USDA Natural Resources Conservation Service

Ecological site R064XY037NE
Thin Upland

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.

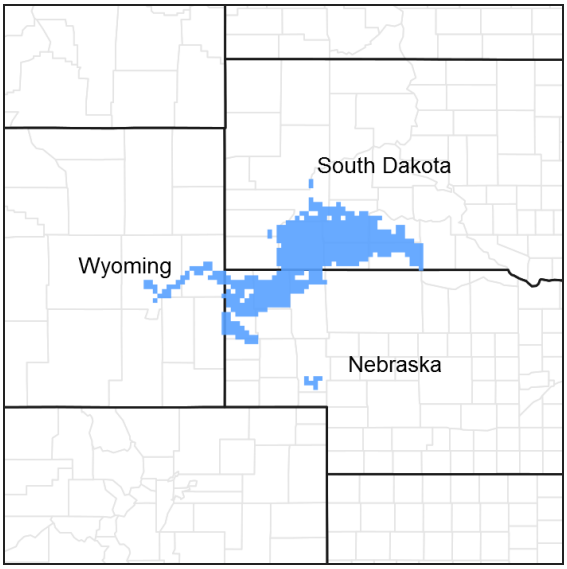


Figure 1. Mapped extent

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 ranges from 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 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 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.
Keye Paha Tablelands—331Ft.
Powder River Basin Section—331G:
Subsection: Powder River Basin—331Ge.

Ecological site concept

The Thin Upland ecological site is throughout MLRA 64. It is on upland landscapes. It is a runoff site and does not receive additional water from overflow. Typically, the slope ranges from 0 to 40 percent. The soils are moderately deep to very deep, exceeding 20 inches in depth. The surface layer, or “A” horizon, is 2 to 6 inches thick. It ranges from very fine sandy loam to silty clay loam. The subsurface layers range from very fine sandy loam to silty clay loam. Carbonates are at or near the surface (within a depth of 6 inches).

The vegetation in the reference state is a mix of warm- and cool-season grasses. Forbs are common and diverse but never dominant; shrubs can be present but are in minor amounts.

Associated sites

GX064X01X015	**Loamy 14-17" PZ** The Loamy 14-17” PZ ecological site is on less sloping landscapes adjacent to, or down-slope from, the Thin Upland site.
R064XY032NE	**Sandy 17-20" PZ** The Sandy 17-20” PZ ecological site is on less sloping landscapes adjacent to, or down-slope from, the Thin Upland site.
R064XY035NE	**Clayey 17-20 PZ** The Clayey 17-20” PZ ecological site is on less sloping landscapes adjacent to, or down-slope from, the Thin Upland site.
GX064X01X036	**Loamy 17-20" PZ** The Loamy 17-20” PZ ecological site is on less sloping landscapes adjacent to, or down-slope from, the Thin Upland site.
R064XY040NE	**Shallow** The Shallow ecological site is adjacent to, or intermixed with, the Thin Upland site.
R064XY011NE	**Sandy 14-17" PZ** The Sandy 14-17” PZ ecological site is on less sloping landscapes adjacent to, or down-slope from, the Thin Upland site.
R064XY014NE	**Clayey 14-17" PZ** The Clayey 14-17” PZ ecological site is on less sloping landscapes adjacent to, or down-slope from, the Thin Upland site.

Similar sites

R064XY040NE	**Shallow** The Shallow ecological site has less little bluestem than the Thin Upland site, slightly lower production, and soils that are shallow to a root restrictive layer of rock or gravel (10 to 20 inches in depth).

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Bouteloua gracilis*

Physiographic features

The Thin Upland ecological site is generally on steep shoulders or backslopes of hills and plains.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Plain (3) Knoll (4) Ridge
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	2,900–5,000 ft
Slope	0–40%
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 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 average temperatures ranging 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. Wind speeds 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)	91-119 days
Freeze-free period (characteristic range)	118-139 days
Precipitation total (characteristic range)	15-19 in
Frost-free period (actual range)	87-122 days
Freeze-free period (actual range)	109-150 days
Precipitation total (actual range)	15-19 in
Frost-free period (average)	105 days
Freeze-free period (average)	129 days
Precipitation total (average)	17 in

Climate stations used

- (1) HARRISON 20 SSE [USW00094077], Harrison, NE
- (2) ALLIANCE 1WNW [USC00250130], Alliance, NE
- (3) HARRISON [USC00253615], Harrison, NE
- (4) HEMINGFORD [USC00253755], Hemingford, NE

- (5) INTERIOR 3 NE [USC00394184], Interior, SD
- (6) MARTIN [USC00395281], Martin, SD
- (7) LUSK 2 SW [USC00485830], Lusk, WY
- (8) TORRINGTON 29N [USC00488997], Jay Em, WY
- (9) CHADRON 3NE [USC00251578], Chadron, NE
- (10) GLENDO 6NE [USC00483936], Glendo, WY

Influencing water features

No riparian areas or wetland features are directly associated with the Thin Upland ecological site.

Wetland description

Not Applicable.

