USDA Natural Resources
Conservation Service

Ecological site R058DY026SD
Thin Sandy

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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.

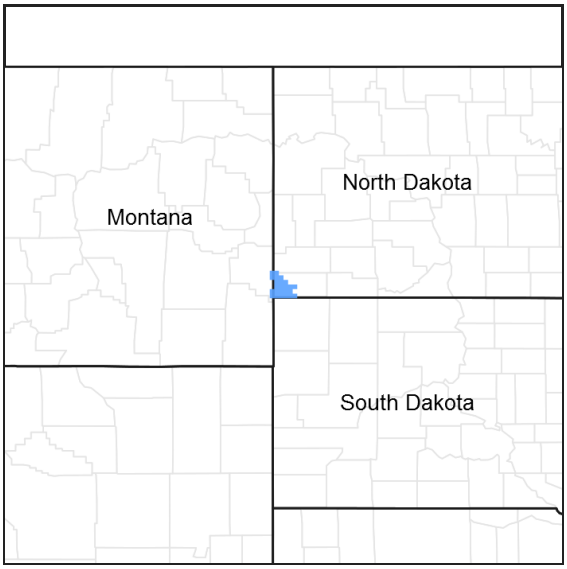

Figure 1. Mapped extent

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 Thin Sandy ecological site is primarily found in the North Dakota section of MLRA 58D. It is located on upland landscapes and does not receive additional moisture from runoff or overflow. Typical slopes range from 3 to 40 percent. Soils are deep (greater than 20 inches) with a loamy fine sand or fine sandy loam surface layer. The surface layer is 2 to 4 inches thick. The texture of the subsurface generally ranges from loamy fine sand to fine sand. Depth to carbonates is 0 to 12 inches.

The vegetation in the Reference State (1.0) is dominated by warm-season grasses with cool-season grasses sub-dominant. The major grasses include prairie sandreed, little bluestem, needle and thread, and western wheatgrass. Forbs are common and diverse. The significant shrubs are western sandcherry, fringed sagewort (prairie sagewort), rose, dwarf false indigo, and yucca.

Associated sites

R058DY009SD	**Sandy** The Sandy ecological site is found on level to slightly sloping landscapes adjacent to the Thin Sandy ecological site.

R058DY010SD	**Loamy** The Loamy ecological site is found on level to slightly sloping landscapes adjacent to the Thin Sandy ecological site.
R058DY028SD	**Shallow Sandy** The Shallow Sandy ecological site has shallow soils (10-20” in depth) and is found adjacent to the Thin Sandy ecological site.

Similar sites

R058DY010SD	**Loamy** The Loamy ecological site will have more western wheatgrass; less needle and thread; and have greater vegetative production than the Thin Sandy ecological site.
R058DY009SD	**Sandy** The Sandy ecological site will have more western wheatgrass; and greater vegetative production than the Thin Sandy ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Hesperostipa comata* (2) *Schizachyrium scoparium*

Physiographic features

The Thin Sandy ecological site occurs on gently sloping to very steep sedimentary uplands.

Table 2. Representative physiographic features

Landforms	(1) Upland > Hillslope
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	2,300–4,000 ft
Slope	3–40%
Water table depth	80 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) CAMP CROOK [USC00391294], Camp Crook, SD
- (4) BUFFALO ASOS [USW00094037], Buffalo, SD
- (5) BUFFALO 13 ESE [USW00094081], Reva, SD
- (6) REDIG 11 NE [USC00397062], Buffalo, SD
- (7) HOOVER [USC00393945], Newell, SD

Influencing water features

No significant water features influence the Thin Sandy ecological site.

Soil features

Soils common to the Thin Sandy ecological site has a loamy fine sand or fine sandy loam textured surface layers that is 2 to 5 inches thick. Slopes range from 3 to 40 percent. Soils are deep (greater than 20 inches) and formed in sandy materials weathered from calcareous soft sandstone. The texture of the subsurface layer’s ranges from loamy fine sand to fine sand. The soils in this site are well to excessively drained and have a moderately rapid infiltration rate.

