USDA Natural Resources Conservation Service

Ecological site R058DY024SD
Shallow Loamy

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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.

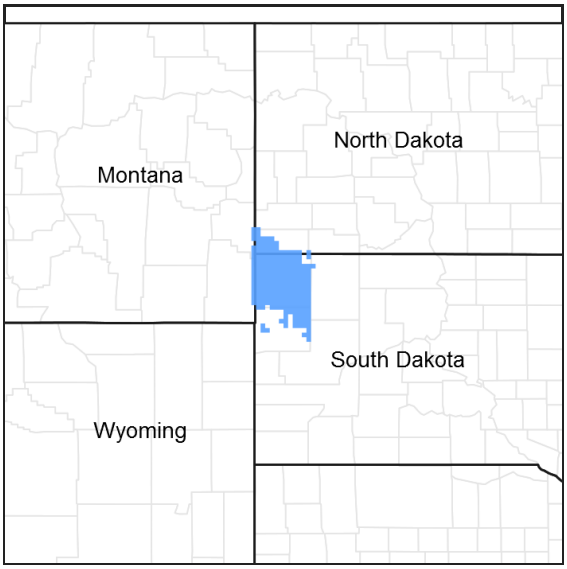


Figure 1. Mapped extent

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 Shallow Loamy ecological site is found throughout MLRA 58D. It is located on upland landscapes and does not receive additional moisture from runoff or overflow. Typical slopes range from 5 to 48 percent. Soils are shallow (between 10 and 20 inches in depth) with a silt loam to loam surface layers. The surface layers are 4 to 6 inches thick. The texture of the subsurface layer’s ranges from loam to silty clay loam.

The vegetation in the Reference State (1.0) is dominated by cool-season grasses. The major grasses include western wheatgrass, needle and thread, and green needlegrass. Forbs are common and diverse. The significant shrubs found in this plant community include rose, western snowberry, and fringed sagewort.

Associated sites

R058DY009SD	**Sandy** The Sandy ecological site is found on level to slightly sloping landscapes adjacent to, or down slope of, the Shallow Loamy ecological site.
R058DY010SD	**Loamy** The Loamy ecological site is found on level to slightly sloping landscapes adjacent to, or down slope of, the Shallow Loamy ecological site.

R058DY016SD	**Very Shallow** The Very Shallow ecological site has very shallow soils (10 inches or less in depth) and is found adjacent to, or up slope of, the Shallow Loamy ecological site.
R058DY029SD	**Stony Hills** The Stony Hills ecological site is found on similar landscapes adjacent to the Shallow Loamy ecological site.

Similar sites

R058DY009SD	**Sandy** The Sandy ecological site will have more prairie sandreed; more needle and thread; and more vegetative production than the Shallow Loamy ecological site.
R058DY010SD	**Loamy** The Loamy ecological site will have more green needlegrass; more needle and thread; and have greater vegetative production than the Shallow Loamy ecological site.
R058DY012SD	**Thin Loamy** The Thin Loamy ecological site will have deep soils, a weak A-horizon, and more little bluestem than the Shallow Loamy ecological site.
R058DY016SD	**Very Shallow** The Very Shallow ecological site will have a restrictive soil layer at 10 inches or less, will have less western wheatgrass; more little bluestem; and less vegetative production than the Shallow Loamy ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Schizachyrium scoparium*

Physiographic features

The Shallow Loamy ecological site occurs on moderately steep to steep uplands.

Table 2. Representative physiographic features

Landforms	(1) Upland > Hill (2) Upland > Ridge
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	2,300–4,000 ft
Slope	5–48%
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 Shallow Loamy ecological site.

Soil features

Soils common to the Shallow Loamy ecological site have a silt loam to loam surface layer that is 4 to 6 inches thick. Slopes range from 5 to 48 percent. Soils are shallow (between 10 and 20 inches in depth) and formed in residuum weathered from sandstone and siltstone. The texture of the subsurface layer’s ranges from loam to silty clay loam. The soils in this site are well drained and have a moderately slow infiltration rate. A restrictive layer to water movement and root penetration occurs at 10 to 20 inches in depth.

