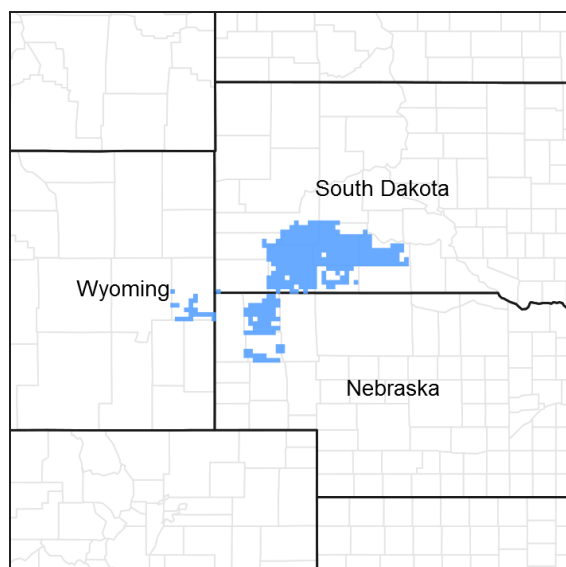


# **Ecological site R064XY022NE** **Wet Land**

Last updated: 12/16/2024  
 Accessed: 05/10/2025

## **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.  
Keya Paha Tablelands—331Ft.

## Ecological site concept

The Wet Land ecological site is found throughout MLRA 64. It is a run-in site on drainageways, oxbows, and flood plains. Slopes range from 0 to 3 percent. The soils are very deep, very poorly drained, and formed in eolian sands and sandy alluvium. The surface layer is loamy fine sand to fine sandy loam and is 5 to 14 inches in depth. A permanent water table fluctuates between the surface and a depth of 1 foot.

Vegetation in Reference State (1.0) consists of grass, sedge, and rush species that are classified as wetland obligate or facultative wetland.

## Associated sites

R064XY024NE	<b>Subirrigated</b> The Subirrigated ecological site is adjacent to the Wet Land ecological site but has a seasonal high water table within 1 to 3 feet of the surface.
R064XY029NE	<b>Sandy Lowland</b> The Sandy Lowland ecological site is on low terraces above the Wet Land ecological site.

## Similar sites

R064XY002NE	<b>Wet Subirrigated</b> The Wet Subirrigated ecological site is found in landscape positions similar to those of the Wet Land site. The Wet Subirrigated plant community has less prairie cordgrass, and fewer obligate grass-like species and forbs than the Wet Land ecological site.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Spartina pectinata</i> (2) <i>Calamagrostis canadensis</i>

## Physiographic features

The Wet Land ecological site is found in level or nearly level valleys near springs, seeps, and sloughs. A water table generally occurs at or within 12 inches of the surface.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Oxbow (3) Flood plain
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Occasional to frequent
Elevation	2,900–5,000 ft
Slope	0–3%
Ponding depth	0–12 in
Water table depth	0–12 in

Aspect	Aspect is not a significant factor
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## 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)	92-120 days
Freeze-free period (characteristic range)	119-139 days
Precipitation total (characteristic range)	16-19 in
Frost-free period (actual range)	87-122 days
Freeze-free period (actual range)	110-149 days
Precipitation total (actual range)	15-20 in
Frost-free period (average)	107 days
Freeze-free period (average)	130 days
Precipitation total (average)	17 in

## Climate stations used

- (1) WOOD [USC00399442], Wood, SD
- (2) LUSK 2 SW [USC00485830], Lusk, WY
- (3) HARRISON 20 SSE [USW00094077], Harrison, NE
- (4) TORRINGTON 29N [USC00488997], Jay Em, WY
- (5) GLENDON 6NE [USC00483936], Glendo, WY
- (6) CHADRON 3NE [USC00251578], Chadron, NE
- (7) ALLIANCE 1WNW [USC00250130], Alliance, NE
- (8) HARRISON [USC00253615], Harrison, NE
- (9) HEMINGFORD [USC00253755], Hemingford, NE
- (10) INTERIOR 3 NE [USC00394184], Interior, SD
- (11) MARTIN [USC00395281], Martin, SD

## Influencing water features

The Wet Land ecological site has a combination of physical and hydrological features that: (1) provides season-long ground water within 1 foot of the surface, (2) allows relatively free movement of water and air in the upper part of the soil, and (3) results in occasional or frequent flooding.

