USDA Natural Resources
Conservation Service

Ecological site R058DY004SD
Wet Meadow

Last updated: 7/18/2024
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): 058D–Northern Rolling High Plains, Eastern Part

The Northern Rolling High Plains, Eastern Part (MLRA 58D) is shared between South Dakota (65 percent), Montana (21 percent), and North Dakota (14 percent). The MLRA is approximately 2,755 square miles. The small towns of Buffalo and Camp Crook, South Dakota, and Marmarth, North Dakota, are all within the boundary of this MLRA, and Baker, Montana, is on the northern most edge. Portions of the Little Missouri National Grassland and Custer National Forest are also in the MLRA. Portions of the Little Missouri River and the headwaters of major tributaries that eventually form the Grand and Moreau Rivers in South Dakota are also in this area.

The Northern Rolling High Plains, Eastern Part consists of Cretaceous marine and continental sediments of shale, siltstone, and sandstone. The continental and marine Hell Creek Formation is under approximately 85 percent of the MLRA, and the Fox Hills Sandstone forms the southern boundary of the MLRA. Tertiary deposits are in scattered areas throughout the MLRA. These deposits consist of the Paleocene Ludlow and Tongue River Formations, the Oligocene White River Group, and the Miocene Arikaree Group. These Tertiary deposits are resistant and positioned above the Cretaceous beds. Ponderosa pine growing in areas of these Tertiary formations further distinguishes these formations from the other formations in the MLRA. Pleistocene and Holocene river sand and gravel deposits are also on the valley floors and on the terraces along the larger rivers in the area. A large Quaternary eolian deposit is directly south of the town of Buffalo.

The average elevation of MLRA 58D ranges from 2,300 feet to 4,000 feet, increasing gradually from east to west. Harding Peak is the highest point at 4,019 feet. In places, flat-topped, steep-sided buttes rise sharply above the gently rolling plains below.

The dominant soil orders in this MLRA are Alfisols, Entisols, Inceptisols, and Mollisols. The soils in the area dominantly have a frigid soil temperature regime, an ustic soil moisture regime that borders on aridic, and mixed mineralogy. They are shallow to very deep, generally well drained, and loamy or clayey.

Annual precipitation is 14 to 17 inches and can fluctuate widely from year to year. Most rainfall occurs early in the growing season. Some high-intensity thunderstorms occur mid to late summer. The native vegetation in this MLRA consists primarily of grasses and forbs with a small component of trees and shrubs along streams. Ponderosa pine grow on the upper slopes and on the top of some of the higher buttes. Open grasslands are characterized by western wheatgrass, green needlegrass, blue grama, and buffalograss. Wyoming big sagebrush grows on clayey soils in the western part of the MLRA.

More than four-fifths of the MLRA is privately owned ranches running cattle, sheep, or both. Less than 5 percent of the area is federally owned. The major resource concerns are water quality, wind erosion, and water erosion (USDA, NRCS. 2006. Ag Handbook 296).

Classification relationships

USDA
Land Resource Region G—Western Great Plains Range and Irrigated Region:
Major Land Resource Area (MLRA) 58D—Northern Rolling High Plains, Eastern Part.

US Environmental Protection Agency (EPA)
Level IV Ecoregions of the Conterminous United States:
Northwestern Great Plains—43:
Forested Buttes—43d.
Sagebrush Steppe—43e.

USDA Forest Service
Ecological Subregions: Sections and Subsections of Conterminous United States:
Great Plains - Palouse Dry Steppe Province—331:
Missouri Plateau Section—331M.
Sagebrush Steppe Subsection—334Mi.

Ecological site concept

The Wet Meadow ecological site is of limited extent in MLRA 58D. It’s a run-in site on oxbows, and flood plains. Slopes range from 0 to 2 percent. The soils are very deep, poorly drained, and formed in clayey or silty alluvium. The surface layer is 5 to 15 inches in depth with silt loam to silty clay textures. A permanent water table fluctuates between the surface and a depth of 36 inches. Ponding occurs for 4 to 8 weeks in the spring of the year.

Vegetation in Reference State (1.0) dominated by prairie cordgrass, reedgrass, sedges, and rushes.

Associated sites

R058DY007SD	**Saline Lowland** The Saline Lowland ecological site is found on similar landscapes as the Wet Meadow ecological site. The plant communities in the Saline Lowland will be more saline-tolerant.
R058DY002SD	**Wet Land** The Wet Land ecological site is found adjacent to or intermixed with the Wet Meadow ecological site. The Wet Land ecological site will have a permanent water table within 18 inches of the soil surface, the Wet Meadow will have a permanent water table within 72 inches of the soil surface.

Similar sites

R058DY002SD	**Wet Land** The Wet Land ecological site will have less prairie cordgrass; and less upland grasses than the Wet Meadow ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Spartina pectinata* (2) *Calamagrostis stricta ssp. inexpansa*

Physiographic features

The Wet Meadow ecological site is found in level or nearly level sedimentary floodplains. A water table generally occurs at or within 36 inches of the surface.

