USDA Natural Resources Conservation Service

Ecological site R058DY016SD
Very Shallow

Last updated: 7/18/2024
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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.

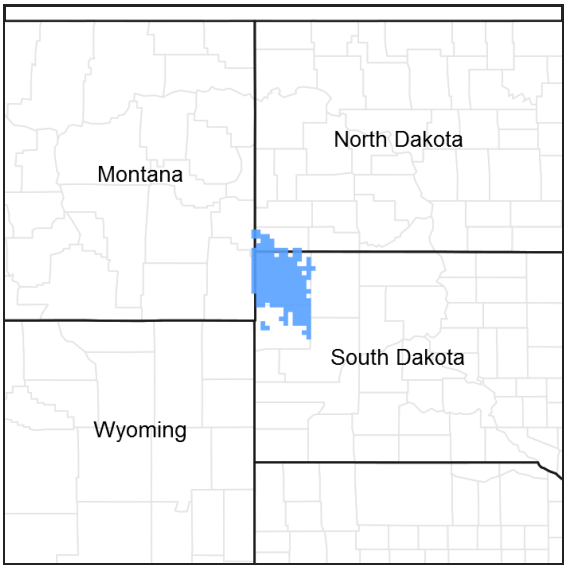


Figure 1. Mapped extent

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 Very Shallow ecological site is found throughout MLRA 58D. It is located on hills and ridges and does not receive additional moisture from runoff or overflow. Typical slopes range from 15 to 40 percent. Soils are very shallow (10 inches or less in depth) with a channery sandy loam to very gravelly loam surface layer that is 3 to 7 inches thick.

The vegetation in the Reference State (1.0) is an even mix of both warm- and cool-season grasses. The major grasses include needle and thread, blue grama, and little bluestem. Forbs are common and diverse. The significant shrubs are fringed sagewort, rose, skunkbush sumac, and small soapweed (yucca).

Associated sites

R058DY024SD	**Shallow Loamy** The Shallow Loamy ecological site is found adjacent to, or intermingled with, the Very Shallow ecological site.
R058DY009SD	**Sandy** The Sandy ecological site is found on level to slightly sloping landscapes typically down slope of, the Very Shallow ecological site.

R058DY028SD	**Shallow Sandy** The Shallow Sandy ecological site is found adjacent to, or intermingled with, the Very Shallow ecological site.

Similar sites

R058DY024SD	**Shallow Loamy** The Shallow Loamy ecological site will have less needle and thread; and have greater vegetative production than the Very Shallow ecological site.
R058DY028SD	**Shallow Sandy** The Shallow Sandy ecological site will have more prairie sandreed; and more vegetative production than the Very Shallow ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Hesperostipa comata var. comata* (2) *Bouteloua gracilis*

Physiographic features

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

Table 2. Representative physiographic features

Landforms	(1) Upland > Ridge (2) Upland > Hill
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	2,300–4,000 ft
Slope	15–40%
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 Very Shallow ecological site.

Soil features

Soils common to the Very Shallow ecological site have a channery sandy loam to very gravelly loam surface layer surface layer. The surface layer is 3 to 7 inches thick. Slopes range from 15 to 40 percent. Soils are very shallow (10 inches or less in depth) and formed in formed in colluvium, alluvium, residuum of mixed origin. The soils in this site are excessively to somewhat excessively drained and have a moderate infiltration rate. Subsurface layers are restrictive to water movement and root penetration.

This site should show slight to no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow paths are broken, 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 Very Shallow ecological site include, Brandenburg, Kirby, Nihill, and Wabek.

The hazard of water erosion increases on slopes greater than about 15 percent. Low available water capacity caused by the very shallow rooting depth strongly influences the soil-water-plant relationship.

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

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and siltstone (2) Colluvium–sandstone and siltstone (3) Residuum–scoria
Surface texture	(1) Channery loam (2) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Moderate
Depth to restrictive layer	3–10 in
Soil depth	3–10 in
Surface fragment cover <=3"	25–60%
Surface fragment cover >3"	0–10%
Available water capacity (0-40in)	1–3 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	45–90%
Subsurface fragment volume >3" (Depth not specified)	0–30%

Ecological dynamics

The Very Shallow 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 Needle and Thread-Little Bluestem-Grama 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.