## Wetland description

Wetland Description: (Cowardin et al., 1979)

System: Lacustrine

Subsystem: Littoral

Class: Unconsolidated Shoreline

Subclass: Permanently, semi-permanently, or seasonally flooded

Wetland Description: (Cowardin et al., 1979)

System: Palustrine

Subsystem: N/A

Class: Persistent Emergent Wetland

Subclass: Permanently, semi-permanently, or seasonally flooded; or saturated

## Soil features

Soils are commonly loamy fine sand to fine sandy loam and have slopes of 0 to 3 percent. A number of soils have a surface layer of mucky peat or slightly decomposed plant material. The soils are very poorly drained and formed in eolian sands and sandy alluvium. The surface layer is 5 to 14 inches thick. The subsurface layers range from sand to very fine sandy loam.

Soils Correlated to the Wet Land Site: Bigwinder, Herdcamp, Interior, and Lisco

Also correlated to this site are unnamed Endoaquolls in Niobrara County, Wyoming, and an unnamed Fluvent in Jackson County, South Dakota.

Because of variations in flooding frequencies, the Interior soil can also be correlated to the Badlands Terrace ecological site (R064XY048NE) and the Badlands Overflow ecological site (R064XY049NE).

The Lisco soil can also be correlated to the Saline Subirrigated (R064XY025NE) ecological site.

Rills and gullies are not typically present. Water flow patterns are barely distinguishable if present. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to nonexistent.

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

**Table 4. Representative soil features**

Parent material	(1) Eolian sands—sandstone and siltstone (2) Alluvium—sandstone and siltstone
Surface texture	(1) Fine sandy loam (2) Very fine sandy loam (3) Loamy fine sand
Family particle size	(1) Sandy
Drainage class	Very poorly drained
Permeability class	Moderate to rapid
Soil depth	80 in
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4-6 in
Calcium carbonate equivalent (0-40in)	0-40%

Electrical conductivity (0-40in)	0–16 mmhos/cm
Sodium adsorption ratio (0-40in)	0–50
Soil reaction (1:1 water) (0-40in)	5.6–9.6
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

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

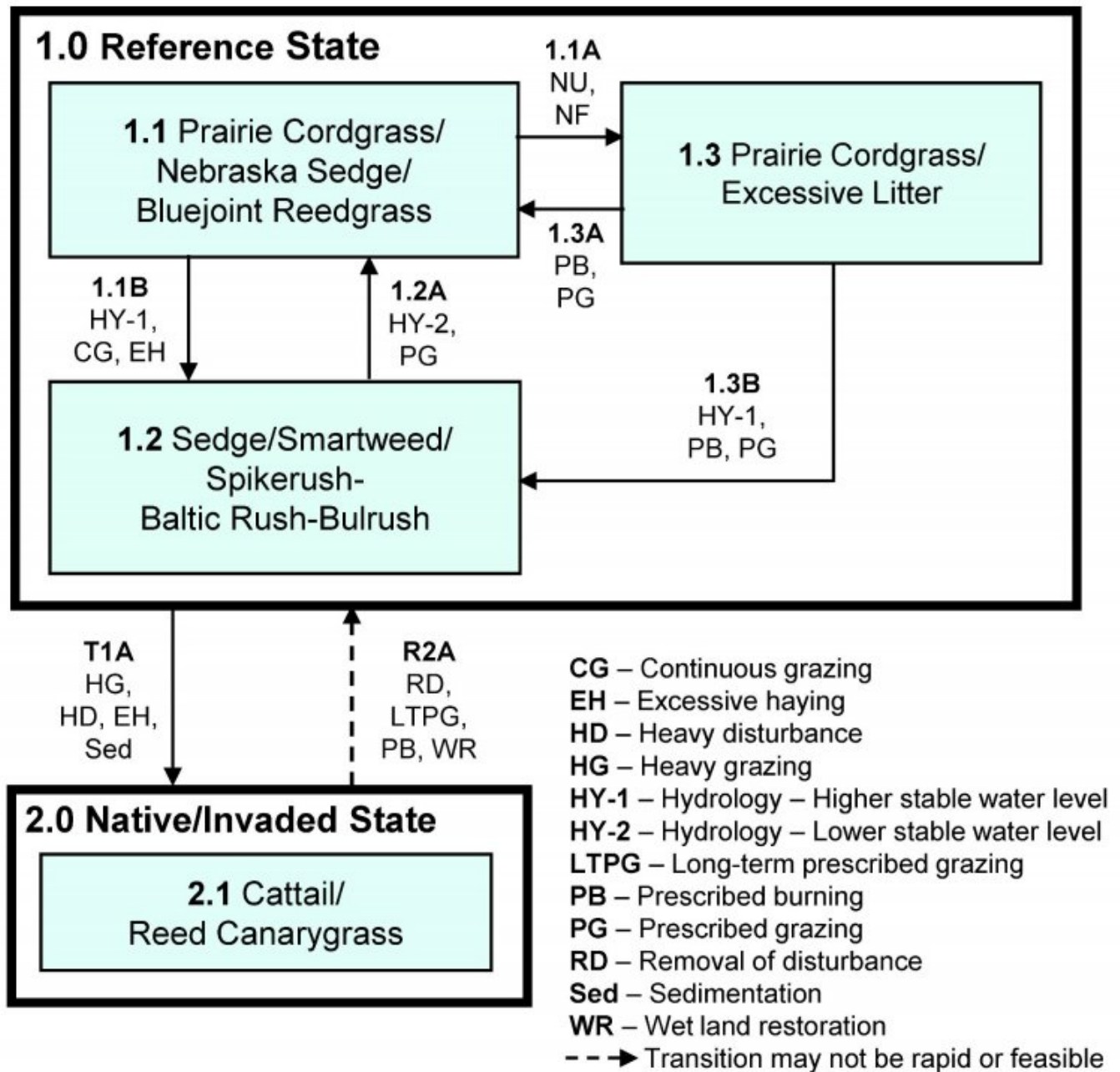
Continuous season-long grazing (during the typical growing season of May through October), or repeated seasonal grazing (e.g., every spring, every summer), without adequate recovery periods following each grazing occurrence causes this site to depart from the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1). Species such as spike sedge and Baltic rush increase in abundance. Grasses and grass-like species such as Nebraska sedge, bluejoint reedgrass, and northern reedgrass decrease in frequency and production.