Table 2. Representative physiographic features

Landforms	(1) Oxbow (2) Flood plain
Runoff class	Negligible to medium
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Occasional to frequent
Elevation	2,300–4,000 ft
Slope	0–2%
Ponding depth	0–6 in
Water table depth	0–72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate in MLRA 58D is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland to the east. Average annual precipitation ranges from 14 to 17 inches with most falling in the early growing season. Some high intensity, convective thunderstorms occur in the summer. Precipitation in winter occurs as snow. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This wide range is due to the high elevation and dry air, which permit rapid incoming and outgoing radiation. Outbreaks of cold air from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter but have the most severe effect on ranching operations during late winter and in spring.

The normal average annual temperature is about 44 °F. January is the coldest month with average temperatures ranging from about 12 °F (Marmarth, North Dakota) to about 20 °F (Baker, Montana). July is the warmest month with temperatures averaging from about 70 °F (Marmarth, North Dakota) to about 76 °F (Baker, Montana). The range of normal average monthly temperatures between the coldest and warmest months is about 55 °F. Wind speeds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime winds. Strong storms may bring brief periods of high winds with gusts of more than 50 mph.

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)	97-111 days
Freeze-free period (characteristic range)	121-129 days
Precipitation total (characteristic range)	15-17 in
Frost-free period (actual range)	93-115 days
Freeze-free period (actual range)	120-132 days
Precipitation total (actual range)	14-17 in
Frost-free period (average)	104 days
Freeze-free period (average)	125 days
Precipitation total (average)	16 in

Climate stations used

- (1) BAKER 1 E [USC00240412], Baker, MT
- (2) LADNER 9SW [USC00394671], Camp Crook, SD
- (3) BUFFALO ASOS [USW00094037], Buffalo, SD
- (4) BUFFALO 13 ESE [USW00094081], Reva, SD
- (5) REDIG 11 NE [USC00397062], Buffalo, SD
- (6) CAMP CROOK [USC00391294], Camp Crook, SD
- (7) HOOVER [USC00393945], Newell, SD

Influencing water features

Wetland description

System: Palustrine
Subsystem: N/A
Class: Emergent Wetland
Subclass: Persistent
(Cowardin et al., 1979)

Soil features

Soils common to the Wet Meadow ecological site have a silt loam to silty clay surface layer that is 5 to 15 inches thick. Slopes range from 0 to 2 percent. Soils are deep (greater than 20 inches) and formed in alluvium. The texture of the subsurface layer’s ranges from silt loam to silty clay. Subsurface layers are nonrestrictive to water movement and root penetration. The soils in this site are poorly drained and have a very slow infiltration rate. Ponded water conditions and slow permeability strongly influences the soil-water-plant relationship.

This site should show no evidence of rills, wind-scoured areas, or pedestalled plants. The soil surface is stable and intact.

The major soils correlated to the Wet Meadow ecological site include, Lallie and Regan.

Lallie is also correlated to the Wet Land ecological site when there is a permanent water table within 1 to 2 feet of the surface.

Regan is also correlated to the Saline Lowland when it has a saline local phase.

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

Table 4. Representative soil features

Parent material	(1) Alluvium–mudstone (2) Alluvium–siltstone
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Poorly drained
Permeability class	Slow to moderate
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–8 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The Wet Meadow ecological site developed under the 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. While 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.

The plant community upon which interpretations are primarily based is the Prairie Cordgrass-Northern Reedgrass Plant Community (1.1). This plant community has been determined by studying rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

Ecological changes occur on this site primarily because of continuous grazing without adequate recovery opportunities between grazing events, and non-use and lack of fire. Continuous grazing will cause species such as spikerush, mountain rush (Baltic rush), and native bluegrass to increase. Introduced species such as Kentucky bluegrass and creeping meadow foxtail will begin to invade and dominate, as will reed canarygrass. Grasses such as prairie cordgrass and northern reedgrass will decrease in frequency and production and can eventually be removed from the site. Non-use (extended rest over years) or lack of fire will cause litter levels and plant decadence and mortality to increase.