This site typically should show slight to no evidence of rills, wind-scoured areas. Bunch grasses are occasionally pedestalled, but no exposed roots will be present. Water flow paths are broken, irregular in appearance, or discontinuous with numerous vegetative barriers. The soil surface is stable and intact. These soils are somewhat susceptible to water erosion.

Major Soils correlated to the Thin Sandy ecological site, Beisigl and Tusler.

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

More information 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) Residuum–sandstone
Surface texture	(1) Loamy fine sand (2) Fine sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid
Soil depth	20–80 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3–4 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Thin Sandy 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. 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 Bluestem-Prairie Sandreed Plant Community (1.1). This plant community has been determined through study or 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.

Several years of continuous grazing without adequate recovery periods, following each grazing occurrence will likely cause this site to depart from the Bluestem-Prairie Sandreed Plant Community (1.1). Species such as needle and thread and little bluestem will initially increase. Sand bluestem, prairie sandreed, big bluestem, and plains muhly will decrease in frequency and production. Continuous season-long grazing causes sedge and blue grama to increase and eventually dominate and pioneer perennials, and annuals 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

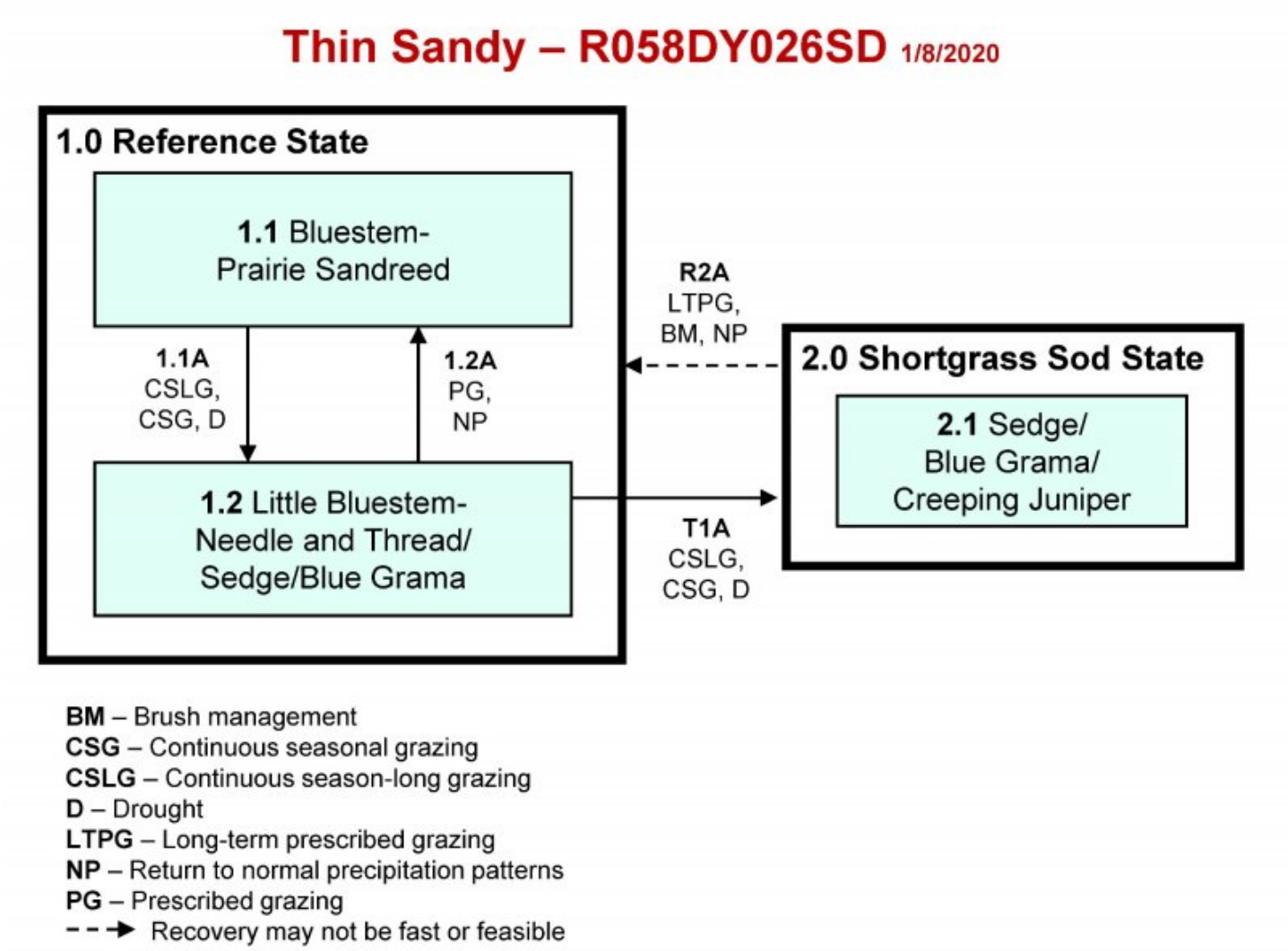

Diagram Legend: Thin Sandy - R058DY026SD

T1A	1.0 to 2.0	Continuous seasonal grazing (spring or winter grazing); continuous season-long grazing; or heavy grazing in combination with drought.
R2A	2.0 to 1.0	Long-term prescribed grazing, including proper stocking rates, change in season of use, and adequate time for recovery; a return to normal precipitation patterns following drought. Brush management may be an option depending on site conditions. Transition may not be fast or feasible.
1.1A	1.1 to 1.2	Continuous seasonal grazing (repeated spring or early winter grazing); continuous season-long grazing; or heavy grazing in combination with drought.
1.2A	1.2 to 1.1	Prescribed grazing, including proper stocking rates, change in season of use, and adequate time for recovery; and a return to normal precipitation patterns following drought.

State 1