Interpretations are primarily based on the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass 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 state-and-transition diagram illustrates the common plant communities on the site and the transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

## State and transition model

# Wet Land – R064XY022NE 3/12/19



### Diagram Legend: Wet Land - R064XY022NE

<b>T1A</b>	1.0 to 2.0	Heavy grazing without change in season of use or adequate recovery period; excessive haying; or heavy disturbance; and sedimentation.
<b>R2A</b>	2.0 to 1.0	Removal of management induced disturbance followed by long-term prescribed grazing including proper stocking rates, change in season of use, and adequate recovery periods; possibly prescribed burning; or wet land restoration. Recovery may not be fast or meet management objectives.
<b>1.1A</b>	1.1 to 1.3	Non-use and no fire.
<b>1.1B</b>	1.1 to 1.2	Change to a wetter hydrologic cycle with a higher stable water level; continuous grazing without change in season of use or adequate recovery time; or excessive haying.
<b>1.2A</b>	1.2 to 1.1	Return to a normal or slightly drier hydrologic cycle; and prescribed grazing that provided change in season of use and adequate recovery time.
<b>1.3A</b>	1.3 to 1.1	Prescribed grazing including, proper stocking rates, change in season of use, and adequate time for rest and recovery; and possibly prescribed burning.
<b>1.3B</b>	1.3 to 1.2	Change to a wetter hydrologic cycle with a higher stable water level; prescribed grazing, including proper stocking rates, change in season of use, and adequate time for rest and recovery; and possibly prescribed burning.

## 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 Wet Land ecological site prior to European settlement. This site, in the Reference State (1.0), is dominated by grasses, grass-like species, and forbs. Variations in annual precipitation and in length of time the site is ponded greatly influence the species composition from year to year. During wet years, the plant community responds to higher surface water levels. Grass-like species and forbs increase in abundance. During drier years, the plant community is dominated by grasses and obligate sedges and rushes. Grazing pressure on this site and surrounding sites also influence the plant community dynamics. Hoof action during wet periods can cause soil compaction and reduce rooting depth and soil saturation levels. Heavy animal concentrations or cropping on the surrounding landscapes can increase runoff and sedimentation. In pre-European settlement times, the primary disturbances included grazing by large ungulates, occasional fire, and drought. Favorable growing conditions occurred during the spring and the warm months of June through August. Today, a similar state can be found in areas where proper livestock management occurs.