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

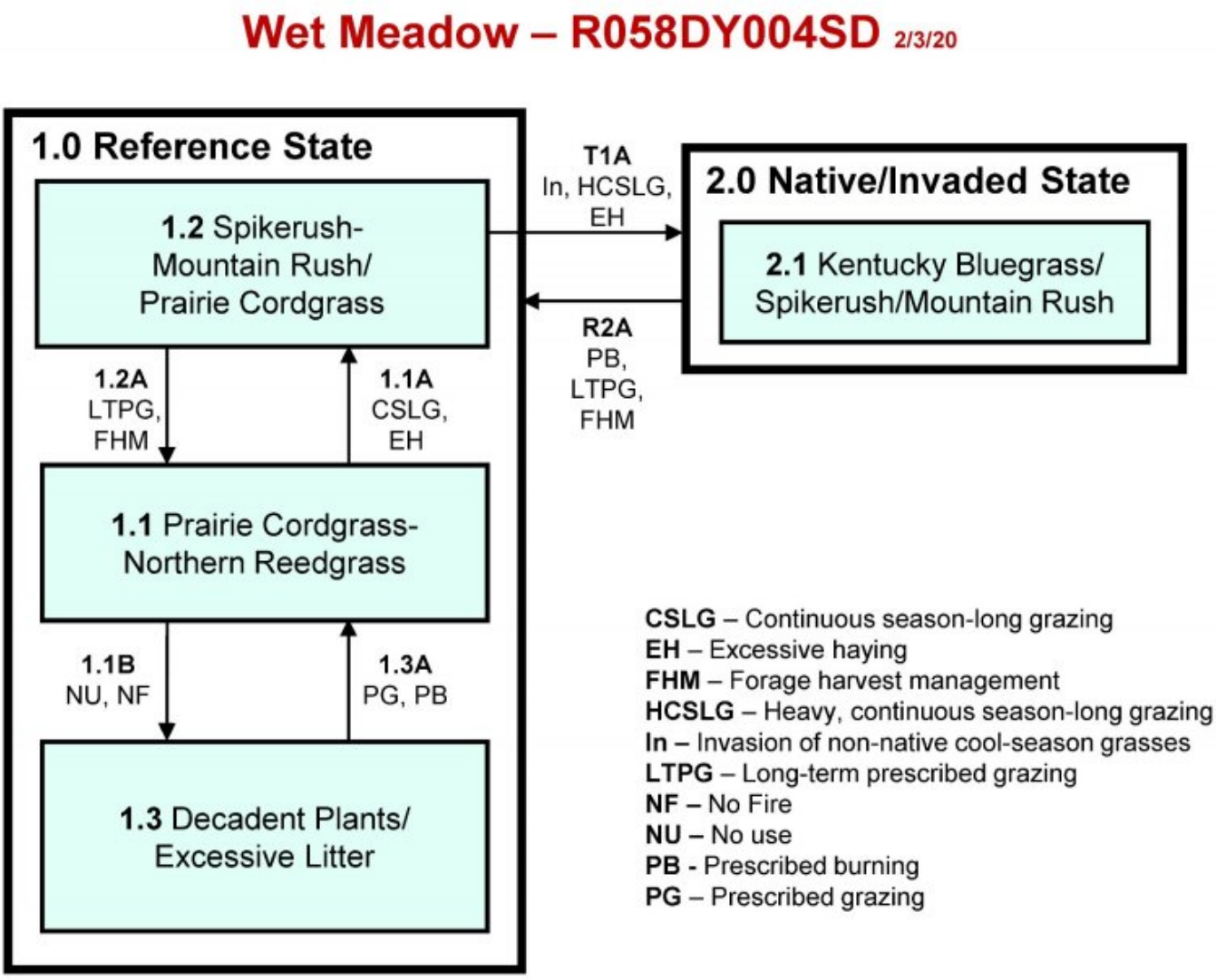

Diagram Legend: Wet Meadow - R058DY004SD

T1A	1.0 to 2.0	Heavy, continuous season-long grazing without change in season of use or adequate recovery; excessive haying; invasion and establishment of non-native cool-season grasses.
R2A	2.0 to 1.0	Long-term prescribed grazing including proper stocking rates, change in season of use, and adequate recovery periods following grazing event; prescribed burning; forage harvest management.
1.1A	1.1 to 1.2	Continuous season-long grazing without change in season of use, or adequate recovery following grazing event; or excessive haying.
1.1B	1.1 to 1.3	No use and no fire, accumulation of litter.
1.2A	1.2 to 1.1	Long-term prescribed grazing including proper stocking rates, change in season of use, and adequate time for recovery following grazing event; forage harvest management.
1.3A	1.3 to 1.1	Prescribed grazing including proper stocking rates, change in season of use, and adequate time for recovery following grazing event; prescribed burning.

State 1
Reference State

The Reference State (1.0) represents what is believed to show the natural range of variability that dominated the

dynamics of the Wet Meadow ecological site prior to European settlement. This site is dominated by a mixture of cool- and warm-season grasses and grass-likes. In pre-European settlement times, the primary disturbances included grazing by large ungulates and small mammals, drought, and a fluctuating water table. 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 use has occurred.

Dominant plant species

- prairie cordgrass (*Spartina pectinata*), grass
- spikerush (*Eleocharis*), grass
- mountain rush (*Juncus arcticus ssp. littoralis*), grass
- northern reedgrass (*Calamagrostis stricta ssp. inexpansa*), grass
- Rocky Mountain bulrush (*Schoenoplectiella saximontana*), grass