Reference State

The Reference State (1.0) represents what is believed to show the natural range of variability that dominated the dynamics of this ecological site prior to European settlement. This site in the Reference State (1.0) is dominated by warm-season grasses and cool-season grasses sub-dominant. In pre-European times, the primary disturbance mechanisms included periodic fire and grazing by large herding ungulates. Timing of fires and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Taller warm-season grasses and cool-season needlegrasses would have declined and a corresponding increase in short statured grass and grass-like species would have occurred. Today, a similar state can be found on areas that are properly

managed with grazing and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Bluestem-Prairie Sandreed

The interpretive plant community for this site is the Bluestem-Prairie Sandreed Plant Community. This is also considered to be Reference Plant Community (1.1). This plant community can be found on areas that are properly managed with grazing and sometimes on areas receiving occasional short periods of deferment. The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. Warm-season grasses dominate this plant community. The major grasses include prairie sandreed, little bluestem, needle and thread, and western wheatgrass. Other grasses or grass-like species occurring on the site include big bluestem, sand bluestem, sedge, blue grama, prairie Junegrass, plains muhly, and sideoats grama. Significant forbs include dotted gayfeather, green sagewort, goldenrod, hairy goldaster, purple coneflower, and purple prairie clover. The significant shrubs that occur include western sandcherry, fringed sagewort, rose, dwarf false indigo, and yucca. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). The diversity in plant species allows for high drought tolerance. This is a healthy and sustainable plant community. Moderate or high available water capacity provides a favorable soil-water-plant relationship. Overall, the interpretive plant community has the appearance of being stable, diverse, and productive. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1030	1521	2010
Shrub/Vine	85	135	185
Forb	85	135	185
Moss	0	9	20
Total	**1200**	**1800**	**2400**

Figure 9. Plant community growth curve (percent production by month). SD5804, Northern Rolling High Plains, warm-season dominant, cool-season sub-dominant.. Warm-season dominant, cool-season sub-dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	18	24	25	15	7	1	0	0