## Community 1.1

### Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass

Interpretations are based primarily on the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1). This is also considered to be the reference plant community. Potential vegetation is about 60 percent grasses, 25 percent sedges and rushes, 10 percent forbs, and 5 percent trees. The major grasses and grass-like species include prairie cordgrass, Nebraska sedge, bluejoint reedgrass, and northern reedgrass. Grasses and grass-like species of lesser importance are Baltic rush and low-growing, unpalatable sedges. The plant community is well adapted to the Northern Great Plains climatic conditions. It is a critical plant community providing water and habitat for the surrounding area. The diversity in plant species provides a variety of habitats for wildlife. It is resistant to drought due to a dependable water supply. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type



Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	4280	4537	4700
Forb	220	688	1200
Shrub/Vine	0	275	600
<b>Total</b>	<b>4500</b>	<b>5500</b>	<b>6500</b>

Figure 9. Plant community growth curve (percent production by month).  
NE6408, Pine Ridge/Badlands, lowland cool-season/warm-season co-dominant. Cool-season, warm-season co-dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	12	20	25	19	11	5	3		

## Community 1.2

### Sedge/Smartweed/Spikerush-Baltic Rush-Bulrush

This plant community develops during a wetter cycle of precipitation and hydrology in conjunction with either continuous grazing without adequate recovery periods between grazing events or excessive haying. This plant community is approximately 30 percent grasses, 40 percent grass-like species, 25 percent forbs, and 5 percent shrubs. The plant community becomes dominated by grass-like species such as Nebraska sedge, various obligate and facultative wet sedges, spikerush, and Baltic rush. Forbs include Pennsylvania smartweed, swamp smartweed, and cattail. When compared to the Prairie Cordgrass-Bluejoint Reedgrass/Nebraska Sedge Plant Community (1.1), the abundance of prairie cordgrass, northern reedgrass, bluejoint reedgrass, and Nebraska sedge is decreased in Plant Community 1.2. Low growing unpalatable sedges, Baltic rush, and cattails have increased in abundance. The abundant production and proximity to water make Plant Community 1.2 important for livestock and wildlife such as birds, mule deer, and antelope. The plant community is stable and protected from excessive erosion. The biotic integrity of this plant community is intact. The watershed is usually functioning. Although plant diversity has been reduced, the soil is still stable. The water cycle, nutrient cycle, and energy flow are slightly reduced but continue to function adequately.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	980	1170	1455
Forb	220	585	950
Shrub/Vine	0	45	95
<b>Total</b>	<b>1200</b>	<b>1800</b>	<b>2500</b>

Figure 11. Plant community growth curve (percent production by month).  
NE6408, Pine Ridge/Badlands, lowland cool-season/warm-season co-dominant. Cool-season, warm-season co-dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	12	20	25	19	11	5	3		

## Community 1.3

### Prairie Cordgrass/Excessive Litter

This plant community develops after an extended period of non-use and in areas where fire has been eliminated. Excessive litter shades-out plants. This shading inhibits photosynthesis, reduces soil temperatures, and delays green-up in the spring. Plants become decadent and exhibit low vigor. Bunch grasses commonly develop dead centers. Organic matter oxidizes into the air rather than being incorporated into the soil. The dominant plants tend to be somewhat similar to those found in the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1); however, in advanced stages, frequency and production can be lower. Compared to the reference

community, litter amounts have increased, causing plants to become decadent. Much of the plant nutrients are tied up in excessive litter. Organic matter oxidizes into the air rather than being incorporated into the soil due to the absence of animal impact. Typically, bunchgrasses develop dead centers and rhizomatous grasses form small colonies because of a lack of tiller stimulation. Weedy species, cool-season grasses, and sedges can potentially increase in abundance. Prairie cordgrass is decreased in abundance. American licorice tends to invade. Noxious weeds such as Canada thistle may invade if a seed source is present. Plant diversity is moderate to high. This plant community is not resistant to change. Prescribed grazing or prescribed fire can easily move Plant Community 1.3 toward the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1). Soil erosion is not a concern due to increased litter levels and landscape position. The plant community is at-risk due to invasive plants.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3550	3625	3700
Forb	450	1125	1750
Shrub/Vine	0	250	550
<b>Total</b>	<b>4000</b>	<b>5000</b>	<b>6000</b>

Figure 13. Plant community growth curve (percent production by month).  
NE6408, Pine Ridge/Badlands, lowland cool-season/warm-season co-dominant. Cool-season, warm-season co-dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	12	20	25	19	11	5	3		

### Pathway 1.1B Community 1.1 to 1.2

Plant Community 1.1 is shifted to the Sedge/Smartweed/Spikerush-Baltic Rush-Bulrush Plant Community (1.2) by a wetter hydrologic cycle that has a higher stable water level; continuous grazing without adequate recovery periods; or excessive haying.

### Pathway 1.1A Community 1.1 to 1.3

Long-term non-use and no fire convert this plant community (1.1) to the Prairie Cordgrass/Excessive Litter Plant Community (1.3). Initially, excess litter begins to build-up. Eventually, native plants can show signs of mortality and decadence.

### Pathway 1.2A Community 1.2 to 1.1

Prescribed grazing that provides change in season of use and allows adequate recovery time, in conjunction with a return to a normal or slightly drier cycle of precipitation and hydrology, shift Plant Community 1.2 to the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1).

