes of elm, green ash, and boxelder; with a shrub component of chokecherry, wild plum, western snowberry, silver sagebrush, wild rose, etc. The presence or absence of this tree/shrub component is an important factor influencing wildlife species composition. Rare flooding events deposit silt on the site which may allow the potential sprouting of plains cottonwood. However, due to the doughtiness of this site, cottonwood establishment does not occur. This site is subject to invasion of grass species such as Kentucky bluegrass, smooth brome, and cheatgrass. Woody species such as Russian olive, Tamarisk (saltcedar), and eastern redcedar may invade this site. This site provides habitat for grassland- and shrub-thicket-nesting birds, small rodents, bats, mammalian predators, and a variety of reptiles, amphibians, and insects. Within the MLRA, this site provides suitable habitat for numerous riparian-associated species. This site provides foraging and brood-rearing habitat for upland game birds, such as the sharp-tailed grouse. However, due to the presence of invasive grass and woody species, reproduction of groundnesting birds is reduced.

Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees (1.1): This site is dominated by western wheatgrass, needle and thread, and big bluestem. Shrub community generally dominated by silver sagebrush, American plum, rose, chokecherry, western snowberry, false indigo, and silver buffaloberry, favoring grazers and mixed-feeders, such as deer. Plant communities associated with shrub thickets and low shrubs provide habitat for songbirds such as brown thrasher, yellow warbler, gray catbird, Say’s phoebe, loggerhead shrike, Lazuli bunting, and yellow-breasted chat. Raptors such as red-tailed hawk, Ferruginous hawk, Swainson’s hawk, American kestrel, and great horned owl may use this site. Insects, such as pollinators, play a limited role in maintaining the forb community but do provide a significant forage base for birds and various bats, especially species such as the Western small-footed Myotis, the fringe-tailed Myotis, and the Townsend’s big-eared bat. Diverse prey populations are available for grassland raptors and mammalian predators, especially bobcat. Other mammalian predators utilizing this plant community include the coyote, mink, long-tailed and least weasels, and spotted and striped skunks.

The Loamy Terrrace ecological site provides a diversity of grasses, forbs, and shrubs for small and large herbivores including shrews, voles, mice, spotted ground squirrel, desert cottontail rabbit, white- and black-tailed jackrabbits, and deer. This site provides excellent nesting and brood-rearing habitat for sharp-tailed grouse and turkey. This ecological site provides excellent fawning habitat for white-tailed deer. The relatively tall stature of this plant community provides suitable thermal, protective, and escape cover for small and large mammals. This plant community provides 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 along with lesser numbers of various lizard species. Introduced bird species such as European starling, ring-necked pheasant, and gray partridge will use this site.

Blue Grama-Rhizomatous Wheatgrass/Shrubs/Scattered Trees (1.2): Resulting from continuous seasonal grazing or haying, blue grama will become dominant. Forb, shrub, and tree diversity and abundance decrease. If the decrease results from haying, then shrub dependent wildlife species will decline. However, songbirds such as brown thrasher and raptors such as red-tailed hawk, Swainson’s hawk, American kestrel, and great horned owl will

continue to use this site. This site will continue to attractor pollinators and other insects, thereby still providing a suitable forage base for birds and bats. This plant community will continue to provide areas suitable for sharp-tailed grouse. Species such as the horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will increase in locations where shrub species decline. This site continues to provide suitable habitat for various snakes, toads, and lizards. The interspersion of short and tall vegetation provides adequate thermal, protective, and escape cover. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel.

Early Seral State (2.0): Resulting from heavy, continuous season-long grazing over many years or frequent and severe defoliation, threeawn and annuals will dominate. The forb abundance has increased; however, forb diversity has substantially decreased, and shrub abundance has increased. A shift to short plant structure and relatively high percentage of bare ground will favor prairie dog expansion with prairie dog town sites and associate species such as swift fox, ferruginous hawk and burrowing owl. Species such as horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will increase. Species such as desert cottontail and grassland-nesting birds requiring moderate cover height will rarely use this site. The short stature of this plant community limits suitable thermal, protective, and escape cover. Prey populations are reduced and are more vulnerable to raptor and mammalian predation. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel. Extreme impairment of the ecological processes impacts offsite aquatic habitats through excessive runoff, nutrient, and sediment loads. Elevated surface temperatures resulting from reduced cover and litter will greatly reduce habitat for most amphibian species, grassland birds, and mammals.