Community 1.2
Little Bluestem-Needle and Thread/Sedge/Blue Grama

This plant community develops under continuous season-long grazing or continuous seasonal grazing (i.e., grazing an area during the same season every year) or from over utilization during extended drought periods. The potential vegetation is made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. The dominant grass or grass-like species include little bluestem, needle and thread, sedge, and blue grama. Other grasses or grass-like species may include prairie sandreed, western wheatgrass, hairy grama, and sand dropseed. Significant forbs include white prairie aster, scurfpea, green sagewort, and goldenrod. The dominant shrubs that occur include yucca, creeping juniper, and fringed sagewort. Compared to the Bluestem-Prairie Sandreed Plant Community (1.1), the shortgrass species including blue grama and threadleaf sedge have increased. The warm-season species including prairie sandreed, big bluestem, sand bluestem, plains muhly, and sideoats grama have decreased in composition. Annual bromes, bluegrass, sweetclover, and other annual grasses and forbs can invade the site. This plant community can occur in a mosaic with patchy, slightly used areas occurring adjacent to and intermingled with this plant community. This plant community is not resistant to change. Changes in grazing management can result in a shift to another plant community. This community is fairly resilient following normal disturbances because of the high diversity of plant species and the high amount of litter. Soil erosion is low. The water cycle is functioning due to the litter cover on the soil surface. Infiltration is high because of the soil texture

and surface litter.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	780	1092	1600
Shrub/Vine	60	98	135
Forb	60	97	135
Moss	0	13	30
Total	**900**	**1300**	**1900**

Figure 11. Plant community growth curve (percent production by month). SD5803, Northern Rolling High Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous seasonal grazing; continuous season-long grazing; or heavy grazing in combination with drought will lead the Reference Plant Community (1.1) to the Little Bluestem-Needle and Thread/Sedge/Blue Grama Plant Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing with proper stocking rate, change in season of use, and adequate time for plant recovery; and a return to normal precipitation patterns following drought will convert the Little Bluestem-Needle and Thread/Sedge/Blue Grama Plant Community (1.2) to the Bluestem-Prairie Sandreed Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2
Shortgrass Sod State

The Shortgrass Sod State (2.0) is dominated by shortgrass species, upland sedges and creeping juniper. This State is the result of grazing management that does not provide adequate recovery time for warm- or cool-season grasses. The hydrologic function of this state is dramatically altered. Runoff is high and infiltration is low. This State is very resistant to change through grazing management alone.

Community 2.1
Sedge/Blue Grama/Creeping Juniper

This plant community typically develops over a period of several years with continuous season-long grazing or continuous seasonal grazing (grazing at the same time of year every year for extended periods during the growing season). It is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs. The dominant grasses and grass-likes are sedge and blue grama. Significant forbs include green sagewort, scurfpea, goldenrod, and white prairie aster. Dominant shrubs in this community include creeping juniper, fringed sagewort, and yucca. Compared to the Bluestem-Prairie Sandreed Plant Community (1.1), sedge and blue grama have greatly increased. Prairie sandreed is greatly diminished. Sand bluestem, big bluestem, and little bluestem are essentially absent. Desirable plant species have decreased. This plant community is resistant to change due to the sod forming habit of the sedges and blue grama. The water cycle is impaired due to a reduction

in litter and the potential for higher runoff and decreased infiltration. The risk for soil erosion increases.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	420	720	1115
Shrub/Vine	40	90	140
Forb	40	68	95
Moss	0	22	50
Total	**500**	**900**	**1400**

Figure 13. Plant community growth curve (percent production by month). SD5803, Northern Rolling High Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Transition T1A
State 1 to 2

Continuous season-long grazing, or continuous seasonal grazing (early spring), or heavy grazing in combination with drought will transition the Reference State (1.0) to the Shortgrass Sod State (2.0). This transition is most likely to originate from the Little Bluestem-Needle and Thread/Sedge/Blue Grama Plant Community (1.2).

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing, and favorable climatic conditions, which allow for adequate plant recovery periods, may allow for a transition from the Shortgrass Sod State (2.0) to the Reference State (1.0). This transition may not be rapid or in the end meet management goals. Brush management may be an option to reduce juniper composition and help facilitate this transition.