#### Conservation practices

Prescribed Grazing
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### Pathway 1.3A Community 1.3 to 1.1

Prescribed grazing that includes proper stocking rates, change in season of use, and adequate time for plant recovery; or, possibly, prescribed burning in combination with prescribed grazing shift Plant Community 1.3 to the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1).

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3B  
Community 1.3 to 1.2

Change to a wetter hydrologic cycle that has a higher stable water level; or prescribed burning followed by prescribed grazing convert Plant Community 1.3 to the Sedge/Smartweed/Spikerush-Baltic Rush-Bulrush Plant Community (1.2).

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2  
Native/Invaded State

The Native/Invaded State (2.0) is dominated by native and non-native cool-season grasses and grass-like species. The non-native cool-season grasses, primarily Kentucky bluegrass, make up 10 to 15 percent of the total annual production. This state is the result of heavy grazing; excessive haying; or heavy disturbance that can create soil compaction and sedimentation. Cattails and possibly reed canarygrass increase in abundance and replace the reference plant community. The Native/Invaded State (2.0) is very resilient and resistant to change.

Community 2.1  
Cattail/Reed Canarygrass

This plant community develops due to further heavy grazing; excessive haying; or heavy disturbance and sedimentation. Cattails and possibly reed canarygrass invade the site and displace the more palatable grasses and grass-like species. The drier areas of the plant community are likely to be dominated by Kentucky bluegrass. Compared to the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1), the abundance of prairie cordgrass, bluejoint reedgrass, and Nebraska sedge has decreased. Low growing unpalatable sedges, Baltic rush, and cattails have increased in abundance. The plant community is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact. The watershed is usually functioning.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1780	2175	2575
Forb	220	675	1100
Shrub/Vine	0	150	325
Total	2000	3000	4000

Figure 15. Plant community growth curve (percent production by month).  
NE6408, Pine Ridge/Badlands, lowland cool-season/warm-season co-  
dominant. Cool-season, warm-season co-dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	12	20	25	19	11	5	3		

Transition T1A  
State 1 to 2

Heavy grazing, excessive haying with no recovery opportunity, or heavy disturbance that results in sedimentation transition State 1.0 to the Native/Invaded State (2.0).

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

Removal of management-induced disturbance coupled with long-term prescribed grazing; or prescribed burning in combination with prescribed grazing may eventually move the Native/Invaded State (2.0) toward the Reference State (1.0). This transition pathway assumes the availability of an adequate seed and vegetative source. This process may require a long time to accomplish and may be difficult to attain depending on the degree of degradation. Wetland restoration may be an alternative but may be cost prohibitive and may not meet management objectives.

**Conservation practices**

Prescribed Burning
Prescribed Grazing

**Additional community tables**

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall Warm-Season Grasses			2200–3025	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	2200–3025	–
2	Cool-Season Grasses			550–1650	
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	550–1375	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	275–825	
3	Other Native Grasses			275–550	
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	110–275	–
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	0–275	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	110–275	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–275	–
	American sloughgrass	BESY	<i>Beckmannia syzigachne</i>	0–55	–
4	Grass-Likes			1100–1925	
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	550–1375	–
	bulrush	SCHOE6	<i>Schoenoplectus</i>	275–550	–
	sedge	CAREX	<i>Carex</i>	275–550	–
	rush	JUNCU	<i>Juncus</i>	0–275	–
	spikerush	ELEOC	<i>Eleocharis</i>	55–275	–
	scouringrush horsetail	EQHY	<i>Equisetum hyemale</i>	0–275	–
5	Non-Native Cool-Season Grasses			0	
Forb					
6	Forbs			275–1100	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–275	–
	aster	ASTER	<i>Aster</i>	0–110	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–110	–
	broadleaf cattail	TYLA	<i>Typha latifolia</i>	0–110	–
	iris	IRIS	<i>Iris</i>	0–110	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–110	–
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	0–110	–
	poison hemlock	COMA2	<i>Conium maculatum</i>	0–110	–
	swamp smartweed	POHY2	<i>Polygonum hydropiperoides</i>	0–110	–
	water hemlock	CICUT	<i>Cicuta</i>	0–110	–
	onion	ALLIU	<i>Allium</i>	0–110	–
	curly dock	RUCR	<i>Rumex crispus</i>	0–110	–
	plantain	PLANT	<i>Plantago</i>	0–110	–
	duckweed	LEMNA	<i>Lemna</i>	0–110	–
Shrub/Vine					
7	Shrubs			0–550	
	willow	SALIX	<i>Salix</i>	0–550	