This site should show slight to no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow paths are typically not present, but when visible they are broken and irregular in appearance or discontinuous. The soil surface is stable and intact. These soils are mainly susceptible to water erosion.

Major Soils correlated to the Shallow Loamy ecological site include, Cabba, Cabbart, Lehr, and Werner.

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 and siltstone
Surface texture	(1) Loam (2) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow
Depth to restrictive layer	1–10 in
Soil depth	10–20 in
Surface fragment cover <=3"	10–15%
Surface fragment cover >3"	0–45%
Available water capacity (0-40in)	1–2 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	10–15%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The Shallow Loamy 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.

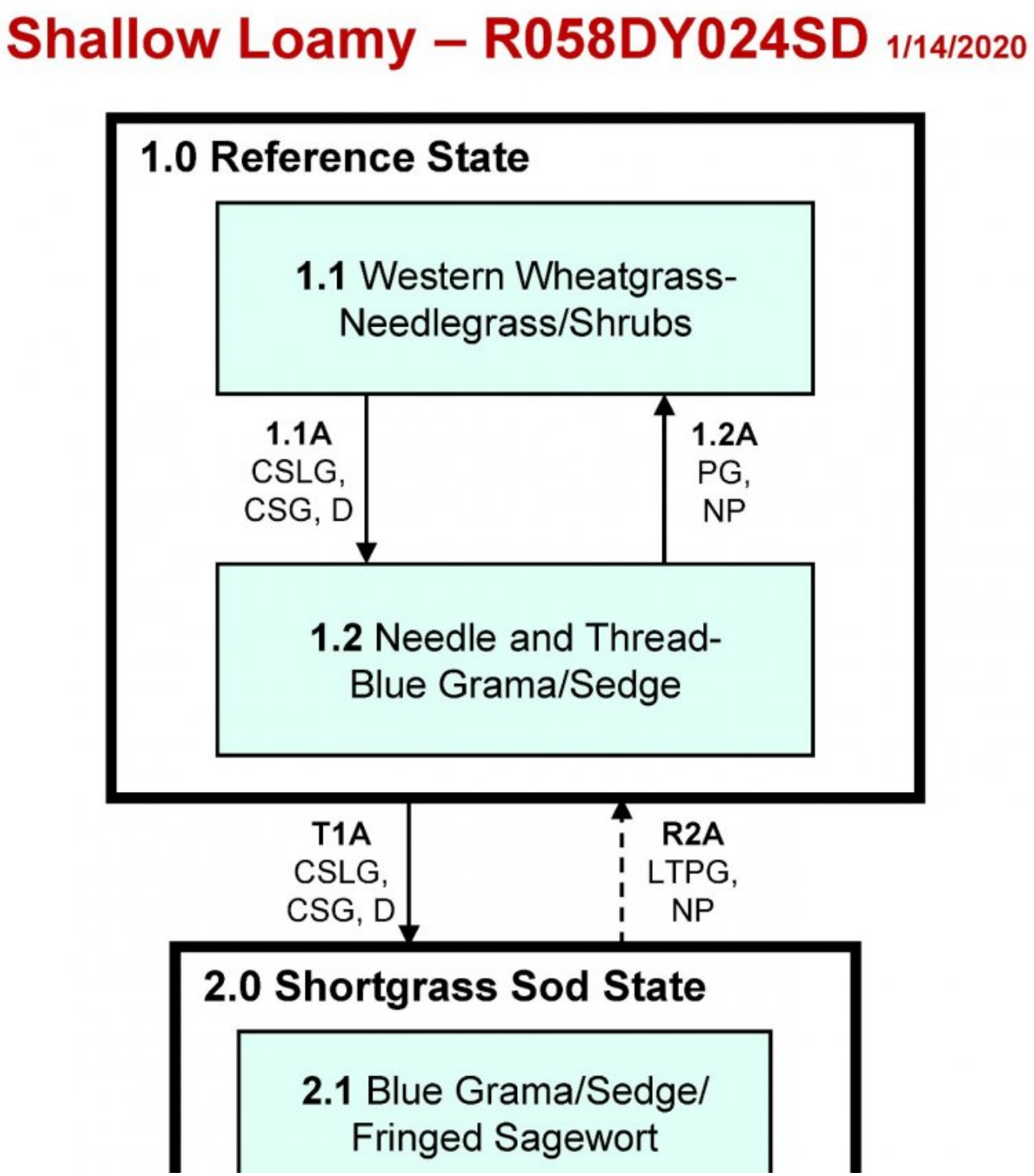
The plant community upon which interpretations are primarily based is the Western Wheatgrass-Needlegrass/Shrubs Plant Community (1.1). This plant community has been determined by studying rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. 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.