Community 1.1
Prairie Cordgrass-Northern Reedgrass

Interpretations are based primarily on the Prairie Cordgrass-Northern Reedgrass Plant Community. This is also considered to be the Reference Plant Community (1.1). Potential vegetation is about 55 percent grasses, 40 percent sedges and rushes, 5 percent forbs, and 0 to 2 percent shrubs and trees. Prairie cordgrass is the dominant tall warm-season grass occupying this plant community. Northern reedgrass is the dominant tall cool-season species. A variety of sedges and rushes occur throughout this community, as well as, switchgrass and fowl bluegrass. Key forbs include Maximillian sunflower, Canada goldenrod, and cinquefoil. This plant community is diverse, stable, and productive, and is well adapted to the Northern Great Plains. The high-water table supplies much of the moisture for plant growth. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for the variability of both the fluctuations of water table and reoccurring flooding. 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	3870	4252	4625
Forb	130	180	230
Shrub/Vine	0	45	95
Tree	0	23	50
Total	**4000**	**4500**	**5000**

Figure 9. Plant community growth curve (percent production by month). SD5808, Northern Rolling High Plains, lowland cool-season/warm-season codominant. Cool-season, Warm-season codominant, Lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Community 1.2
Spikerush-Mountain Bulrush/Prairie Cordgrass

This plant community will slowly develop from the adverse effects of continuous season-long grazing which includes grazing at moderate to heavy stocking levels for the full growing season, each year, and without change in season of use, or adequate recovery periods between each grazing event during the growing season. This plant community is approximately 45 percent grasses, 45 percent grass-like species, 10 percent forbs, and 0 to 3 percent shrubs and trees. Recognition of this plant community will enable the land user to implement key management decisions before a significant ecological threshold is crossed. Prairie cordgrass has been reduced in this plant community, but still persists in fair amounts. Spikerush and mountain rush (Baltic rush), as well as, other grass-likes have increased and become the dominant species. Northern reedgrass has been significantly reduced. Switchgrass may be

removed at this stage. Creeping meadow foxtail can typically invade along drainageways if an upstream seed source is present. Forb species would include asters, goldenrod and cinquefoil as well as a possible invasion of Canada thistle. Plant production and frequency have been reduced. The water cycle, nutrient cycle and energy flow are slightly reduced but continue to adequately function.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2830	3185	3510
Forb	170	262	375
Shrub/Vine	0	35	75
Tree	0	18	40
Total	**3000**	**3500**	**4000**

Figure 11. Plant community growth curve (percent production by month). SD5808, Northern Rolling High Plains, lowland cool-season/warm-season codominant. Cool-season, Warm-season codominant, Lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Community 1.3
Decadent Plants/Excessive Litter

This plant community develops after an extended period (10 to 20 years or more) of non-use or exclusion of fire. Eventually litter levels become high enough to reduce native grass vigor, diversity, and density. Years of accumulated litter will tend to make this community wetter. Mountain rush (Baltic rush) and bulrush will increase. Hydrophytic forbs will also increase. Bluegrasses such as fowl bluegrass and Kentucky bluegrass as well as creeping meadow foxtail can flourish in this environment and will become a major component of this plant community. This plant community is resistant to change without prescribed grazing and fire. The combination of both grazing and fire is most effective in moving this plant community towards the Prairie Cordgrass-Northern Reedgrass Plant Community (1.1). Soil erosion and runoff is low. Once this plant community is reached, time and external resources will be needed to see any immediate recovery.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2900	3308	3705
Forb	100	140	180
Shrub/Vine	0	35	75
Tree	0	17	40
Total	**3000**	**3500**	**4000**

Figure 13. Plant community growth curve (percent production by month). SD5806, Northern Rolling High Plains, lowland cool-season dominant. Cool-season dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing without change in season of use, or adequate recovery periods between grazing events; or excessive haying will shift the Prairie Cordgrass-Northen Reedgrass Plant Community (1.1) to the

Spikerush-Mountain Bulrush/Prairie Cordgrass Plant Community (1.2).

Pathway 1.1B
Community 1.1 to 1.3

Non-use and no fire for an extended period of time will allow for litter build-up and a shift the Reference Plant Community (1.1) to the Decadent Plants/Excessive Litter Plant community (1.3).

Pathway 1.2A
Community 1.2 to 1.1

Long-term prescribed grazing including proper stocking rates, change in season of use, and adequate time for recovery following grazing event; or forage harvest management will shift the Spikerush-Mountain Rush/Prairie Cordgrass Plant Community (1.2) to the Prairie Cordgrass-Northern Reedgrass Plant Community (1.1).

Conservation practices

Forage Harvest Management
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

Prescribed grazing or prescribed burning followed by prescribed grazing will move this plant community toward the Prairie Cordgrass-Northern Reedgrass Plant Community (1.1). This would require long-term management with prescribed grazing and prescribed burning under controlled conditions.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Native/Invaded

The Native/Invaded State (2.0) is dominated by native and non-native cool-season grasses and grass-like plants. The non-native cool-season grasses are primarily Kentucky bluegrass, quackgrass, and possibly creeping meadow foxtail on reed canarygrass. This state is the result of the invasion of non-native cool-season grasses in combination with continuous season-long grazing, or excessive haying. The species that invaded may have also been seeded or escaped from adjacent haylands. The Native/Invaded State (2.0) is very resilient and resistant to change.