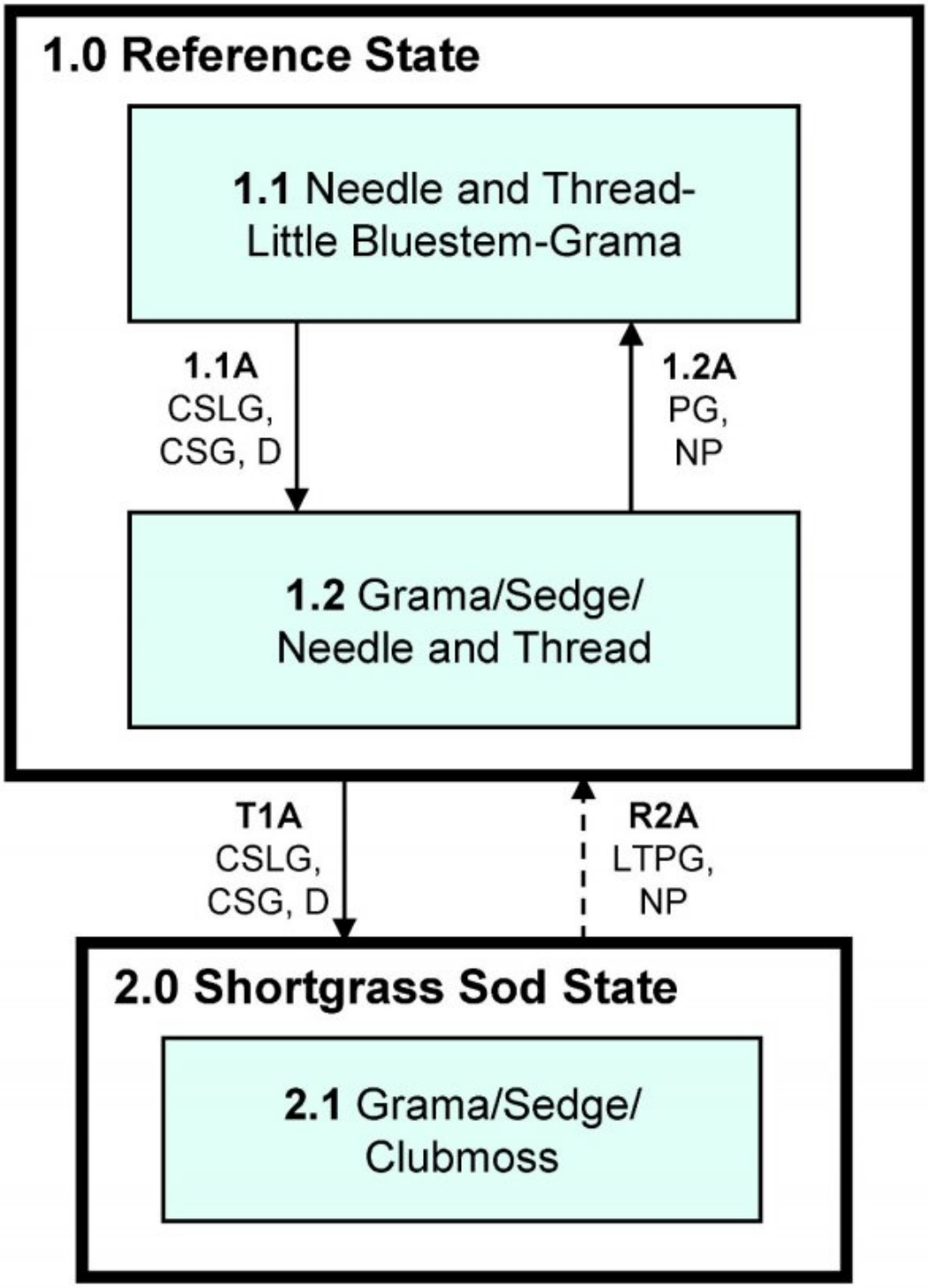
Continuous season-long grazing, or continuous seasonal (spring) grazing, without adequate recovery periods following each grazing occurrence causes this site to depart from the Needle and Thread-Little Bluestem-Grama Plant Community (1.1). Species such as threadleaf sedge and blue grama will initially increase. Plains muhly, western wheatgrass, little bluestem, and sideoats grama will decrease in frequency and production and later disappear. Long-tern continuous season-long or seasonal grazing causes blue grama and threadleaf sedge 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 Needle and Thread-Little Bluestem-Grama 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.