Continuous season-long grazing, or continuous seasonal (spring) grazing, without adequate recovery periods

following each grazing occurrence causes this site to depart from the Western Wheatgrass-Needlegrass/Shrubs Plant Community (1.1). Blue grama will begin to increase. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass will decrease in frequency and production. In time, heavy continuous grazing will likely cause upland sedges and blue grama to dominate. This resulting plant community is relatively stable, and the competitive advantage prevents other species from establishing. This plant community is less productive than the Western Wheatgrass-Needlegrass/Shrubs Plant Community (1.1). Runoff increases and infiltration will decrease. Soil erosion will be minimal.

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



CSG – Continuous seasonal grazing (spring)
CSLG – Continuous season-long grazing
D – Drought
LTPG – Long-term prescribed grazing
NP – Return to normal precipitation patterns
PG – Prescribed grazing
– – → Recovery may not be fast or feasible

Diagram Legend: Shallow Loamy - R058DY024SD

T1A	1.0 to 2.0	Continuous season-long grazing; continuous seasonal grazing (repeated spring 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. Transition may not be fast or feasible.
1.1A	1.1 to 1.2	Continuous season-long grazing; continuous seasonal grazing (repeated spring 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; 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 cool-season grasses with sub-dominant warm-season grasses. 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. Cool-season wheatgrasses and needlegrasses and taller warm-season grasses 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.

Dominant plant species

- western snowberry (*Symphoricarpos occidentalis*), shrub
- skunkbush sumac (*Rhus trilobata*), shrub
- prairie sagewort (*Artemisia frigida*), shrub
- rose (*Rosa*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- green needlegrass (*Nassella viridula*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass
- blue grama (*Bouteloua gracilis*), grass
- big bluestem (*Andropogon gerardii*), grass
- prairie Junegrass (*Koeleria macrantha*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- sedge (*Carex*), grass
- prairie coneflower (*Ratibida*), other herbaceous
- scarlet globemallow (*Sphaeralcea coccinea*), other herbaceous
- purple prairie clover (*Dalea purpurea*), other herbaceous

- beardtongue (*Penstemon*), other herbaceous
- American vetch (*Vicia americana*), other herbaceous
- white sagebrush (*Artemisia ludoviciana*), other herbaceous

Community 1.1
Western Wheatgrass-Needlegrass/Shrubs

The interpretive plant community for this site is the Western Wheatgrass-Needlegrass/Shrubs 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 or prescribed burning, and on areas receiving occasional short periods of deferment. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, 10 percent shrubs, and 0 to 1 percent cryptogams. Cool-season grasses dominate this plant community. The major grasses include western wheatgrass, green needlegrass, and needle and thread. Other grasses or grass-likes occurring on the site include blue grama, big bluestem, prairie Junegrass, buffalograss, and sedge. Significant forbs include prairie coneflower, scarlet globemallow, purple prairie clover, penstemon, American vetch, and cudweed sagewort. The significant shrubs that occur include snowberry, sumac, fringed sagewort, and rose. An occasional Rocky Mountain juniper or ponderosa pine may also occur on this site. 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	710	1078	1405
Forb	65	140	240
Shrub/Vine	125	175	240
Moss	0	7	15
Total	**900**	**1400**	**1900**

Figure 9. Plant community growth curve (percent production by month). SD5802, Northern Rolling High Plains, cool-season dominant, warm-season subdominant. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 1.2
Needle and Thread-Blue Grama/Sedge