Plant Community 3.1: Rhizomatous Wheatgrass-Needlegrass-Non-Native-Cool-Season Grasses/Shrubs/Scattered Trees: Resulting from non-use or long-term light grazing, and the invasion of non-native cool-season grasses. This plant community can develop excessive litter and exhibits a reduction in plant density. If managed to maintain species diversity and structural/function groups, this plant community will provide similar habit and wildlife value at the Reference Plant Community (1.1).

Invaded State (4.0) and Disturbed Rangeland State (5.0): This group includes separate vegetation states that are highly variable in nature. They are derived through distinct management scenarios. These plant communities have been or are highly susceptible to invasion of annual bromegrasses, bluegrasses, crested wheatgrass, and other nonnative species. Since secondary succession is highly variable, plant and wildlife species will vary. This plant community provides habitat for generalist or early successional species. In addition, these communities may contain prairie dog towns. Prairie dog towns are sites of high plant and wildlife diversity.

The Invaded State (4.0) includes areas that have been invaded and are dominated by species such as smooth brome, Kentucky bluegrass, crested wheatgrass, non-native thistles, field bindweed, knapweeds, leafy spurge, hoary cress, and other introduced species. These sites greatly reduce forage, reproductive, and escape cover for grassland-nesting bird species.

The Go-back Plant Community (5.1) can be reached whenever severe mechanical disturbance (i.e., abandoned farmland) is eliminated. Early successional plant communities include annual and perennial weedy type species first to occupy the site. These sites provide diverse forage, reproductive, and escape cover that favors multiple edge species. This pioneer plant community provides abundant opportunity for insect, bird, and small mammal foraging due to abundant flowers and seed sources.

The Seeded Plant Community (5.2) provides increased forage, and, therefore, a potential for increased herbivore populations such as deer, pronghorn, and various small mammals. These sites provide diverse forage, reproductive, and escape cover favoring multiple edge species.

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

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

Plant Community: Rhizomatous Wheatgrass-Needle and Thread-Big Bluestem/Shrubs/Scattered Trees (1.1)
Average Production (lbs./acre, air-dry): 2,600
Stocking Rate (AUM/acre): 0.71

Plant Community: -Blue Grama-Rhizomatous Wheatgrass/Shrubs/Scattered Trees (1.2)
Average Production (lbs./acre, air-dry): 1,600
Stocking Rate (AUM/acre): 0.44

*Plant Community: Blue Grama/Sedge (2.1)
Average Production (lbs./acre, air-dry): Variable
Stocking Rate (AUM/acre): Variable

Plant Community: Rhizomatous Wheatgrass-Needlegrass-Non-Native Cool-Season Grasses/Shrubs/Scattered Trees (3.1)
Average Production (lbs./acre, air-dry): 2,400
*Stocking Rate (AUM/acre): 0.66

*Plant Community: Kentucky Bluegrass (>30%)-Smooth Brome (4.1)
Average Production (lbs./acre, air-dry): 1,100
Stocking Rate (AUM/acre): 0.30

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

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

Total annual production on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may 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 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 herbage production on this site. The site is dominated by soils in hydrologic groups B and C. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where shortgrasses form a dense 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.

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 Wade Anderson, Range Professional/Rancher.

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Approval

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Acknowledgments

ESD updated by Rick L. Peterson on 2/13/19.
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.

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Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 5 percent is typical.

5. **Number of gullies and erosion associated with gullies:** None should be present.

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

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.

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. 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 5 to 15 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular in the

upper A-horizon.

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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 & tall rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration.

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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):** None – when dry, B horizons can be hard and appear to be compacted, but no platy structure will be present.

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

    Dominant: Mid cool-season rhizomatous grasses >

    Sub-dominant: Mid to tall cool-season bunchgrasses > Tall warm-season rhizomatous grasses > Shrubs = Forbs >

    Other: Short warm-season grasses = Grass-likes > Short cool-season grasses

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

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14. **Average percent litter cover (%) and depth (in):** Litter cover is roughly 50 to 80 percent, and the depth is 0.25 to 0.5 inches.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 1,700 to 3,600 pounds/acre, with the reference value being 2,600 pounds/acre (air-dry 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:** State and local noxious weeds; also Kentucky bluegrass.

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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 should have vigorous rhizomes or tillers.