Conservation practices

Brush Management
Prescribed Grazing

Additional community tables

Table 8. 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**			270–630	
	prairie sandreed	CALO	*Calamovilfa longifolia*	180–450	–
	big bluestem	ANGE	*Andropogon gerardii*	90–180	–
	sand bluestem	ANHA	*Andropogon hallii*	90–180	–
2	**Mid- Warm-Season Grasses**			180–540	
	little bluestem	SCSC	*Schizachyrium scoparium*	180–450	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	18–90	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–90	–
	Grass, perennial	2GP	*Grass, perennial*	0–90	–

3	**Cool-Season Grasses**			90–270	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	36–270	–
	western wheatgrass	PASM	*Pascopyrum smithii*	36–270	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	18–90	–
	Grass, perennial	2GP	*Grass, perennial*	0–90	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	18–54	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–18	–
4	**Short Warm-Season Grasses**			36–180	
	blue grama	BOGR2	*Bouteloua gracilis*	36–144	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	18–90	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–54	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–54	–
5	**Grass-Likes**			90–180	
	threadleaf sedge	CAFI	*Carex filifolia*	90–180	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–54	–
6	**Non-Native Cool-Season Grasses**			0	
Forb					
7	**Forbs**			90–180	
	Forb, native	2FN	*Forb, native*	18–90	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	18–36	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	18–36	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	18–36	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	18–36	–
	purple prairie clover	DAPU5	*Dalea purpurea*	18–36	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	18–36	–
	scurfpea	PSORA2	*Psoralidium*	18–36	–
	silky prairie clover	DAVI	*Dalea villosa*	18–36	–
	dotted blazing star	LIPU	*Liatris punctata*	18–36	–
	goldenrod	SOLID	*Solidago*	18–36	–
	field sagewort	ARCA12	*Artemisia campestris*	18–36	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	18–36	–
	Indian breadroot	PEDIO2	*Pediomelum*	0–18	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–18	–
	milkvetch	ASTRA	*Astragalus*	0–18	–
	beardtongue	PENST	*Penstemon*	0–18	–
	Gunnison's mariposa lily	CAGU	*Calochortus gunnisonii*	0–18	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–18	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	0–18	–
	buckwheat	ERIOG	*Eriogonum*	0–18	–
	spiny phlox	PHHO	*Phlox hoodii*	0–18	–

	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–18	–
	pussytoes	ANTEN	*Antennaria*	0–18	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–18	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–18	–
Shrub/Vine					
8	**Shrubs**			90–180	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	18–90	–
	rose	ROSA5	*Rosa*	18–54	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–36	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–36	–
	soapweed yucca	YUGL	*Yucca glauca*	0–36	–
	dwarf false indigo	AMNA	*Amorpha nana*	18–36	–
	prairie sagewort	ARFR4	*Artemisia frigida*	18–36	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	18–36	–
	pricklypear	OPUNT	*Opuntia*	0–18	–
Moss					
9	**Mat-Forming Forbs**			0–18	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–18	–

Table 9. 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**			13–104	
	prairie sandreed	CALO	*Calamovilfa longifolia*	13–104	–
	big bluestem	ANGE	*Andropogon gerardii*	0–26	–
	sand bluestem	ANHA	*Andropogon hallii*	0–26	–
2	**Mid- Warm-Season Grasses**			130–325	
	little bluestem	SCSC	*Schizachyrium scoparium*	130–325	–
	Grass, perennial	2GP	*Grass, perennial*	0–39	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–26	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–26	–
3	**Cool-Season Grasses**			195–325	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	130–260	–
	western wheatgrass	PASM	*Pascopyrum smithii*	13–104	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	13–65	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	13–52	–
	Grass, perennial	2GP	*Grass, perennial*	0–52	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–26	–
4	**Short Warm-Season Grasses**			130–260	
	blue grama	BOGR2	*Bouteloua gracilis*	65–195	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	13–104	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	13–104	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	13–65	–