Dominant plant species

- Kentucky bluegrass (*Poa pratensis*), grass
- mountain rush (*Juncus arcticus ssp. littoralis*), grass
- spikerush (*Eleocharis*), grass
- prairie cordgrass (*Spartina pectinata*), grass
- northern reedgrass (*Calamagrostis stricta ssp. inexpansa*), grass

Community 2.1
Kentucky Bluegrass/Spikerush-Mountain Rush

This plant community developed with heavy continuous season-long grazing without adequate recovery periods between grazing events. Various bluegrasses, Spikerush, and mountain rush (Baltic rush) dominate the community. Kentucky bluegrass will invade on drier portions of the community. Prairie cordgrass will tend to persist in trace amounts, greatly reduced in vigor. Goldenrod, dogbane, and cinquefoil have increased. A significant amount of production and diversity has been lost when compared to the Prairie Cordgrass-Northern Reedgrass Plant

Community (1.1). Loss or reduction of native cool- and warm-season grasses, and the forb component have negatively impacted energy flow and nutrient cycling. It will take an extended period of time to restore this plant community back to Reference State (1.0) with improved management. Renovation in most cases would not be practical, as well as, very costly.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1780	2162	2540
Forb	220	313	400
Shrub/Vine	0	13	30
Tree	0	12	30
Total	**2000**	**2500**	**3000**

Figure 15. Plant community growth curve (percent production by month). SD5806, Northern Rolling High Plains, lowland cool-season dominant. Cool-season dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Transition T1A
State 1 to 2

Heavy, continuous season-long grazing without adequate recovery periods between grazing events; or excessive haying; and the invasion of non-native cool-season grasses will transition the Reference State (1.0) to the Native/Invaded State (2.0). This transition is most likely to occur from the Spikerush-Mountain Rush/Prairie Cordgrass Plant Community (1.2).

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing with adequate recovery periods following each grazing event and proper stocking, over long periods of time; prescribed burning; and forage harvest management will move the Native/Invaded State (2.0) to the Spikerush-Baltic Rush/Prairie Cordgrass Plant Community (1.2). This plant community may eventually return to Reference Plant Community (1.1) or associated successional communities assuming an adequate seed and vegetative source is available. This process may take greater than 20 years.

Conservation practices

Prescribed Burning
Forage Harvest Management
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**			900–1575	
	prairie cordgrass	SPPE	*Spartina pectinata*	900–1350	–
	switchgrass	PAVI2	*Panicum virgatum*	135–225	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	45–90	–

2	**Cool-Season Grasses**			1125–1800	
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	450–675	–
	American mannagrass	GLGR	*Glyceria grandis*	225–450	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	225–450	–
	western wheatgrass	PASM	*Pascopyrum smithii*	90–225	–
	fowl bluegrass	POPA2	*Poa palustris*	45–90	–
	rough bentgrass	AGSC5	*Agrostis scabra*	45–90	–
3	**Other Native Grasses**			0–225	
	rough barnyardgrass	ECMU2	*Echinochloa muricata*	0–90	–
	Grass, perennial	2GP	*Grass, perennial*	0–90	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–45	–
4	**Grass-Likes**			900–1800	
	shortbeak sedge	CABR10	*Carex brevior*	225–450	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	225–450	–
	shortbeak sedge	CABR10	*Carex brevior*	225–450	–
	clustered field sedge	CAPR5	*Carex praegracilis*	225–360	–
	woolly sedge	CAPE42	*Carex pellita*	180–360	–
	spikerush	ELEOC	*Eleocharis*	135–225	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	45–225	–
	flatsedge	CYPER	*Cyperus*	45–90	–
5	**Non-Native Cool-Season Grasses**			0	
Forb					
6	**Forbs**			135–225	
	Canada goldenrod	SOCA6	*Solidago canadensis*	45–90	–
	dogbane	APOCY	*Apocynum*	45–90	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	45–90	–
	wild mint	MEAR4	*Mentha arvensis*	45–90	–
	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	45–90	–
	western dock	RUAQ	*Rumex aquaticus*	0–45	–
	Forb, native	2FN	*Forb, native*	0–45	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–45	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–45	–
	cinquefoil	POTEN	*Potentilla*	0–45	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–45	–
Shrub/Vine					
7	**Shrubs**			0–90	
	false indigo bush	AMFR	*Amorpha fruticosa*	0–45	–
	willow	SALIX	*Salix*	0–45	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–45	–
Tree					
8	**Trees**			0–45	
	cottonwood	POPUL	*Populus*	0–45	–