Soil features

The soils in this site commonly have a surface layer of very fine sandy loam to silty clay loam 2 to 6 inches thick. Slopes typically range from 0 to 40 percent but can reach up to 60 percent. The soils are well drained or somewhat excessively drained. They formed in soft siltstone or in loamy alluvium and residuum. The subsurface layers range from very fine sandy loam to silty clay loam. The soils have a moderate infiltration rate. They are typically calcareous at or near the surface; however, carbonates are not always distinguishable in the upper layers. The soil profile typically shows evidence of weak development (i.e., a thin “A” horizon, pale colors, and lack an argillic horizon).

This site typically has no evidence of rills, wind-scoured areas, or pedestalled plants. Waterflow paths 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 Thin Upland Ecological Site: Colby, Fairburn, Keota, Minnequa, Mitchell, and Ziggy. Keota may also be correlated to the Thin Breaks ecological site.

In the adjacent MLRA 67A, some of these soils may be correlated to the Limy Upland ecological site. The Thin Upland site and the Limy Upland site have similar plant communities and ecological dynamics.

The soils are susceptible to wind erosion and water erosion. The hazard of water erosion increases on slopes greater than about 15 percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and vegetative production.

More information is available in soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Table 4. Representative soil features

Parent material	(1) Loess–sandstone and siltstone (2) Residuum–sandstone and siltstone
Surface texture	(1) Silt loam (2) Silty clay loam (3) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderate
Soil depth	20–80 in
Available water capacity (0-40in)	5–8 in

Calcium carbonate equivalent (0-40in)	0–45%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–13
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

TThe Thin Upland 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, impacts of native and exotic plant and animal species, and management actions. Although the following plant community descriptions specify the more typical 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, species composition, or both.

There is a potential for encroachment and establishment of ponderosa pine, Rocky Mountain juniper, and eastern redcedar from associated sites. These species may grow in small amounts in several plant communities.

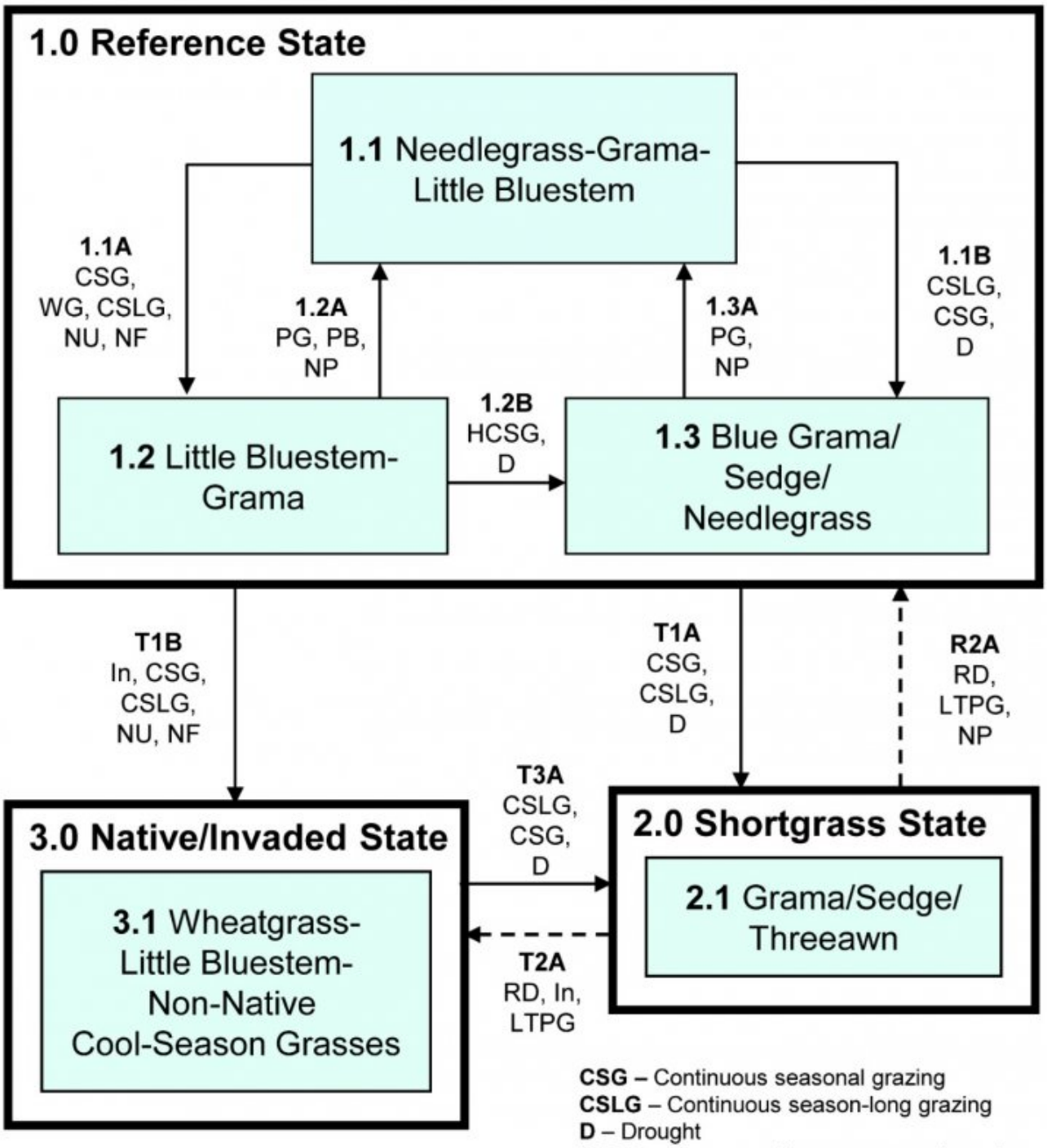
Continuous season-long grazing (during the typical growing season of May through October) or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence causes this site to depart from the Needlegrass-Grama-Little Bluestem Plant Community (1.1).