This plant community develops under continuous season-long grazing; 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 70 percent grasses and grass-like species, 10 percent forbs, 15 percent shrubs, and 1 to 4 percent cryptogams. The dominant grasses include blue grama and western wheatgrass. Other grasses or grass-likes may include sedge, needle and thread, and prairie Junegrass. Significant forbs include cudweed sagewort, goldenrod, purple coneflower, scurfpea, and western yarrow. The dominant shrubs that occur include fringed sagewort, rose, sumac, and western snowberry. An occasional Rocky Mountain juniper or ponderosa pine may also occur on this site. Compared to the Western Wheatgrass-Needlegrass/Shrubs Plant Community (1.1), the shortgrass species including blue grama and threadleaf sedge have increased. The cool-season species including western wheatgrass 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 somewhat resistant to change. The dominant herbaceous species are very adapted to grazing;

however, the mid-grass species and the more palatable forbs will decrease. If the herbaceous component is intact, it tends to be resilient if disturbance is not long-term. Because of the sod forming habit of the shortgrass species, water infiltration is lower, and runoff is moderate to high. Typically, the runoff is very clean because of the low potential for on-site soil erosion. However, offsite areas may be affected by increased runoff.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	545	797	1020
Shrub/Vine	100	165	250
Forb	50	110	185
Moss	5	28	45
Total	**700**	**1100**	**1500**

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 season-long grazing; continuous seasonal grazing (every spring); or heavy grazing in combination with drought will lead the Reference Plant Community (1.1) to the Needle and Thread-Blue Grama/Sedge 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 Needle and Thread-Blue Grama/Sedge Plant Community (1.2) to the Western Wheatgrass-Needlegrass/Shrubs Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2
Shortgrass Sod State

The Shortgrass Sod State (2.0) is dominated by shortgrass species, and upland sedges. Clubmoss may also become common on this site. This State is the result of grazing management that does not provide adequate recovery time for tall and mid-statured 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.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- threadleaf sedge (*Carex filifolia*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- prairie Junegrass (*Koeleria macrantha*), grass
- threeawn (*Aristida*), grass
- cheatgrass (*Bromus tectorum*), grass
- bluegrass (*Poa*), grass

- scurfpea (*Psoralidium*), other herbaceous
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- goldenrod (*Solidago*), other herbaceous
- clubmoss (*Lycopodiella*), other herbaceous
- prairie sagewort (*Artemisia frigida*), other herbaceous
- soapweed yucca (*Yucca glauca*), other herbaceous

Community 2.1
Blue Grama/Sedge/Fringed Sagewort

This plant community develops under continuous season-long grazing; continuous seasonal grazing of heavy grazing in combination with drought. It is made up of approximately 75 percent grasses, 10 percent forbs, 10 percent shrubs, and 1 to 7 percent cryptogams. The dominant grasses and grass-like species include blue grama and threadleaf sedge. Other grasses may include western wheatgrass, prairie Junegrass, threeawn, bluegrass, and cheatgrass. The dominant forbs include scurfpea, cudweed sagewort, goldenrod, and clubmoss. The dominant shrubs include fringed sagewort and cactus. Compared to the Western Wheatgrass-Needlegrass/Shrubs Plant Community (1.1), blue grama and sedge have increased, and the cool-season mid-grasses have diminished greatly. Nonpalatable forbs and cactus have increased and non-native species have invaded the site. Plant diversity is low. This plant community is very stable. Generally, this plant community will require significant management inputs (i.e., high animal impact, long-term prescribed grazing, favorable climatic conditions, etc.,) and time to move it towards the Needle and Thread-Blue Grama/Sedge Plant Community (1.2). Onsite soil erosion is low. Infiltration is low and runoff is high. Typically, the runoff is very clean because of the low potential for onsite soil erosion. However, offsite areas can be significantly impacted due to the increased runoff.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	325	628	925
Shrub/Vine	35	80	130
Forb	35	60	85
Moss	5	32	60
Total	**400**	**800**	**1200**

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).