	Pendleri threeawn	ARPE2	*Aristida purpurea var. longiseta*	13–65	
5	**Grass-Likes**			130–260	
	threadleaf sedge	CAFI	*Carex filifolia*	65–195	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	13–104	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–104	–
6	**Non-Native Cool-Season Grasses**			0–65	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–65	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–65	–
	cheatgrass	BRTE	*Bromus tectorum*	0–65	–
	field brome	BRAR5	*Bromus arvensis*	0–26	–
Forb					
7	**Forbs**			65–130	
	Forb, native	2FN	*Forb, native*	13–65	–
	Forb, introduced	2FI	*Forb, introduced*	0–52	–
	field sagewort	ARCA12	*Artemisia campestris*	13–52	–
	goldenrod	SOLID	*Solidago*	13–39	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	13–39	–
	scurfpea	PSORA2	*Psoralidium*	13–39	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–26	–
	dotted blazing star	LIPU	*Liatris punctata*	0–26	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	13–26	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–26	–
	pussytoes	ANTEN	*Antennaria*	0–13	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–13	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–13	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–13	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–13	–
	Indian breadroot	PEDIO2	*Pediomelum*	0–13	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–13	–
	milkvetch	ASTRA	*Astragalus*	0–13	–
	buckwheat	ERIOG	*Eriogonum*	0–13	–
	silky prairie clover	DAVI	*Dalea villosa*	0–13	–
	spiny phlox	PHHO	*Phlox hoodii*	0–13	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–13	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–13	–
Shrub/Vine					
8	**Shrubs**			65–130	
	creeping juniper	JUHO2	*Juniperus horizontalis*	13–65	–
	prairie sagewort	ARFR4	*Artemisia frigida*	13–65	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–52	–
	soapweed yucca	YUGL	*Yucca glauca*	0–39	–
	rose	ROSA5	*Rosa*	13–26	–
	pricklypear	OPUNT	*Opuntia*	0–26	–

	skunkbush sumac	RHTR	*Rhus trilobata*	0–13	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–13	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–13	–
Moss					
9	**Mat-Forming Forbs**			0–26	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–26	–

Table 10. 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**			0–18	
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–18	–
2	**Mid- Warm-Season Grasses**			0–45	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–45	–
	Grass, perennial	2GP	*Grass, perennial*	0–18	–
3	**Cool-Season Grasses**			18–90	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	9–72	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–45	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	9–36	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–27	–
	Grass, perennial	2GP	*Grass, perennial*	0–27	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–27	–
4	**Short Warm-Season Grasses**			135–270	
	blue grama	BOGR2	*Bouteloua gracilis*	90–225	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	9–90	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	9–90	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	9–63	–
5	**Grass-Likes**			225–315	
	threadleaf sedge	CAFI	*Carex filifolia*	180–270	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	18–90	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
6	**Non-Native Cool-Season Grasses**			9–72	
	cheatgrass	BRTE	*Bromus tectorum*	9–63	–
	Kentucky bluegrass	POPR	*Poa pratensis*	0–45	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–45	–
	field brome	BRAR5	*Bromus arvensis*	0–27	–
Forb					
7	**Forbs**			45–90	
	field sagewort	ARCA12	*Artemisia campestris*	9–45	–
	Forb, introduced	2FI	*Forb, introduced*	0–45	–
	Forb, native	2FN	*Forb, native*	9–45	–
	goldenrod	SOLID	*Solidago*	9–27	–

	white prairie aster	SYFA	*Symphyotrichum falcatum*	9–27	–
	scurfpea	PSORA2	*Psoralidium*	9–27	–
	spiny phlox	PHHO	*Phlox hoodii*	0–9	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–9	–
	milkvetch	ASTRA	*Astragalus*	0–9	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–9	–
	pussytoes	ANTEN	*Antennaria*	0–9	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–9	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–9	–
	buckwheat	ERIOG	*Eriogonum*	0–9	–
	dotted blazing star	LIPU	*Liatris punctata*	0–9	–
Shrub/Vine					
8	**Shrubs**			45–135	
	creeping juniper	JUHO2	*Juniperus horizontalis*	18–90	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–72	–
	soapweed yucca	YUGL	*Yucca glauca*	0–36	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	pricklypear	OPUNT	*Opuntia*	0–27	–
	rose	ROSA5	*Rosa*	0–9	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–9	–
Moss					
9	**Mat-Forming Forbs**			0–45	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–45	–

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 Thin Sandy ecological site provides upland grassland cover with an associated forb component. It was typically part of an expansive grassland landscape that included combinations of Clayey, Loamy,

Shallow Loamy, Shallow Clayey, Thin Loamy, Claypan, Sands, Sandy Claypan, and Thin Claypan ecological sites.

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

The majority of the Thin Sandy ES remains intact and provides increasingly important habitat for grassland nesting birds, small rodents, coyotes, and a variety of reptiles, amphibians, and insects. Invasive species such as annual bromegrasses and crested wheat have impacted the biological integrity of the site for some grassland birds.