Interpretations are primarily based on the Needlegrass-Grama-Little Bluestem Plant Community (1.1). The community was determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Also studied were trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts. Plant communities, states, transitional pathways, and thresholds were determined through similar studies and experience.

The following diagram illustrates the common plant community phases on the site and the transition pathways between communities and states. These are the most common plant community phases based on current knowledge and experience. Changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

State and transition model

Thin Upland – R064XY037NE 11/01/18



CSG – Continuous seasonal grazing
CSLG – Continuous season-long grazing
D – Drought
HCSG – Heavy continuous seasonal grazing
HD – Heavy disturbance
In – Invasion of nonnative cool-season grasses
LTPG – Long-term prescribed grazing
NF – No fire
NP – Normal precipitation patterns
NU – No use
PB – Prescribed burning
PG – Prescribed grazing
RD – Remove disturbance
WG – Winter grazing
– – ➤ Transition may not be fast and/or feasible

Diagram Legend: Thin Upland - R064XY037NE

T1A	1.0 to 2.0	Continuous season-long grazing; continuous seasonal grazing; or heavy grazing in combination with drought.
T1B	1.0 to 3.0	Invasion of non-native cool-season grasses; continuous seasonal grazing; continuous season-long grazing; or non-use and no fire.
T2A	2.0 to 3.0	Invasion of non-native cool-season grasses. 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 meet management objectives.
T3A	3.0 to 2.0	Continuous season-long grazing; continuous seasonal grazing without adequate recovery; or heavy grazing in combination with drought.
R2A	2.0 to 1.0	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 - 1.2	Continuous seasonal grazing (spring); late winter grazing; continuous season-long grazing; or no use and no fire.
1.1B	1.1 - 1.3	Continuous season-long grazing; continuous seasonal grazing without adequate recovery; or heavy grazing in combination with drought.
1.2A	1.2 - 1.1	Prescribed grazing with proper stocking rates, change in season of use, adequate time for recovery; or a return to normal precipitation patterns following drought. Prescribed burning may also be a management option.
1.2B	1.2 - 1.3	Heavy, continuous season seasonal grazing without adequate recovery; or heavy grazing in combination with drought.
1.3A	1.3 - 1.1	Prescribed grazing with proper stocking rates, change in season of use, and adequate time for recovery; and a return to normal precipitation patterns following drought.

State 1
Reference State

The Reference State (1.0) represents the best estimate of the natural range of variability that dominated the dynamics of the Thin Upland 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, grazing by large ungulates, and small mammals. Favorable growing conditions occurred during the spring and the warm months of June through August. This state is in areas having a history of proper grazing management, including adequate recovery periods between grazing events.

Community 1.1
Needlegrass-Grama-Little Bluestem

Interpretations are based primarily on the Needlegrass-Grama-Little Bluestem Plant Community, which is considered the Reference Plant Community (1.1). This plant community is in areas that are properly managed with grazing or prescribed burning and in some areas that receive occasional short periods of rest. The potential vegetation is about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. The plant community is dominated by a mixture of cool- and warm-season grasses. The major grasses include little bluestem, needle and thread, sideoats grama, and blue grama. Other grasses and grass-like plants include sedge, western wheatgrass, green needlegrass, and prairie Junegrass. Significant forbs include purple coneflower, dotted gayfeather (dotted blazing star), and prairie clover. Significant shrubs in this plant community include leadplant, fringed sagewort (prairie sagewort), and rose. This plant community is extremely resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite. Natural plant mortality is very low. The diversity in plant species allows for high drought tolerance.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1030	1485	1915
Forb	85	180	300
Shrub/Vine	85	135	185
Total	**1200**	**1800**	**2400**

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
Little Bluestem-Grama

Historically, this plant community evolved under continuous seasonal grazing or continuous season-long grazing and a low fire frequency. This plant community can also result from extended periods of non-use and no fire. Little bluestem dominates this plant community, as it takes advantage of soil disturbance (resulting from hoof action or increased bare ground due to reduced plant vigor under non-use and no fire). Other significant grasses or grass-like plants include blue grama, sideoats grama, and sedge. Forbs commonly in this plant community include white sagebrush (cudweed sagewort), purple coneflower, and dotted gayfeather (dotted blazing star). Significant shrubs include fringed sagewort (prairie sagewort) and leadplant. The potential vegetation is about 80 percent grasses and grass-like plants, 10 percent forbs, and 10 percent shrubs. Although production remains relatively high, little bluestem plants often become “wolfy” and largely unavailable to most herbivores. This plant community is moderately resistant to change. The herbaceous species are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	850	1360	1770
Forb	75	120	165
Shrub/Vine	75	120	165
Total	**1000**	**1600**	**2100**