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing, including proper stocking rates, change in season of use, and time for adequate plant recovery; and favorable climatic conditions; may facilitate this 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.

Conservation practices

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	**Rhizomatous Wheatgrasses**			210–350	
	western wheatgrass	PASM	*Pascopyrum smithii*	210–350	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–70	–
2	**Cool-Season Bunch Grasses**			70–350	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	28–210	–
	green needlegrass	NAVI4	*Nassella viridula*	28–140	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	14–70	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–42	–
3	**Mid- Tall Warm-Season Grasses**			70–210	
	little bluestem	SCSC	*Schizachyrium scoparium*	70–210	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	14–112	–
	big bluestem	ANGE	*Andropogon gerardii*	0–70	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–70	–
4	**Short-Warm Season Grasses**			70–140	
	blue grama	BOGR2	*Bouteloua gracilis*	70–140	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–28	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–14	–
5	**Other Native Grasses**			14–70	
	prairie Junegrass	KOMA	*Koeleria macrantha*	14–70	–
	Grass, perennial	2GP	*Grass, perennial*	0–70	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–28	–
6	**Grass-Likes**			70–140	
	threadleaf sedge	CAFI	*Carex filifolia*	28–140	–
	needleleaf sedge	CADU6	*Carex duriuscula*	14–112	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–42	–
7	**Non-Native Cool-Season Grasses**			0	
Forb					
8	**Forbs**			70–210	
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	14–70	–
	dotted blazing star	LIPU	*Liatris punctata*	14–42	–
	buckwheat	ERIOG	*Eriogonum*	0–42	–
	goldenrod	SOLID	*Solidago*	14–42	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	14–42	–
	Forb, native	2FN	*Forb, native*	14–42	–
	scurfpea	PSORA2	*Psoralidium*	14–28	–
	American vetch	VIAM	*Vicia americana*	14–28	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	14–28	–

	scarlet beeblossom	GACO5	*Gaura coccinea*	14–28	
	wavyleaf thistle	CIUN	*Cirsium undulatum*	14–28	–
	purple prairie clover	DAPU5	*Dalea purpurea*	14–28	–
	milkvetch	ASTRA	*Astragalus*	14–28	–
	beardtongue	PENST	*Penstemon*	0–28	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–14	–
	old man's whiskers	GETR	*Geum triflorum*	0–14	–
	pussytoes	ANTEN	*Antennaria*	0–14	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–14	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–14	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–14	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–14	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–14	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–14	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–14	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–14	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–14	–
	spiny phlox	PHHO	*Phlox hoodii*	0–14	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–14	–
Shrub/Vine					
9	**Shrubs**			140–210	
	skunkbush sumac	RHTR	*Rhus trilobata*	14–112	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	14–70	–
	soapweed yucca	YUGL	*Yucca glauca*	0–70	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–70	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–70	–
	prairie rose	ROAR3	*Rosa arkansana*	14–42	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–42	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	14–42	–
	leadplant	AMCA6	*Amorpha canescens*	0–28	–
	prairie sagewort	ARFR4	*Artemisia frigida*	14–28	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	14–28	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–14	–
Moss					
10	**Mat-Forming Forbs**			0–14	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–14	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrasses**			22–110	
	western wheatgrass	PASM	*Pascopyrum smithii*	22–110	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–55	–