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

Very Shallow – R058DY016SD 1/17/2020



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: Very Shallow - R058DY016SD

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 an even mix of both warm- and cool-season grass species. 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

- needle and thread (*Hesperostipa comata ssp. comata*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- blue grama (*Bouteloua gracilis*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- threadleaf sedge (*Carex filifolia*), grass
- dense blazing star (*Liatris spicata*), other herbaceous
- purple coneflower (*Echinacea*), other herbaceous
- prairie clover (*Dalea*), other herbaceous
- spiny cocklebur (*Xanthium spinosum*), other herbaceous
- prairie sagewort (*Artemisia frigida*), other herbaceous
- rose (*Rosa*), other herbaceous
- smooth sumac (*Rhus glabra*), other herbaceous
- yucca (*Yucca*), other herbaceous
- pricklypear (*Opuntia*), other herbaceous

Community 1.1
Needle and Thread-Little Bluestem-Grama

The plant community upon which interpretations are primarily based is the Needle and Thread-Little Bluestem-Grama 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 prescribed grazing that allows for proper utilization, changes in season of use, and adequate recovery periods following each grazing event. The potential vegetation is about 85 percent grass or grass-like species, 10 percent forbs, 5 percent shrubs, and 0 to 1 percent mat-forming forbs. An even mix of both warm- and cool-season species dominates this plant community. The major grasses include needle and thread, little bluestem, and blue grama. Other grasses occurring on the site include sideoats grama, western wheatgrass, and threadleaf sedge. The significant forbs include gayfeather, purple coneflower, prairie clover, and cutleaf ironplant. Significant shrubs are fringed sagewort, rose, skunkbush sumac, 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). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning at the site potential. Plant litter is properly

distributed with some movement offsite and natural plant mortality is low. The diversity in plant species allows for high drought tolerance.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	430	676	920
Forb	35	60	85
Shrub/Vine	35	60	85
Moss	0	4	10
Total	**500**	**800**	**1100**

Figure 9. 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

Community 1.2
Grama/Sedge/Needle and Thread

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 80 percent grass and grass-like species, 10 percent forbs, 10 percent shrubs, and 1 to 3 percent mat-forming forbs. The dominant grasses are blue grama, threadleaf sedge, and needle and thread. Significant forbs include cudweed sagewort, green sagewort, and white prairie aster. Dominant shrubs in include fringed sagewort, yucca, and broom snakeweed. Compared to the Needle and Thread-Little Bluestem-Grama Plant Community (1.1), blue grama and sedge have greatly increased. Little bluestem, sideoats grama, plains muhly, and western wheatgrass are greatly diminished. Desirable plant species have decreased. This plant community is not resistant to change due to the higher percentage of bare ground. 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 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	350	468	690
Forb	25	60	95
Shrub/Vine	25	60	95
Moss	0	12	20
Total	**400**	**600**	**900**

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, or heavy grazing in combination with drought will lead the Reference Plant Community (1.1) to the Grama/Sedge/Needle and Thread 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 Grama/Sedge/Needle and Thread Plant Community (1.2) to the Needle and Thread-Little Bluestem-Grama 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

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- blue grama (*Bouteloua gracilis*), grass
- threadleaf sedge (*Carex filifolia*), grass
- hairy grama (*Bouteloua hirsuta*), grass
- threeawn (*Aristida*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- tarragon (*Artemisia dracunculus*), other herbaceous
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- pricklypear (*Opuntia*), other herbaceous
- prairie sagewort (*Artemisia frigida*), other herbaceous
- clubmoss (*Lycopodiella*), other herbaceous

Community 2.1
Grama/Sedge/Clubmoss

This plant community develops under long-term, continuous season-long grazing; long-term, continuous seasonal grazing, or heavy grazing in combination with drought. It is made up of approximately 75 percent grasses, 10 percent forbs, 10 percent shrubs, and 1-5 percent mat-forming forbs. The dominant grasses and grass-like species include blue grama and threadleaf sedge. Other grasses may include hairy grama, threeawn, buffalograss, and little bluestem. Significant forbs include green sagewort and cudweed sagewort. The significant shrubs include broom snakeweed, cactus, and fringed sagewort. Clubmoss, while not dominant by weight, forms an extensive mat, and restricts infiltration. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives blue grama and sedges a competitive advantage over cool- and warm-season mid-grasses. This plant community is less productive than the Needle and Thread-Little Bluestem-Grama Plant Community (1.1). Runoff increases and infiltration has decreased. Soil erosion does not increase appreciably. Plant diversity is low.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	200	288	425
Forb	35	60	85
Shrub/Vine	15	40	65
Moss	0	12	25
Total	**250**	**400**	**600**