Figure 11. Plant community growth curve (percent production by month). NE6405, Pine Ridge/Badlands, warm-season dominant. Warm-season dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	7	15	20	30	15	5	5		

Community 1.3
Blue Grama/Sedge/Needlegrass

This plant community typically develops, over a period of several years, under continuous season-long grazing; continuous seasonal grazing; or heavy grazing in association with drought. These conditions result in the plant community transitioning to a grazing resistant plant community. The community is typically made up of sod forming grasses and grass-like plants with only remnants of mid-height cool-season grasses remaining. The dominant grasses are blue grama and threadleaf sedge. The abundance of needle and thread, western wheatgrass, and sideoats grama are reduced, and little bluestem is nearly absent. Other grasses include Sandberg bluegrass and prairie Junegrass. Significant forbs include scarlet globemallow, slimflower scurfpea, and skeletonplant. Significant

shrubs include fringed sagewort (prairie sagewort) and broom snakeweed. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. This plant community is moderately resistant to change. The herbaceous species are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient to short-term disturbance.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	600	880	1430
Forb	50	110	185
Shrub/Vine	50	110	185
Total	**700**	**1100**	**1800**

Figure 13. 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 (early-season grazing with high stocking densities results in increased soil disturbance, which favors the little bluestem); winter grazing that extends in the early part of the growing season; or continuous season-long grazing (low to moderate stocking rates resulting in patch grazing) convert the Reference Plant Community (1.1) to the Little Bluestem-Grama Plant Community (1.2). Non-use and no fire can also shift this plant community to the Little Bluestem-Grama Plant Community (1.2).

Pathway 1.2B
Community 1.1 to 1.3

Continuous season-long grazing (with moderate to high stocking rates); continuous seasonal grazing (during the summer growing season); or heavy grazing in combination with drought convert the Reference Plant Community (1.1) to the Blue Grama/Sedge/Needlegrass Plant Community (1.3).

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that provides proper stocking rates, change in season of use, and adequate time for plant recovery convert the Little Bluestem-Grama Plant Community (1.2) to the Needlegrass-Grama-Little Bluestem Plant Community (1.1). Prescribed burning may also be a management option to remove culms of standing little bluestem.

Conservation practices

Prescribed Grazing

Pathway 1.2B
Community 1.2 to 1.3

Heavy, continuous seasonal grazing during the summer growing season in combination with drought converts the Little Bluestem-Grama Plant Community (1.2) to the Blue Grama/Sedge/Needlegrass Plant Community (1.3).

Pathway 1.3A

Community 1.3 to 1.1

Prescribed grazing that provides proper stocking rates, change in season of use, and adequate time for plant recovery converts the Blue Grama/Sedge/Needlegrass Plant Community (1.3) to the Needlegrass-Grama-Little Bluestem Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2
Shortgrass State

The Shortgrass State (2.0) is dominated by shortgrass species and upland sedges. This state is the result of grazing patterns that do not provide adequate recovery time for warm- and cool-season grasses. In the early stages of this state, mid-grass remnants may be present in sufficient quantities to allow for recovery to the Reference State (1.0). The dominant herbaceous species are well adapted to grazing. The hydrologic function of this site is dramatically altered. Runoff is high, and infiltration is low. This state is very resistant to change through grazing management alone.

Community 2.1
Grama/Sedge/Threeawn

The Grama/Sedge/Threeawn Plant Community (2.1) develops due to moderate to heavy grazing over many years. Diversity is diminished as the short grasses become dominant in the plant community. The grazing tolerant blue grama and sedges replace little bluestem, western wheatgrass, and needlegrasses. Sideoats grama remains in the plant community but is less productive because of competition and grazing pressure. Due to low palatability, white sagebrush (cudweed sagewort), milkvetch, heath aster, and field sagewort (green sagewort) become more prevalent in the plant community. Fringed sagewort (prairie sagewort) is the dominant shrub in this plant community. The potential vegetation is about 75 percent grasses or grass-like plants, 10 percent forbs, and 15 percent shrubs. This plant community (2.1) is less productive than most other plant community phases. The thick sod prevents other species from becoming established. Lack of litter and reduced plant vigor cause higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which give the short-statured grass species a competitive advantage. Soil erosion is minimal due to the sod-forming of dominant species in this phase. This plant community is resistant to change.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	420	742	1065
Forb	40	90	140
Shrub/Vine	40	68	95
Total	**500**	**900**	**1300**

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		

State 3
Native/Invaded State

The Native/Invaded State (3.0) consists of areas that have been invaded by smooth brome, Kentucky bluegrass, and annual brome grass but not at the levels where the plant community is dominated by these species. Targeted grazing and either prescribed burning or chemical herbicide treatments can be used to reduce the amount of non-

native cool-season grasses in the plant community, but these grasses are not completely removed. From State 3, a restoration pathway to the Reference State (1.0) does not exist.