2	**Cool-Season Bunchgrass**			110–220	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	110–220	–
	green needlegrass	NAVI4	*Nassella viridula*	0–55	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–11	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–11	–
3	**Mid- Tall Warm-Season Grasses**			11–55	
	little bluestem	SCSC	*Schizachyrium scoparium*	11–55	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–33	–
4	**Short-Warm Season Grasses**			110–220	
	blue grama	BOGR2	*Bouteloua gracilis*	110–220	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–55	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	11–44	–
5	**Other Native Grasses**			11–55	
	Grass, perennial	2GP	*Grass, perennial*	0–55	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	11–33	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–33	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–11	–
6	**Grass-Likes**			55–165	
	threadleaf sedge	CAFI	*Carex filifolia*	55–165	–
	needleleaf sedge	CADU6	*Carex duriuscula*	22–110	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–55	–
7	**Non-Native Cool-Season Grasses**			0–55	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–55	–
	cheatgrass	BRTE	*Bromus tectorum*	0–55	–
	field brome	BRAR5	*Bromus arvensis*	0–22	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–11	–
Forb					
8	**Forbs**			55–165	
	white sagebrush	ARLU	*Artemisia ludoviciana*	11–55	–
	goldenrod	SOLID	*Solidago*	11–44	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–33	–
	scurfpea	PSORA2	*Psoralidium*	11–33	–
	Forb, introduced	2FI	*Forb, introduced*	0–33	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–22	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	11–22	–
	woolly plantain	PLPA2	*Plantago patagonica*	11–22	–
	Forb, native	2FN	*Forb, native*	11–22	–
	dotted blazing star	LIPU	*Liatris punctata*	11–22	–
	buckwheat	ERIOG	*Eriogonum*	0–22	–
	spiny phlox	PHHO	*Phlox hoodii*	0–11	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–11	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–11	–
	pussytoes	ANTEN	*Antennaria*	0–11	–

	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–11	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–11	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–11	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–11	–
	milkvetch	ASTRA	*Astragalus*	0–11	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–11	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–11	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–11	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–11	–
	American vetch	VIAM	*Vicia americana*	0–11	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–11	–
Shrub/Vine					
9	**Shrubs**			110–220	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–77	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–77	–
	soapweed yucca	YUGL	*Yucca glauca*	0–66	–
	skunkbush sumac	RHTR	*Rhus trilobata*	11–55	–
	prairie sagewort	ARFR4	*Artemisia frigida*	11–55	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	11–44	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–33	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	11–33	–
	prairie rose	ROAR3	*Rosa arkansana*	11–22	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–22	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–11	–
	leadplant	AMCA6	*Amorpha canescens*	0–11	–
Moss					
10	**Mat-Forming Forbs**			11–44	
	lesser spikemoss	SEDE2	*Selaginella densa*	11–44	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrasses**			0–40	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–40	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–24	–
2	**Cool-Season Bunchgrass**			0–80	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–80	–
3	**Mid- Tall Warm-Season Grasses**			0–16	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–16	–
4	**Short Warm-Season Grasses**			160–240	
	blue grama	BOGR2	*Bouteloua gracilis*	160–240	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	8–56	–

	hairy grama	BOHI2	*Bouteloua hirsuta*	0–40	–
5	**Other Native Grasses**			8–40	
	Grass, perennial	2GP	*Grass, perennial*	0–40	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	8–16	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–16	–
6	**Grass-Likes**			120–240	
	threadleaf sedge	CAFI	*Carex filifolia*	80–200	–
	needleleaf sedge	CADU6	*Carex duriuscula*	40–120	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–64	–
7	**Non-Native Cool-Season Grasses**			8–40	
	Kentucky bluegrass	POPR	*Poa pratensis*	8–40	–
	cheatgrass	BRTE	*Bromus tectorum*	8–40	–
	field brome	BRAR5	*Bromus arvensis*	0–16	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–8	–
Forb					
8	**Forbs**			40–80	
	white sagebrush	ARLU	*Artemisia ludoviciana*	8–56	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	8–32	–
	Forb, introduced	2FI	*Forb, introduced*	0–32	–
	goldenrod	SOLID	*Solidago*	8–32	–
	scurfpea	PSORA2	*Psoralidium*	8–24	–
	woolly plantain	PLPA2	*Plantago patagonica*	8–16	–
	Forb, native	2FN	*Forb, native*	8–16	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–16	–
	spiny phlox	PHHO	*Phlox hoodii*	0–8	–
	dotted blazing star	LIPU	*Liatris punctata*	0–8	–
	buckwheat	ERIOG	*Eriogonum*	0–8	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–8	–
	pussytoes	ANTEN	*Antennaria*	0–8	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–8	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–8	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–8	–
Shrub/Vine					
9	**Shrubs**			40–120	
	prairie sagewort	ARFR4	*Artemisia frigida*	24–80	–
	soapweed yucca	YUGL	*Yucca glauca*	0–40	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	8–40	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–32	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–32	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–24	–
	skunkbush sumac	RHTR	*Rhus trilobata*	8–24	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	8–24	–

	prairie rose	ROAR3	*Rosa arkansana*	8–16	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	8–16	–
Moss					
10	**Mat-Forming Forbs**			8–56	
	lesser spikemoss	SEDE2	*Selaginella densa*	8–56	–