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

Long-term, 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	**Cool-Season Bunchgrass**			120–200	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	120–200	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–40	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–24	–
2	**Mid- and Tall Warm-Season Grasses**			120–200	
	little bluestem	SCSC	*Schizachyrium scoparium*	40–120	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	16–80	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	16–64	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–40	–
3	**Short Warm-Season Grasses**			120–200	
	blue grama	BOGR2	*Bouteloua gracilis*	40–144	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	8–40	–
	threeawn	ARIST	*Aristida*	8–40	–

	buffalograss	BODA2	*Bouteloua dactyloides*	0–40	–
4	**Rhizomatous Wheatgrass**			16–80	
	western wheatgrass	PASM	*Pascopyrum smithii*	16–80	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–40	–
5	**Other Native Grasses**			8–40	
	prairie Junegrass	KOMA	*Koeleria macrantha*	8–32	–
	Grass, perennial	2GP	*Grass, perennial*	0–24	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–16	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–16	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–8	–
6	**Grass-Likes**			40–80	
	threadleaf sedge	CAFI	*Carex filifolia*	40–80	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–40	–
7	**Non-Native Cool-Season Grasses**			0	
Forb					
8	**Forbs**			40–80	
	Forb, native	2FN	*Forb, native*	0–32	–
	beardtongue	PENST	*Penstemon*	8–24	–
	field sagewort	ARCA12	*Artemisia campestris*	8–24	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	8–24	–
	purple prairie clover	DAPU5	*Dalea purpurea*	8–24	–
	pussytoes	ANTEN	*Antennaria*	8–16	–
	milkvetch	ASTRA	*Astragalus*	8–16	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	8–16	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	8–16	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	8–16	–
	dotted blazing star	LIPU	*Liatris punctata*	8–16	–
	spiny phlox	PHHO	*Phlox hoodii*	8–16	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	8–16	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–16	–
	textile onion	ALTE	*Allium textile*	0–8	–
	buckwheat	ERIOG	*Eriogonum*	0–8	–
	white prairie clover	DACA7	*Dalea candida*	0–8	–
	deathcamas	ZIGAD	*Zigadenus*	0–8	–
	scurfpea	PSORA2	*Psoralidium*	0–8	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–8	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–8	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–8	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–8	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–8	–
Shrub/Vine					
9	**Shrubs**			40–80	
	prairie sagewort	ARFR4	*Artemisia frigida*	8–32	–

	prairie sagewort	ARLU	*Artemisia ludoviciana*	0–32	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–32	–
	kinnikinnick	ARUV	*Arctostaphylos uva-ursi*	0–16	–
	rose	ROSA5	*Rosa*	8–16	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–16	–
	soapweed yucca	YUGL	*Yucca glauca*	8–16	–
	pricklypear	OPUNT	*Opuntia*	8–16	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–16	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–8	–
Moss					
10	**Mat-Forming Forbs**			0–8	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–8	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-Season Bunchgrass**			30–90	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	30–90	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–12	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–6	–
2	**Mid- and Tall Warm-Season Grasses**			6–60	
	little bluestem	SCSC	*Schizachyrium scoparium*	6–48	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–30	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–18	–
3	**Short Warm-Season Grasses**			120–210	
	blue grama	BOGR2	*Bouteloua gracilis*	90–150	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	6–60	–
	threeawn	ARIST	*Aristida*	6–60	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–48	–
4	**Rhizomatous Wheatgrass**			6–30	
	western wheatgrass	PASM	*Pascopyrum smithii*	6–30	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–6	–
5	**Other Native Grasses**			6–48	
	prairie Junegrass	KOMA	*Koeleria macrantha*	6–30	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–24	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–18	–
	Grass, perennial	2GP	*Grass, perennial*	0–18	–
6	**Grass-Likes**			60–120	
	threadleaf sedge	CAFI	*Carex filifolia*	60–120	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–60	–
7	**Non-Native Cool-Season Grasses**			0–12	
	cheatgrass	BRTE	*Bromus tectorum*	0–12	–
	field brome	BRAR5	*Bromus arvensis*	0–12	–