Community 3.1
Wheatgrass-Little Bluestem-Non-Native Cool-Season Grasses

Plant Community 3.1 developed under continuous seasonal grazing, continuous season-long grazing, or long-term light grazing; and the invasion of non-native cool-season grasses (e.g. smooth bromegrass, Kentucky bluegrass, annual bromegrass). This plant community can also develop due to non-use and no-fire. The potential plant community is approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. The dominant species are variable in this phase but commonly consist of wheatgrass, little bluestem, sideoats grama, blue grama, smooth bromegrass, Kentucky bluegrass, annual bromegrass, sand dropseed, and sedges. Other plant species from adjacent ecological sites can become minor components in this plant community. Compared to the Needlegrass-Grama-Little Bluestem Plant Community (1.1), the abundance of western wheatgrass and blue grama is increased. Various non-native species, such as smooth bromegrass, Kentucky bluegrass, and annual bromegrass, are also increased in abundance. The previously dominant mid-grass species are significantly reduced in abundance or are not present.

Figure 16. 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		

Transition T1A
State 1 to 2

Continuous season-long grazing (grazing at moderate to heavy stocking levels for the entire growing season); continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year); or heavy grazing in combination with drought can cause a transition from the Reference State (1.0) to the Shortgrass State (2.0).

Transition T1B
State 1 to 3

Continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year), continuous season-long grazing (grazing at light to moderate stocking levels for the entire growing season), or non-use and no fire; and the invasion of non-native cool-season grasses can cause a transition from the Reference State (1.0) to the Native/Invaded State (3.0).

Restoration pathway R2A
State 2 to 1

The removal of grazing disturbance followed by long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods; or periodic light to moderate stocking levels possibly including periodic rest) may result in State (2.0) passing over a threshold to the Reference State (1.0). This restoration is likely to take a long period of time, and recovery may not be feasible.

Conservation practices

Prescribed Grazing

Transition T2A
State 2 to 3

The invasion of non-native cool-season grasses; the removal of grazing disturbance followed by long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods; or periodic light to moderate

stocking levels possibly including periodic rest) may lead State (2.0) to the Native/Invaded State (3.0). This transition is likely take a long period of time, and recovery may not meet management objectives.

Conservation practices

Prescribed Grazing

Transition T3A
State 3 to 2

Continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year); continuous season-long grazing (grazing at light to moderate stocking levels for the entire growing season); or a combination of disturbances, such as extended periods of below average precipitation coupled with periodic heavy grazing, shift State (3.0) to the Shortgrass Sod State (2.0).

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	**Little Bluestem**			180–540	
	little bluestem	SCSC	*Schizachyrium scoparium*	180–540	–
2	**Sideoats Grama**			90–360	
	sideoats grama	BOCU	*Bouteloua curtipendula*	90–360	–
3	**Needlegrass**			180–270	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	180–270	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–90	–
	green needlegrass	NAVI4	*Nassella viridula*	0–90	–
4	**Short Warm-Season**			180–360	
	blue grama	BOGR2	*Bouteloua gracilis*	180–360	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–90	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–90	–
5	**Native Grasses and Grass-likes**			180–450	
	western wheatgrass	PASM	*Pascopyrum smithii*	90–270	–
	big bluestem	ANGE	*Andropogon gerardii*	0–180	–
	sedge	CAREX	*Carex*	90–180	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	18–90	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–54	–
	Grass, perennial	2GP	*Grass, perennial*	0–54	–
Forb					
6	**Forbs**			90–270	
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	36–180	–
	dotted blazing star	LIPU	*Liatris punctata*	36–90	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	18–90	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	18–90	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–90	–
	milkvetch	ASTRA	*Astragalus*	18–90	–
	false boneset	BREU	*Brickellia eupatorioides*	0–90	–

	prairie clover	DALEA	*Dalea*	18–90	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	18–72	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	18–54	–
	spiny phlox	PHHO	*Phlox hoodii*	0–36	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–36	–
	pussytoes	ANTEN	*Antennaria*	0–36	–
	Forb, perennial	2FP	*Forb, perennial*	0–36	–
	buttecandle	CRCE	*Cryptantha celosioides*	0–36	–
Shrub/Vine					
7	**Shrubs**			90–180	
	leadplant	AMCA6	*Amorpha canescens*	18–90	–
	prairie sagewort	ARFR4	*Artemisia frigida*	36–90	–
	rose	ROSA5	*Rosa*	0–90	–
	soapweed yucca	YUGL	*Yucca glauca*	0–90	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–54	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–36	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–36	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–36	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Little Bluestem**			480–880	
	little bluestem	SCSC	*Schizachyrium scoparium*	480–880	–
2	**Sideoats Grama**			16–160	
	sideoats grama	BOCU	*Bouteloua curtipendula*	16–160	–
3	**Needlegrass**			0–80	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–80	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–16	–
	green needlegrass	NAVI4	*Nassella viridula*	0–16	–
4	**Short Warm-Season Grasses**			240–560	
	blue grama	BOGR2	*Bouteloua gracilis*	240–480	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–160	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–160	–
5	**Native Grasses/Grass-Likes**			160–320	
	sedge	CAREX	*Carex*	160–240	–
	threeawn	ARIST	*Aristida*	0–80	–
	dropseed	SPORO	*Sporobolus*	0–80	–
	Grass, perennial	2GP	*Grass, perennial*	0–48	–
	big bluestem	ANGE	*Andropogon gerardii*	0–48	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–48	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–48	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–48	–
Forb					