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall Warm-Season Grasses</b>			0–90	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	0–90	–
2	<b>Cool-Season Grasses</b>			0–90	
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	0–90	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	0–90	–
3	<b>Other Native Grasses</b>			90–180	
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	90–180	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–90	–
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	18–90	–
	American sloughgrass	BESY	<i>Beckmannia syzigachne</i>	0–36	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–18	–
4	<b>Grass-Likes</b>			360–810	
	bulrush	SCHOE6	<i>Schoenoplectus</i>	90–360	–
	spikerush	ELEOC	<i>Eleocharis</i>	180–360	–
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	90–270	–
	sedge	CAREX	<i>Carex</i>	18–180	–
	rush	JUNCU	<i>Juncus</i>	18–90	–
	scouringrush horsetail	EQHY	<i>Equisetum hyemale</i>	0–90	–
5	<b>Non-Native Cool-Season Grasses</b>			0–90	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–90	–
<b>Forb</b>					
6	<b>Forbs</b>			270–900	
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	270–540	–
	broadleaf cattail	TYLA	<i>Typha latifolia</i>	90–270	–
	swamp smartweed	POHY2	<i>Polygonum hydropiperoides</i>	90–180	–
	curly dock	RUCR	<i>Rumex crispus</i>	36–180	–
	duckweed	LEMNA	<i>Lemna</i>	0–90	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–90	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–90	–
	iris	IRIS	<i>Iris</i>	0–36	–
	water hemlock	CICUT	<i>Cicuta</i>	0–36	–
	poison hemlock	COMA2	<i>Conium maculatum</i>	0–36	–
	plantain	PLANT	<i>Plantago</i>	0–36	–
	aster	ASTER	<i>Aster</i>	0–36	–
	onion	ALLIU	<i>Allium</i>	0–18	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–18	–
<b>Shrub/Vine</b>					
7	<b>Shrubs</b>			0–90	
	willow	SALIX	<i>Salix</i>	0–90	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall Warm-Season Grasses</b>			1000–1500	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	1000–1500	–
2	<b>Cool-Season Grasses</b>			500–1000	
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	250–750	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	250–500	–
3	<b>Other Native Grasses</b>			250–1000	
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	250–500	–
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	250–500	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–250	–
	American sloughgrass	BESY	<i>Beckmannia syzigachne</i>	0–100	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–100	–
4	<b>Grass-Likes</b>			500–1250	
	sedge	CAREX	<i>Carex</i>	250–750	–
	rush	JUNCU	<i>Juncus</i>	250–500	–
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	250–500	–
	bulrush	SCHOE6	<i>Schoenoplectus</i>	250–500	–
	spikerush	ELEOC	<i>Eleocharis</i>	50–250	–
	scouringrush horsetail	EQHY	<i>Equisetum hyemale</i>	0–250	–
5	<b>Non-Native Cool-Season Grasses</b>			100–500	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	100–500	–
<b>Forb</b>					
6	<b>Forbs</b>			500–1750	
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	250–750	–
	broadleaf cattail	TYLA	<i>Typha latifolia</i>	250–750	–
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	0–500	–
	swamp smartweed	POHY2	<i>Polygonum hydropiperoides</i>	0–500	–
	curly dock	RUCR	<i>Rumex crispus</i>	100–500	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–250	–
	plantain	PLANT	<i>Plantago</i>	0–100	–
	water hemlock	CICUT	<i>Cicuta</i>	0–100	–
	poison hemlock	COMA2	<i>Conium maculatum</i>	0–100	–
	iris	IRIS	<i>Iris</i>	0–100	–
	aster	ASTER	<i>Aster</i>	0–100	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–50	–
	onion	ALLIU	<i>Allium</i>	0–50	–
	duckweed	LEMNA	<i>Lemna</i>	0–50	–
<b>Shrub/Vine</b>					
7	<b>Shrubs</b>			0–500	
	willow	SALIX	<i>Salix</i>	0–500	–



Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall Warm-Season Grasses</b>			300–450	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	300–450	–
2	<b>Cool-Season Grasses</b>			150–600	
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	150–300	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	150–300	–
3	<b>Other Native Grasses</b>			450–750	
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	300–600	–
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	150–300	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–150	–
	American sloughgrass	BESY	<i>Beckmannia syzigachne</i>	0–60	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–60	–
4	<b>Grass-Likes</b>			450–750	
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	150–450	–
	bulrush	SCHOE6	<i>Schoenoplectus</i>	150–450	–
	sedge	CAREX	<i>Carex</i>	150–450	–
	rush	JUNCU	<i>Juncus</i>	150–300	–
	spikerush	ELEOC	<i>Eleocharis</i>	30–150	–
	scouringrush horsetail	EQHY	<i>Equisetum hyemale</i>	0–150	–
5	<b>Non-Native Cool-Season Grasses</b>			150–600	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	150–600	–
<b>Forb</b>					
6	<b>Forbs</b>			300–1050	
	broadleaf cattail	TYLA	<i>Typha latifolia</i>	300–750	–
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	60–300	–
	curly dock	RUCR	<i>Rumex crispus</i>	30–300	–
	swamp smartweed	POHY2	<i>Polygonum hydropiperoides</i>	0–150	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–150	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–150	–
	aster	ASTER	<i>Aster</i>	0–60	–
	water hemlock	CICUT	<i>Cicuta</i>	0–60	–
	plantain	PLANT	<i>Plantago</i>	0–60	–
	poison hemlock	COMA2	<i>Conium maculatum</i>	0–60	–
	iris	IRIS	<i>Iris</i>	0–60	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–60	–
	duckweed	LEMNA	<i>Lemna</i>	0–30	–
	onion	ALLIU	<i>Allium</i>	0–30	–
<b>Shrub/Vine</b>					
7	<b>Shrubs</b>			0–300	
	willow	SALIX	<i>Salix</i>	0–300	–

## 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 Wet Land ecological site provides wetland obligate or facultative wet plant communities. This site is typically part of an expansive grassland landscape that included combinations of Thin Breaks, Clayey, Claypan, Dense Clay, Loamy, Saline, Sandy, Shallow, Overflow, and Terrace ecological sites.

The Wet Land ecological site has remained relatively intact but may be subject to haying under drier conditions. This site receives surface and subsurface water from adjacent upland sites during precipitation events. The site provides ponded water that is important habitat for water fowl and shore birds. Other birds that frequent this site include red-wing blackbirds, sandhill cranes, Wilson snipe, Virginia rail, sora, American bittern, and upland sandpipers. The diverse plant communities are beneficial to small rodents, bats, mammalian predators, reptiles, amphibians, and insects. These sites may provide forage sites for sharp-tailed grouse broods.

### Grazing Interpretations:

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

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

Plant Community: Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass (1.1)

Average Production (lb/acre, air-dry): 5,500

Stocking Rate (AUM/acre): 1.51

\*Plant Community: Sedge/Smartweed/Spikerush-Baltic Rush-Bulrush (1.2)

Average Production (lb/acre, air-dry): 1,800

Stocking Rate (AUM/acre): Variable

Plant Community: Prairie Cordgrass/Excessive Litter (1.3)

Average Production (lb/acre, air-dry): 5,000  
Stocking Rate (AUM/acre): 1.37

\*Plant Community: Cattails/Reed Canarygrass (2.1)  
Average Production (lb/acre, air-dry): Variable  
Stocking Rate (AUM/acre): Variable

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

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 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 has insufficient protein to meet livestock requirements. Added protein allows ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

## **Hydrological functions**

Excessive water is the principal factor limiting forage production on this site. Soils on this site are in Hydrologic Soil Groups C and D due to high water tables. Although the soils are permeable, the high water tables limit infiltration. Surrounding upland areas tend to have very permeable soils that cause surface inflow peaks to these sites to be muted. Generally, outflows occur only as a result of very intense storms or seepage inflows during very wet years. Many areas of the Wet Land ecological site are frequently to continuously flooded. 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 bird watching and for hunting upland game species and water fowl. 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 has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, range management specialist (RMS), NRCS; Jill Epley, RMS, NRCS; Rick Peterson, RMS, NRCS; David Steffen, RMS, NRCS; Jeff Vander Wilt, RMS, NRCS; Phil Young, soil scientist, NRCS; and George Gamblin, RMS, NRCS.

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## **Contributors**

Rick L. Peterson  
Stan C. Boltz

## **Approval**

Suzanne Mayne-Kinney, 12/16/2024

## **Acknowledgments**

This ecological site was reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS on 2/15/2019.

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## **Rangeland health reference sheet**

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

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

## Indicators

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

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2. **Presence of water flow patterns:** None. Water flow patterns are not expected on the site.  

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3. **Number and height of erosional pedestals or terracettes:** None. Pedestals and terracettes are not expected on the site.  

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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 less than 5 percent. During periods of above average precipitation and run-on, this site may be ponded for longer than normal durations, and typical vegetation may be temporarily reduced, creating significant areas of bare ground for relatively short periods of time.  

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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 on this site.  