	Tree	2TREE	*Tree*	0–45	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			525–875	
	prairie cordgrass	SPPE	*Spartina pectinata*	350–525	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	105–175	–
	switchgrass	PAVI2	*Panicum virgatum*	70–105	–
2	**Cool-Season Grasses**			525–1225	
	American sloughgrass	BESY	*Beckmannia syzigachne*	175–350	–
	fowl bluegrass	POPA2	*Poa palustris*	175–350	–
	western wheatgrass	PASM	*Pascopyrum smithii*	105–245	–
	rough bentgrass	AGSC5	*Agrostis scabra*	105–175	–
	American mannagrass	GLGR	*Glyceria grandis*	0–105	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–70	–
3	**Other Native Grasses**			175–525	
	foxtail barley	HOJU	*Hordeum jubatum*	70–175	–
	rough barnyardgrass	ECMU2	*Echinochloa muricata*	0–175	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–175	–
	Grass, annual	2GA	*Grass, annual*	35–175	–
	Grass, perennial	2GP	*Grass, perennial*	35–70	–
4	**Grass-Likes**			1225–1575	
	spikerush	ELEOC	*Eleocharis*	350–700	–
	shortbeak sedge	CABR10	*Carex brevior*	350–525	–
	shortbeak sedge	CABR10	*Carex brevior*	350–525	–
	flatsedge	CYPER	*Cyperus*	175–350	–
	clustered field sedge	CAPR5	*Carex praegracilis*	175–350	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	35–175	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	35–175	–
	woolly sedge	CAPE42	*Carex pellita*	70–175	–
5	**Non-Native Cool-Season Grasses**			0–175	
	creeping meadow foxtail	ALAR	*Alopecurus arundinaceus*	0–175	–
	Kentucky bluegrass	POPR	*Poa pratensis*	0–175	–
	quackgrass	ELRE4	*Elymus repens*	0–175	–
Forb					
6	**Forbs**			175–350	
	Canada goldenrod	SOCA6	*Solidago canadensis*	105–280	–
	cinquefoil	POTEN	*Potentilla*	105–175	–
	common dandelion	TAOF	*Taraxacum officinale*	105–175	–
	curly dock	RUCR	*Rumex crispus*	105–175	–
	dogbane	APOCY	*Apocynum*	105–175	–

	blue-eyed grass	SISYR	*Sisyrinchium*	105–175	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	70–105	–
	western dock	RUAQ	*Rumex aquaticus*	35–70	–
	Forb, native	2FN	*Forb, native*	35–70	–
	Forb, introduced	2FI	*Forb, introduced*	35–70	–
	wild mint	MEAR4	*Mentha arvensis*	0–35	–
Shrub/Vine					
7	**Shrubs**			0–70	
	false indigo bush	AMFR	*Amorpha fruticosa*	0–35	–
	willow	SALIX	*Salix*	0–35	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–35	–
Tree					
8	**Trees**			0–35	
	cottonwood	POPUL	*Populus*	0–35	–
	Tree	2TREE	*Tree*	0–35	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			350–700	
	prairie cordgrass	SPPE	*Spartina pectinata*	175–350	–
	switchgrass	PAVI2	*Panicum virgatum*	175–350	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–70	–
2	**Cool-Season Grasses**			525–1225	
	western wheatgrass	PASM	*Pascopyrum smithii*	175–350	–
	fowl bluegrass	POPA2	*Poa palustris*	175–350	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	35–175	–
	American mannagrass	GLGR	*Glyceria grandis*	35–175	–
	rough bentgrass	AGSC5	*Agrostis scabra*	70–105	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	0–70	–
3	**Other Native Grasses**			175–875	
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–350	–
	Grass, annual	2GA	*Grass, annual*	70–175	–
	Grass, perennial	2GP	*Grass, perennial*	35–175	–
	foxtail barley	HOJU	*Hordeum jubatum*	35–70	–
	rough barnyardgrass	ECMU2	*Echinochloa muricata*	0–70	–
4	**Grass-Likes**			700–1050	
	clustered field sedge	CAPR5	*Carex praegracilis*	175–350	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	175–350	–
	spikerush	ELEOC	*Eleocharis*	175–350	–
	woolly sedge	CAPE42	*Carex pellita*	175–350	–
	shortbeak sedge	CABR10	*Carex brevior*	35–175	–
	flatsedge	CYPER	*Cyperus*	105–175	

	flatsedge	CYPER	*Cyperus*	105–175	–
	shortbeak sedge	CABR10	*Carex brevior*	35–175	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	35–175	–
5	**Non-Native Cool-Season Grasses**			0–350	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–350	–
	quackgrass	ELRE4	*Elymus repens*	0–350	–
	creeping meadow foxtail	ALAR	*Alopecurus arundinaceus*	0–350	–
Forb					
6	**Forbs**			105–175	
	wild mint	MEAR4	*Mentha arvensis*	70–105	–
	curly dock	RUCR	*Rumex crispus*	70–105	–
	dogbane	APOCY	*Apocynum*	0–70	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	35–70	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	35–70	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	35–70	–
	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	35–70	–
	western dock	RUAQ	*Rumex aquaticus*	35–70	–
	Forb, native	2FN	*Forb, native*	35–70	–
	Forb, introduced	2FI	*Forb, introduced*	35–70	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–70	–
	Canada goldenrod	SOCA6	*Solidago canadensis*	35–70	–
	cinquefoil	POTEN	*Potentilla*	35–70	–
	common dandelion	TAOF	*Taraxacum officinale*	0–70	–
Shrub/Vine					
7	**Shrubs**			0–70	
	false indigo bush	AMFR	*Amorpha fruticosa*	0–35	–
	willow	SALIX	*Salix*	0–35	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–35	–
Tree					
8	**Trees**			0–35	
	cottonwood	POPUL	*Populus*	0–35	–
	Tree	2TREE	*Tree*	0–35	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			125–375	
	mat muhly	MURI	*Muhlenbergia richardsonis*	125–250	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–125	–
	switchgrass	PAVI2	*Panicum virgatum*	0–25	–
2	**Cool-Season Grasses**			500–875	
	fowl bluegrass	POPA2	*Poa palustris*	250–375	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	250–375	–