6	**Forbs**			80–160	
	white sagebrush	ARLU	*Artemisia ludoviciana*	32–96	–
	tarragon	ARDR4	*Artemisia dracunculus*	16–96	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	16–96	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	32–80	–
	white heath aster	SYER	*Symphyotrichum ericoides*	16–80	–
	prairie clover	DALEA	*Dalea*	0–48	–
	dotted blazing star	LIPU	*Liatris punctata*	0–48	–
	false boneset	BREU	*Brickellia eupatorioides*	0–48	–
	kisses	OESU4	*Oenothera suffulta*	0–48	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	16–48	–
	Forb, perennial	2FP	*Forb, perennial*	0–32	–
	milkvetch	ASTRA	*Astragalus*	16–32	–
	buttecandle	CRCE	*Cryptantha celosioides*	0–16	–
	spiny phlox	PHHO	*Phlox hoodii*	0–16	–
	pussytoes	ANTEN	*Antennaria*	0–16	–
Shrub/Vine					
7	**Shrubs**			80–160	
	prairie sagewort	ARFR4	*Artemisia frigida*	48–96	–
	rose	ROSA5	*Rosa*	0–80	–
	soapweed yucca	YUGL	*Yucca glauca*	0–80	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–48	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–32	–
	leadplant	AMCA6	*Amorpha canescens*	2–32	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–16	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–16	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Little Bluestem**			–	
	little bluestem	SCSC	*Schizachyrium scoparium*	11–110	–
2	**Sideoats Grama**			–	
	sideoats grama	BOCU	*Bouteloua curtipendula*	11–55	–
3	**Needlegrass**			–	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	55–110	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–55	–
	green needlegrass	NAVI4	*Nassella viridula*	0–55	–
4	**Short Warm-Season Grasses**			–	
	blue grama	BOGR2	*Bouteloua gracilis*	165–330	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–110	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–110	–
5	**Native Grasses/Grass-Likes**			–	
	sedge	CAREX	*Carex*	110–220	–

	prairie Junegrass	KOMA	*Koeleria macrantha*	0–55	–
	western wheatgrass	PASM	*Pascopyrum smithii*	22–55	–
	Sandberg bluegrass	POSE	*Poa secunda*	22–55	–
	threeawn	ARIST	*Aristida*	0–33	–
	Grass, perennial	2GP	*Grass, perennial*	0–33	–
	dropseed	SPORO	*Sporobolus*	0–22	–
	big bluestem	ANGE	*Andropogon gerardii*	–	–
Forb					
6	**Forbs**			–	
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	22–110	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–55	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	11–55	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	1–55	–
	dotted blazing star	LIPU	*Liatris punctata*	11–55	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–55	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–55	–
	milkvetch	ASTRA	*Astragalus*	11–22	–
	Forb, perennial	2FP	*Forb, perennial*	0–22	–
	spiny phlox	PHHO	*Phlox hoodii*	0–22	–
	pussytoes	ANTEN	*Antennaria*	0–22	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	0–22	–
	buttecandle	CRCE	*Cryptantha celosioides*	0–11	–
	false boneset	BREU	*Brickellia eupatorioides*	0–11	–
	prairie clover	DALEA	*Dalea*	0–11	–
Shrub/Vine					
7	**Shrubs**			–	
	prairie sagewort	ARFR4	*Artemisia frigida*	33–110	–
	leadplant	AMCA6	*Amorpha canescens*	0–33	–
	rose	ROSA5	*Rosa*	0–33	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–33	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–22	–
	soapweed yucca	YUGL	*Yucca glauca*	0–22	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–11	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	–	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Little Bluestem**			9–90	
	little bluestem	SCSC	*Schizachyrium scoparium*	9–90	–
2	**Sideoats Grama**			9–45	
	sideoats grama	BOCU	*Bouteloua curtipendula*	9–45	–
3	**Needlegrass**			0–45	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–45	–

	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–18	
	porcupinegrass	HESP11	*Hesperostipa spartea*	–	–
	green needlegrass	NAVI4	*Nassella viridula*	–	–
4	**Short Warm-Season Grasses**			180–360	
	blue grama	BOGR2	*Bouteloua gracilis*	180–360	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–90	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–90	–
5	**Native Grasses/Grass-Likes**			135–315	
	sedge	CAREX	*Carex*	135–225	–
	threeawn	ARIST	*Aristida*	18–90	–
	dropseed	SPORO	*Sporobolus*	9–45	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–45	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–27	–
	Grass, perennial	2GP	*Grass, perennial*	0–27	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–27	–
	big bluestem	ANGE	*Andropogon gerardii*	–	–
Forb					
6	**Forbs**			45–135	
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	18–72	–
	tarragon	ARDR4	*Artemisia dracunculus*	9–54	–
	white heath aster	SYER	*Symphyotrichum ericoides*	18–54	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	18–54	–
	pussytoes	ANTEN	*Antennaria*	0–45	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	9–45	–
	milkvetch	ASTRA	*Astragalus*	18–36	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	9–36	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	9–27	–
	spiny phlox	PHHO	*Phlox hoodii*	0–27	–
	Forb, perennial	2FP	*Forb, perennial*	0–18	–
	dotted blazing star	LIPU	*Liatris punctata*	0–18	–
	false boneset	BREU	*Brickellia eupatorioides*	–	–
	prairie clover	DALEA	*Dalea*	–	–
	buttecandle	CRCE	*Cryptantha celosioides*	–	–
Shrub/Vine					
7	**Shrubs**			45–90	
	prairie sagewort	ARFR4	*Artemisia frigida*	27–90	–
	soapweed yucca	YUGL	*Yucca glauca*	0–54	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	rose	ROSA5	*Rosa*	0–18	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–18	–
	leadplant	AMCA6	*Amorpha canescens*	–	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	–	–
	dwarf false indigo	AMNA	*Amorpha nana*	–	–