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 Shallow Loamy ecological site provides upland grassland cover with an associated forb and shrub component. It was typically part of an expansive grassland landscape that included combinations of Loamy, Shallow Clayey, Thin Loamy, Claypan, Sandy, Sandy Claypan, Clayey, 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 Shallow Loamy ecological site remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, coyotes, and a variety of reptiles, amphibians, and insects. Invasive species such as annual bromegrasses and crested wheatgrass have impacted the biological integrity of the site for some grassland birds such as greater sage-grouse. Changes in historic fire regime and domestic grazing have impacted the forb/shrub/grass
percentages. Greater sage-grouse and Brewer’s sparrow benefit when big sagebrush increases.

Western Wheatgrass-Needlegrass/Shrubs (1.1) and Needle and Thread-Blue Grama/Sedge (1.2): 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.

Brewer’s and grasshopper sparrow, lark bunting, western meadowlark, greater sage-grouse, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides. This site provides important breeding habitat for loggerhead shrike. This site provides excellent nesting and brood rearing habitat for sharp-tailed grouse. Brewer’s sparrow and greater sage-grouse may be present depending on the

frequency and distribution of big sagebrush. Diverse prey populations are available for grassland raptors such as ferruginous hawk, Swainson's hawk, golden eagle, and prairie falcon.

The diversity of grasses, forbs, and shrubs provide high nutrition levels for small and large herbivores including voles, mice, thirteen-lined ground squirrel, white-tailed jackrabbit, and deer. This ES provides excellent wintering habitat for pronghorn. The moderate stature of this plant community provides suitable thermal, protective, and escape cover for small 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 spade foot toad, Great Plains toad, bull snake, and western rattlesnake.

Resulting from continuous grazing or from over utilization during extended drought periods, the shift to a needle and thread, blue grama, and sedge community occurs. The forb and shrub diversity have not decreased. The shift from the Reference Plant Community (1.1) to the Needle and Thread-Blue Grama/Sedge Plant Community (1.2) does not result in a significant change to the wildlife community.

Blue Grama/Sedge/Fringed Sagewort (2.1): This plant community develops under heavy continuous grazing. The forb diversity has decreased; however, the shrub community remains diverse. The abundance of big sagebrush has diminished. The shift from a taller to shorter herbaceous plant community may favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, tiger salamander, and swift fox. Species such as horned larks, upland sandpipers, and white-tailed jackrabbit will increase due to the loss of big sagebrush. The density of species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail will decline based on the abundance of big sagebrush. However, this plant community may provide areas suitable for lek site development. The short stature of this plant community limits thermal, protective, and escape cover. Predators utilizing this plant community include 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: Western Wheatgrass-Needlegrass/Shrubs (1.1)
Average Production (lb/acre, air-dry): 1,400
Stocking Rate (AUM/acre): 0.38

Plant Community: Needle and Thread-Blue Grama/Sedge (1.2)
Average Production (lb/acre, air-dry): 1,100
Stocking Rate (AUM/acre): 0.30

Plant Community: Blue Grama/Sedge/Fringed Sagewort (2.1)
Average Production (lb/acre, air-dry): 800*
Stocking Rate (AUM/acre): 0.22*

* 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 D. 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

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site description include: Ryan Beer, Range Management Specialist (RMS), NRCS; Chuck Berdan, Biologist (BIO), Bureau of Land Management (BLM); Stan Boltz, RMS, NRCS; Dave Dewald, Wildlife BIO, NRCS; Mitch Faulkner, RMS, NRCS; Jody Forman, RMS, NRCS; Dennis Froemke, RMS, NRCS; Tom Juntti, BIO, United States Forest Service (USFS); Cheryl Nielsen,

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There is 1 SCS-RANGE-417 collected in 2004 from Harding County, South Dakota.