	rough bentgrass	AGSC5	*Agrostis scabra*	125–250	–
	western wheatgrass	PASM	*Pascopyrum smithii*	50–125	–
	American mannagrass	GLGR	*Glyceria grandis*	0–25	–
3	**Other Native Grasses**			250–750	
	foxtail barley	HOJU	*Hordeum jubatum*	125–250	–
	rough barnyardgrass	ECMU2	*Echinochloa muricata*	0–250	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–250	–
	Grass, annual	2GA	*Grass, annual*	125–250	–
	Grass, perennial	2GP	*Grass, perennial*	0–50	–
4	**Grass-Likes**			625–875	
	spikerush	ELEOC	*Eleocharis*	250–625	–
	shortbeak sedge	CABR10	*Carex brevior*	250–375	–
	shortbeak sedge	CABR10	*Carex brevior*	250–375	–
	flatsedge	CYPER	*Cyperus*	125–250	–
	clustered field sedge	CAPR5	*Carex praegracilis*	125–250	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	25–50	–
	woolly sedge	CAPE42	*Carex pellita*	25–50	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	25–50	–
5	**Non-Native Cool-Season Grasses**			375–875	
	quackgrass	ELRE4	*Elymus repens*	0–875	–
	creeping meadow foxtail	ALAR	*Alopecurus arundinaceus*	0–875	–
	Kentucky bluegrass	POPR	*Poa pratensis*	375–500	–
Forb					
6	**Forbs**			250–375	
	Canada goldenrod	SOCA6	*Solidago canadensis*	100–250	–
	curly dock	RUCR	*Rumex crispus*	125–250	–
	cinquefoil	POTEN	*Potentilla*	125–200	–
	blue-eyed grass	SISYR	*Sisyrinchium*	100–150	–
	dogbane	APOCY	*Apocynum*	75–125	–
	common dandelion	TAOF	*Taraxacum officinale*	75–100	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	50–75	–
	Forb, native	2FN	*Forb, native*	50–75	–
	Forb, introduced	2FI	*Forb, introduced*	50–75	–
	wild mint	MEAR4	*Mentha arvensis*	0–25	–
	western dock	RUAQ	*Rumex aquaticus*	0–25	–
Shrub/Vine					
7	**Shrubs**			0–25	
	false indigo bush	AMFR	*Amorpha fruticosa*	0–25	–
	willow	SALIX	*Salix*	0–25	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–25	–
Tree					
8	**Trees**			0–25	
	cottonwood	POPUL	*Populus*	0–25	–
	Tree	2TREE	*Tree*	0–25	–

Animal community

Wildlife Interpretations
MLRA 58D lies within the drier portion of the northern mixed-grass prairie ecosystem where sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this area consisted of diverse grass- 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, amphibians, and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as several small mammal and insect species, were the primary consumers linking the grassland resources to predators such as the gray wolf, mountain lion, and grizzly bear, and smaller carnivores such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant; however, the species remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox were associated with prairie dog complexes.

Historically, the northern mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbance factors either singly or in combination. Following European settlement, livestock grazing, cropland conversion, elimination of fire, energy development, and other anthropogenic factors influenced species composition and abundance. Introduced and invasive species further impacted plant and animal communities. The bison was a historical keystone species but had been extirpated in this area as a free-ranging herbivore. The loss of the bison and reduction of prairie dog populations and fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development has reduced habitat quality for area-sensitive species.

Within MLRA 58D, the Wet Meadow ecological site provides upland/wetland complex cover with an associated forb component. It was typically part of an expansive grassland landscape that included combinations of Shallow Loamy, Shallow Clayey, Thin Loamy, Thin Claypan, Sandy, Sandy Claypan, Loamy, Loamy Terrace, Sandy Terrace, and Clayey ecological sites.

The Wet Meadow ecological site has remained relatively intact but may be subject to haying under drier conditions. This site has sufficient hydrology to support hydrophytic vegetation and wildlife species associated with saturated soil conditions. This site receives subsurface water from adjacent upland sites. The site provides important wetland habitat for birds, small rodents, bats, mammalian predators, reptiles, amphibians, and insects. These sites also provide forage sites for greater sagegrouse broods.