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 supported 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 Thin Upland Ecological Site provides upland grassland cover and associated forb, shrub, and tree components. The site 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 ecological sites.

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

The majority of the Thin Upland Ecological Site remains intact and provides increasingly important habitat for grassland and shrub-steppe nesting birds, small rodents, coyotes, and a variety of reptiles, amphibians, and insects. Invasive species, such as annual bromegrasses and crested wheatgrass, have impacted the biological integrity of the site for some grassland birds. Changes in historic fire regime and domestic grazing have impacted the relative composition of forbs, shrubs, and grasses.

Needlegrass-Grama-Little Bluestem (1.1) and Little Bluestem-Grama (1.2): The predominance of grasses plus the high diversity of forbs and shrubs in these communities favor grazers and mixed-feeders, such as deer and pronghorn. Insects, including pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. The complex structural diversity of plant populations 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 provides high nutritional levels for small and large herbivores, including voles, mice, spotted ground squirrel, white-tailed jackrabbit, black-tailed jackrabbit, and deer. The higher stature of this plant community provides thermal, protective, and escape cover for herbivores and grassland birds. Predators that use this plant community include coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for reptiles, such as the spade foot toad, bull snake, and prairie rattlesnake.

The abundance of needlegrasses declines as a result of continuous seasonal grazing, season-long grazing, or non-use and low fire frequency. The loss of a portion of the medium height grasses and tall grasses provides shorter

grass habitat favoring short-grass-nesting bird species. However, there should be no substantial shift in the wildlife community.

Blue Grama/Sedge/Needlegrass (1.3) and Grama/Sedge/Threeawn (2.1): Grama and sedge dominate after heavy grazing over many years. Diversity of both forbs and shrubs has decreased. A shift to short plant structure favors prairie dog expansion, prairie dog town sites, and associated species, such as ferruginous hawk and burrowing owl. Populations increase of species such as horned lark, long-billed curlew, upland sandpiper, white-tailed jackrabbit, and black-tailed jackrabbit. Species such as desert cottontail 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 that use 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 loads, and sediment loads. Elevated surface temperatures resulting from reduced cover and litter greatly reduce habitat for most amphibian species, grassland birds, and mammals.

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: Needlegrass-Grama-Little Bluestem (1.1)
Average Production (lb/acre, air-dry): 1,800
Stocking Rate (AUM/acre): 0.49

Plant Community: Little Bluestem-Grama (1.2)
Average Production (lb/acre, air-dry): 1,600
Stocking Rate (AUM/acre): 0.44

Plant Community: Blue Grama/Sedge/Needlegrass (1.3)
Average Production (lb/acre, air-dry): 1,100
Stocking Rate (AUM/acre): 0.30

Plant Community: Blue Grama/Sedge/Threeawn (2.1)
Average Production (lb/acre, air-dry): 900
Stocking Rate (AUM/acre): 0.25

*Plant Community: Wheatgrass-Needlegrass-Non-Native Cool-Season Grasses (3.1)
Average Production (lb/acre, air-dry): Variable
Stocking Rate (AUM/acre): Variable

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 groups B and C. Infiltration is moderately slow or moderate. Runoff potential for this site varies from medium to very high, depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short grasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Recreational uses

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

Wood products

No appreciable wood products are 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 5 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 continued refinement toward an “Approved” status is expected.

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 was 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 (SS), NRCS, George Gamblin, RMS, NRCS; and Kent Cooley, SS, NRCS.

Other Inventory Data References: Form SCS-RANGE-417, 5 records between 1968 and 1974, in Dawes and Sheridan Counties, Nebraska, and Mellette County, South Dakota.

Other references

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Approval

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Acknowledgments

This ecological site was reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS on 1/15/2019.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	12/12/2024
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Typically, none. Rills may be present on steeper slopes (greater than 15 percent) and discontinuous when present.

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2. **Presence of water flow patterns:** Typically, none. If present water flow patterns will be barely visible and discontinuous with numerous debris dams when present.