Other references

Beck, J.L., J.W. Connelly, C.L. Wambolt. 2010. Consequences of treating Wyoming big sagebrush to enhance wildlife habitats; Rangeland Ecology and Management 65:444–455, September 2012

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C.A. Carpenter, and W.H McNab. 2007. Ecological subregions: Sections and subsections of the conterminous United States. USDA Forest Service, General Technical Report WO-76D. https://www.fs.fed.us/research/publications/misc/73326-wo-gtr-76d-cleland2007.pdf (accessed 31 January 2019).

Cooper, S.V., P. Lesica, G.M. Kudray. 2001. Post-fire recovery of Wyoming big sagebrush steppe in central and southeastern Montana; Natural Resources and Environmental Issues, Volume 16; Shrublands: Wildlands and Wildlife Habitats, Article 12.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
High Plains Regional Climate Center, University of Nebraska. 2018. http://www.hprcc.unl.edu/ (accessed 6 April 2018).

Innes, Robin J. 2019. Artemisia tridentata subsp. wyomingensis, Wyoming big sagebrush. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: https://www.fs.fed.us/database/feis/plants/shrub/arttriw/all.html (accessed 9 December 2019).

Larson, G.E. and J.R. Johnson. 1999. Plants of the Black Hills and Bear Lodge Mountains. South Dakota State University, College of Agriculture and Biological Sciences and Agriculture Experiment Station, Bulletin 732, Brookings, SD.

Toledo, D., M. Sanderson, K. Spaeth, J. Hendrickson, and J. Printz. 2014. Extent of Kentucky bluegrass and its effect on native plant species diversity and ecosystem services in the Northern Great Plains of the United States. Invasive Plant Science and Management. 7(4):543–522. Weed Science Society of America.

Soil Survey Staff. 2018. Official soil series descriptions. USDA Natural Resources Conservation Service. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053587 (accessed 20 December 2018).

Soil Survey Staff. 2018. Web Soil Survey. USDA Natural Resources Conservation Service. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx (accessed 20 December 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 1997. National range and pasture handbook, rev. 1, 2003. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1043055.pdf (accessed 7 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. Agriculture Handbook 296. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050898.pdf (accessed 17 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2007. National engineering handbook, part 654. Rosgen Stream Classification Technique – Supplemental Materials, Technical Supplement 3E. https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17833.wba (accessed 4 March 2019).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2012. National engineering handbook, part 630. Hydrology chapters from e-Directives. https://directives.sc.egov.usda.gov/viewerFS.aspx?hid=21422

(accessed 17 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2014. National ecological site handbook, 1st ed. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcseprd1291232 (accessed 27 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. Climate data. National Water and Climate Center. http://www.wcc.nrcs.usda.gov/ (accessed 2 December 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. Electronic field office technical guide. https://efotg.sc.egov.usda.gov (accessed 24 September 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. National Soil Information System, Information Technology Center. http://nasis.nrcs.usda.gov (accessed 25 May 2018.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. PLANTS database. National Plant Data Team, Greensboro, NC. http://plants.usda.gov (accessed 27 December 2018).

U.S. Environmental Protection Agency. 2018. EPA level III and level IV ecoregions of the conterminous United States. https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions- conterminous-united-states (accessed 26 April 2018).

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Rick L. Peterson

Approval

Suzanne Mayne-Kinney, 7/18/2024

Acknowledgments

This ecological site description was updated by Rick L. Peterson on January 14, 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.

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Rangeland health reference sheet

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

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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):** 0 to 15 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.

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 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.

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.

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: Rhizomatous wheatgrass > Mid/tall cool-season bunchgrasses >

    Sub-dominant: Mid/tall warm-season grasses = Grass-likes = Forbs = Shrubs >

    Other: Short warm-season grasses > Mid/short cool-season grasses

    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.

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 900-1,900 lbs./acre (air-dry weight). Reference value production is 1,400 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.