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

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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. This site typically has an O-horizon (roots and partly decomposed stems and leaves of plants) that is 0 to 3 inches (0 to 7.6 cm) thick. 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 5 to 14 inches (12.7 to 35.6 cm) thick. Soil colors range from light grayish brown, grayish brown very dark gray to light gray (values of 4 to 7) when dry and grayish brown to very dark grayish brown (values of 3 to 4) when moist.

Structure typically is medium to fine angular blocky in the 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 and tall rhizomatous and tufted perennial cool season grasses) with fine and coarse roots positively influences infiltration.

Relative composition is approximately 60 percent grasses, 25 percent grass-like plants, 10 percent forbs, and 5 percent woody vegetation. The grass component is composed of C4, tallgrasses (40-55%) and C3 grasses (15-35%).

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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. A compaction layer should not occur on this site.
- 

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

Dominant: Phase 1.1

1. Native, perennial, C4 tallgrass, 2200-3025 #/ac, 40-55% (1 species minimum): prairie cordgrass.
2. Native grass-likes, 1100-1925 #/ac, 20-35% (3 species minimum): Nebraska sedge, bulrush, sedge, Baltic rush, rush, spikerush.
3. Native, perennial, C3 grass, 825-2200 #/ac, 15-35% (4 species minimum): bluejoint reedgrass, northern reedgrass, foxtail barley, reed canarygrass, slender wheatgrass, American sloughgrass.

Phase 1.2

1. Native forbs, 270-900 #/ac, 15-50% (4 species minimum): broadleaf cattail, Pennsylvania smartweed, swamp smartweed, curly dock and other forbs that vary from location to location.
2. Native grass-likes, 360-810 #/ac, 20-45% (5 species minimum): Nebraska sedge, bulrush, sedge, rush, spikerush

Phase 1.3

1. Native, perennial, C3 grass, 1000-2000 #/ac, 20-40% (4 species minimum): bluejoint, northern reedgrass, foxtail barley, reed canarygrass, slender wheatgrass, American sloughgrass.
2. Native, perennial, C4, tallgrass, 1000-1500 #/ac, 20-30% (1 species minimum): prairie cordgrass.
3. Native forbs, 500-1750 #/ac, 10-35% (3 species minimum): American licorice, broadleaf cattail, curly dock, and other species which vary from location to location.

Sub-dominant: Phase 1.1

1. Native forbs, 275-1100#/ac, 5-20% (3 species minimum): species present will vary from location to location.

Phase 1.2

1. Native, perennial, C3 grass, 90-270 #/ac, 5-15% (2 species minimum): bluejoint reedgrass, northern reedgrass, foxtail barley, reed canarygrass, slender wheatgrass, American sloughgrass.

Other: Minor - Phase 1.1

1. Shrubs, 0-550 #/ac (0-10%): willow.

Minor - Phase 1.2

1. Native, perennial, C4, tallgrass, 0-90 #/ac, 0-5%: prairie cordgrass.
2. Non-native, perennial, C3 grass, 0-90 #/ac, 0-5%: Kentucky bluegrass.
3. Shrubs, 0-90 #/ac, 0-5%: willow.



Minor - Phase 1.3

1. Native grass-likes, 250-500 #/ac, 5-10%: Nebraska sedge, bulrush, sedge, rush, spike rush.
2. Non-native, perennial, C3 grass, 100-500 #/ac, 2-10%: Kentucky bluegrass.
3. Shrubs, 0-500 #/ac, 0-10%: willow.

Additional: The Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Community or Reference Community (1.1) consists of five F/S groups. These groups, in order of relative abundance, are native, perennial, C4, tallgrass; native grass-likes; native, perennial, C3 grass; native forbs; and shrubs.

The Sedge/Smartweed/Spikerush-Baltic Rush-Bulrush Community (1.2) consists of six F/S groups. These groups, in order of relative abundance are native forbs; native grass-likes; native, perennial, C3 grass; native, perennial, C4 tallgrass = non-native, perennial, C3 grass = and shrubs.

The Prairie Cordgrass-Excessive Litter Community (1.3) consists of six F/S groups. These groups, in order of abundance, are native, perennial, C3 grass; native, perennial, C4, tallgrass; native forbs; native grass-likes; non-native, perennial, C3 grass; and shrubs.

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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 80 to 90 percent and at a depth of 0.50 to 1.50 inch (1.3 to 3.9 cm). Reed canarygrass, Kentucky bluegrass, and creeping meadow foxtail 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 5,500 pounds per acre in a year with normal precipitation and temperatures. Low and High production years should yield 4,500 and 6,500 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. Reed canarygrass, Kentucky bluegrass, and creeping meadow foxtail 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.
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