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3. **Number and height of erosional pedestals or terracettes:** Pedestalled plants and terracettes are not expected on gentle slopes but will occur on slopes steeper than 15 percent becoming more evident as slopes increase, with no exposed roots.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically 5 to 10 percent, and bare ground patches are less than 2 to 3 inches (5.1 to 7.6 cm) in diameter.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally move short distances (less than 6 inches or 15.2 cm), some medium size class litter will move very short (less than 3 inches or 8.5 cm) distances. Litter debris dams are occasionally present

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil 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.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 2 to 6 inches (5.1 to 15.2 cm) thick. Soil colors range from brown, grayish brown, to light brownish gray (values

of 5 to 6) when dry and brown, dark grayish brown, to grayish brown (values of 4 to 5) when moist. Structure should typically be fine granular at least in the upper A-horizon. Some soils have subangular blocky structure parting to weak fine granular.

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

    Relative composition is approximately 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. The grasses and grass-like component is composed of C4, tall- and midgrasses (15-45%), C3 bunchgrasses (10-15%), C3 rhizomatous grasses (10-15%), C4, shortgrasses (10-20%), and grass-likes 5-10%).

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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, subsoil 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: Phase 1.1
    1. Native, perennial, C4, tall- and midgrass, 270-810 #/ac, 15-45% (2 species minimum): little bluestem, sideoats grama, big bluestem.

    Phase 1.2
    1. Native, perennial, C4, tall- and midgrass, 480-960 #/ac, 30-60% (2 species minimum): little bluestem, sideoats grama, big bluestem, dropseed.
    2. Native, perennial, C4 shortgrass, 240-480 #/ac, 15-30% (1 species minimum): blue grama, buffalograss, hairy grama, threeawn.

    Phase 1.3
    1. Native, perennial, C4 shortgrass, 165-440 #/ac, 15-40% (1 species minimum): blue grama, buffalograss, hairy grama.

    Sub-dominant: Phase 1.1
    1. Native, perennial, C4 shortgrass, 180-360 #/ac, 10-20% (1 species minimum): blue grama, buffalograss, hairy grama.
    2. Native, perennial, C3 bunchgrass, 180-270 #/ac, 10-15% (2 species minimum): needle and thread, porcupinegrass, green needlegrass, prairie Junegrass, Sandberg bluegrass.
    3. Native, perennial, C3 rhizomatous grass, 180-270 #/ac, 10-15%, (1 species minimum): western wheatgrass.
    4. Native forbs, 90-270 #/ac, 5-15% (8 species minimum): Cuman ragweed, white sagebrush, milkvetch, prairie clovers, Nuttall's sensitive-briar, dotted blazing star, scarlet globemallow, blacksamson echinacea and others which will vary from site to site.

    Phase 1.2
    1. Native grass-like, 160-240 #/ac, 10-15% (1 species minimum): sedge.

    Phase 1.3
    1. Native grass-like, 110-220 #/ac, 10-20%, (1 species minimum): sedge.
    2. Native, perennial, C4, midgrass, 22-165 #/ac, 2-15% (2 species minimum): little bluestem, sideoats grama, dropseed.

    Other: Minor - Phase 1.1

1. Native grass-likes, 90-180 #/ac, 5-10%: sedges.
2. Shrubs, 90-180 #/ac, 5-10%: shrubs present vary from location to location.

Minor - Phase 1.2
1. Native, perennial and annual forbs, 80-160 #/ac, 5-10%: forbs present vary from location to location.
2. Shrubs, 80-160 #/ac, 5-10%: shrubs present vary from location to location.
3. Native, perennial, C3 grass, 0-160 #/ac, 0-5%: needle and thread, porcupinegrass, green needlegrass, prairie Junegrass, western wheatgrass, Sandberg bluegrass.

Minor - Phase 1.3
1. Shrubs, 33-110%, 3-10%: shrubs present vary from location to location.
2. Native, perennial, C3 grass, 22-110 #/ac, 2-10%: prairie Junegrass, western wheatgrass, Sandberg bluegrass.
3. Native, perennial and annual forbs, 22-100 #/ac, 2-10%: forbs present vary from location to location.

Additional: The Needlegrass-Grama-Little Bluestem Community or Reference Community (1.1) consists of seven F/S groups. These groups, in order of relative abundance, are native, perennial, C4 tall- and midgrass; native, perennial, C4, shortgrass; native, perennial, C3 bunchgrass = native, perennial, C3, rhizomatous grass; native forbs; native grass-likes = shrubs.

The Little Bluestem-Grama Community (1.2) consists of six F/S groups. These groups, in order of relative abundance, are native, perennial, C4, tall- and midgrass; native, perennial, C4 shortgrass; native grass-like; native forbs = shrubs, native, perennial, C3 grass.

The Blue Grama/Sedge/Needlegrass Community (1.3) consists of six F/S groups. These groups, in order of relative abundance, are native, perennial, C4, shortgrass; native grass-likes; native, perennial, C4 midgrass; shrubs, native, perennial, C3 grass = native forbs.

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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.

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14. **Average percent litter cover (%) and depth (in):** Plant litter cover is evenly distributed throughout the site and is expected to be 50 to 70 percent and at a depth of approximately 0.25 inch (0.65 cm). Kentucky bluegrass excessive litter can negatively impact the functionality of this site.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual-production is 1,800 pounds per acre in a year with normal precipitation and temperatures. Low and High production years should yield 1,200 and 2,400 pounds per acre respectively.

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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:** No non-native invasive species are present. Annual bromes, Kentucky bluegrass, crested wheatgrass, smooth brome, 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.

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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.