Prairie Cordgrass-Northern Reedgrass (1.1)
The predominance of hydrophytic vegetation, including a high diversity of sedges and other grass-like species, favors shorebirds (e.g. plovers, sandpipers, and snipe) and wetland associated songbirds. This plant community provides habitat for salamanders, various frog and toad species, and various snake species. Invertebrates are an important component of the food web. Raptors such as northern harrier, short-eared owl, Swainson’s hawk, and American kestrel will use this site. Prey populations are limited to small mammals such as water shrew and meadow vole and invertebrates. When associated with ecological sites dominated by big sagebrush, greater sage-grouse will use this site for brood rearing and foraging habitat.

Spikerush-Mountain Rush/Prairie Cordgrass (1.2) and Kentucky Bluegrass/Spikerush-Mountain Rush (2.1): Resulting from continuous season-long grazing without adequate recovery periods this site becomes dominated by shorter grass-like hydrophytes with increased forb diversity. The predominance of hydrophytic vegetation, still favors shorebirds (e.g. plovers, sandpipers, and snipe) and wetland associated songbirds. Insect pollinators become more abundant at this site. This plant community provides habitat for salamanders, various frog and toad species, and various snake species. Invertebrates are an important component of the food web. Raptors such as northern harrier, short-eared owl, Swainson’s hawk, and American kestrel will use this site. Prey populations are limited to small mammals such as water shrew and meadow vole and invertebrates. Invertebrate and vertebrate prey species are more vulnerable to predation due to the shorter stature of this plant community. When associated with ecological sites dominated by big sagebrush, greater sage-grouse will use this site for brood rearing and foraging habitat.

Decadent Plants/Excessive Litter (1.3): Resulting from non-use and no fire, this site becomes dominated by

decadent plants and excessive amounts of plant litter. Increased amounts of decadent plant material result in limited foraging and nesting habitat for shorebirds and wetland associated songbirds. Insect pollinators continue to use this site. This plant community continues to provide habitat for salamanders, various frog and toad species, and various snake species. Invertebrates are an important component of the food web. Raptors such as northern harrier, short-eared owl, Swainson's hawk, and American kestrel will use this site. Prey populations are limited to small mammals such as water shrew and meadow vole and invertebrates. Invertebrate and vertebrate prey species are less vulnerable to predation due to the amount of decadent plant material and litter buildup. Excessive litter buildup will limit use by greater sage-grouse for brood rearing and foraging habitat.

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-Northern Reedgrass (1.1)
Average Production (lb/acre, air-dry): 4,500*
Stocking Rate (AUM/acre): Variable*

Plant Community: Spikerush-Mountain Rush/Prairie Cordgrass (1.2)
Average Production (lb/acre, air-dry): 3,500*
Stocking Rate (AUM/acre): Variable*

Plant Community: Decadent Plants/Excessive Litter (1.3)
Average Production (lb/acre, air-dry): 3,500*
Stocking Rate (AUM/acre): Variable*

Plant Community: Kentucky Bluegrass/Spikerush-Mountain Rush (2.1)
Average Production (lb/acre, air-dry): 2,500*
Stocking Rate (AUM/acre): Variable*

* 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 need to be 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

This site is dominated by soils in hydrologic groups B and D. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. 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 and waterfowl. 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 typically present on this 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 and experience were also used. Those involved in developing this site description include: Stan Boltz, RMS, NRCS; Dave Dewald, Wildlife Biologist, NRCS; Jody Forman, RMS, NRCS; Dennis Froemke, RMS, NRCS; Cheryl Nielsen, RMS, NRCS; Jeff Printz, RMS, NRCS; Mike Stirling, RMS, NRCS; and Darrell Vanderbusch, Soil Scientist, NRCS.

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Contributors

Stan C. Boltz
Travis Patient
Rick L. Peterson

Approval

Suzanne Mayne-Kinney, 7/18/2024

Acknowledgments

This ecological site description was updated by Rick L. Peterson on February 4, 2020.

The ESDs were available for QC review by Mark Hayek, Emily Helms, Ryan Beer, and Mitch Faulkner.

All ecological sites were then reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS in September 2020.

Rangeland health reference sheet

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

Author(s)/participant(s)	Stan Boltz
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/07/2010
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** None.

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

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

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter falls in place.

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The dark surface horizons should be 12 to 30 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular in the upper horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Deep rooted species (tall rhizomatous cool- and warm-season grasses and grass-likes) with fine and coarse roots positively influences infiltration. Infiltration is somewhat limited naturally due to poor drainage and relatively low permeability.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None – when dry, B horizons can be hard and appear to be compacted, but no platy structure will be present.

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

    Dominant: Tall warm-season grasses = Grass-likes >

    Sub-dominant: Mid/tall cool-season grasses >

Other: Forbs

Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth bromegrass do not fit into reference plant community F/S groups. Other F/S groups may occur in minor amounts.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Little evidence of decadence or mortality.

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 4,000 to 5,000 pounds per acre (air-dry weight), with the reference value being 4,500 pounds per acre (air-dry weight).

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** State and local noxious weeds; Kentucky bluegrass may be prevalent during dry cycles, but will typically not dominate the site. Most invasive species will occupy the perimeter of this site.

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17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses and grass-likes should have vigorous rhizomes or tillers.