Bluestem-Prairie Sandreed (1.1): The predominance of grasses plus high diversity of forbs and shrubs in this community favors grazers and mixed-feeders, such as deer and pronghorn. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. The complex plant structural diversity provides habitat for a wide array of migratory and resident birds. Grasshopper sparrow, chestnut-collared longspur, Sprague's pipit, horned lark, lark bunting, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides. Diverse prey populations are available for grassland raptors such as ferruginous hawk, Swainson's hawk, golden eagle, and prairie falcon. provides.

The diversity of grasses, forbs, and shrubs provide high nutrition levels for small and large herbivores including voles, mice, thirteen-lined ground squirrel, white-tailed jackrabbit, and deer. This ecological site provides excellent wintering habitat for pronghorn. The higher stature of this plant community provides thermal, protective and escape cover for herbivores and grassland birds. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for herptiles such as the spade foot toad, bull snake, and western
rattlesnake.

Little Bluestem-Needle and Thread/Sedge/Blue Grama (1.2): Resulting from continuous seasonal and heavy continuous grazing the warm-season grass component has been substantially reduced and a shift to a medium to short height plant community occurs. The forb and shrub diversity are substantially decreased.

The predominance of grasses and the loss of forbs and shrubs in this community cause a reduction in the insect populations, such as pollinators, and reduce the value to most herbivores. Grasshopper sparrow, horned lark, lark bunting, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides. Diverse prey populations are available for grassland raptors such as ferruginous hawk, Swainson's hawk, golden eagle, and prairie falcon.

The diversity of grasses provides adequate nutrition levels for small and large herbivores including voles, mice, thirteen-lined ground squirrel, white-tailed jackrabbit, and deer. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for herptiles such as the spade foot toad, bull snake, and western rattlesnake.

Sedge/Blue Grama/Creeping Juniper (2.1): Resulting from heavy, continuous grazing or continuous, seasonal grazing sedges, blue grama and creeping juniper will dominate. The decrease in diversity of grasses, forbs, and shrubs will result in less seed production or lower quality nutrition for small herbivores including voles, mice, and thirteen-lined ground squirrel.

The short stature of this plant community limits suitable thermal, protective, and escape cover. Prey populations are reduced and are more vulnerable to raptor and mammalian predation. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel.

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

Plant Community: Little Bluestem-Needle and Thread/Sedge/Blue Grama (1.2)
Average Production (lb/acre, air-dry): 1,300
Stocking Rate (AUM/acre): 0.37

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

* 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

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Normally areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Recreational uses

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

Wood products

No appreciable wood products are 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

IInformation 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 description include: Ryan Beer, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Dennis Froemke, RMS, NRCS; Mitch Faulkner, RMS, NRCS; Cheryl Nielsen, RMS, NRCS; Jeff Printz, RMS, NRCS; Mike Stirling, RMS, NRCS; Darrell Vanderbusch, Soil Scientist, NRCS.

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Approval

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Acknowledgments

This ecological site description was updated by Rick L. Peterson on January 9, 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.

Non-Discrimination Statement

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:** Slight to none, typically on steeper slopes and discontinuous.

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2. **Presence of water flow patterns:** None, or barely visible and discontinuous with numerous debris dams when present.

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3. **Number and height of erosional pedestals or terracettes:** Few pedastalled plants typically on steeper slopes.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not**

bare ground): 5 to 25 percent is typical.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally move short distances, some medium size class litter will move very short distances. Litter debris dams are occasionally present.

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

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 2 to 5 inches thick with light to dark brownish gray colors. Structure should typically be fine granular at least in the upper A-horizon. Some soils have single grain structure of the sandy material.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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

    Dominant: Tall warm-season grasses > Mid warm-season grasses >

    Sub-dominant: Cool-season grasses >

    Other: Short warm-season grasses = Grass-likes = Forbs = Shrubs

    Additional:

---

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

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 1,200-2,400 lbs./acre (air-dry weight). Reference value production is 1,800 lbs./acre (air-dry weight).

---

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

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