Forb					
8	**Forbs**			30–90	
	white sagebrush	ARLU	*Artemisia ludoviciana*	6–30	–
	field sagewort	ARCA12	*Artemisia campestris*	6–30	–
	Forb, native	2FN	*Forb, native*	0–30	–
	Forb, introduced	2FI	*Forb, introduced*	0–30	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	6–24	–
	scurfpea	PSORA2	*Psoralidium*	0–12	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–12	–
	milkvetch	ASTRA	*Astragalus*	6–12	–
	spiny phlox	PHHO	*Phlox hoodii*	6–12	–
	purple prairie clover	DAPU5	*Dalea purpurea*	6–12	–
	pussytoes	ANTEN	*Antennaria*	6–12	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–6	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–6	–
	textile onion	ALTE	*Allium textile*	0–6	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–6	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–6	–
	dotted blazing star	LIPU	*Liatris punctata*	0–6	–
	buckwheat	ERIOG	*Eriogonum*	0–6	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–6	–
	deathcamas	ZIGAD	*Zigadenus*	0–6	–
	beardtongue	PENST	*Penstemon*	0–6	–
Shrub/Vine					
9	**Shrubs**			30–90	
	prairie sagewort	ARFR4	*Artemisia frigida*	12–48	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–24	–
	soapweed yucca	YUGL	*Yucca glauca*	6–18	–
	rose	ROSA5	*Rosa*	6–18	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–18	–
	pricklypear	OPUNT	*Opuntia*	6–18	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–18	–
	kinnikinnick	ARUV	*Arctostaphylos uva-ursi*	0–12	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–12	–
Moss					
10	**Mat-Forming Forbs**			6–18	
	lesser spikemoss	SEDE2	*Selaginella densa*	6–18	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-Season Bunchgrass**			0–20	

	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–20	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–4	–
2	**Mid- and Tall Warm-Season Grasses**			0–20	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–16	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–4	–
3	**Short Warm-Season Grasses**			120–180	
	blue grama	BOGR2	*Bouteloua gracilis*	100–180	–
	threeawn	ARIST	*Aristida*	12–60	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–40	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	4–40	–
4	**Rhizomatous Wheatgrass**			0–12	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–12	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–4	–
5	**Other Native Grasses**			4–28	
	prairie Junegrass	KOMA	*Koeleria macrantha*	4–12	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–12	–
	Grass, perennial	2GP	*Grass, perennial*	0–12	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–8	–
6	**Grass-Likes**			60–100	
	threadleaf sedge	CAFI	*Carex filifolia*	60–100	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–40	–
7	**Non-Native Cool-Season Grasses**			4–28	
	cheatgrass	BRTE	*Bromus tectorum*	4–28	–
	field brome	BRAR5	*Bromus arvensis*	0–28	–
Forb					
8	**Forbs**			40–80	
	field sagewort	ARCA12	*Artemisia campestris*	4–32	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	4–28	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	4–20	–
	Forb, native	2FN	*Forb, native*	0–20	–
	Forb, introduced	2FI	*Forb, introduced*	0–20	–
	spiny phlox	PHHO	*Phlox hoodii*	4–12	–
	scurfpea	PSORA2	*Psoralidium*	4–12	–
	milkvetch	ASTRA	*Astragalus*	4–8	–
	pussytoes	ANTEN	*Antennaria*	4–8	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–4	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–4	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–4	–
	buckwheat	ERIOG	*Eriogonum*	0–4	–
	deathcamas	ZIGAD	*Zigadenus*	0–4	–
Shrub/Vine					
9	**Shrubs**			20–60	
	prairie sagewort	ARFR4	*Artemisia frigida*	8–40	

	prairie sagewort	ARFR4	*Artemisia frigida*	8–40	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	4–20	–
	soapweed yucca	YUGL	*Yucca glauca*	0–16	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–16	–
	pricklypear	OPUNT	*Opuntia*	4–12	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–12	–
	rose	ROSA5	*Rosa*	0–4	–
Moss					
10	**Mat-Forming Forbs**			4–20	
	lesser spikemoss	SEDE2	*Selaginella densa*	4–20	–

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

This site provided habitat for species requiring unfragmented grassland. Important habitat features include 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 bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Very Shallow 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.

Needle and Thread-Little Bluestem-Grama (1.1): The predominance of grasses in this community favors herbivores. Insects, such as pollinators, play a role in maintaining the forb community and provide a forage base for grassland birds and other species. The 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.

The diversity of grasses and forbs provide high nutrition levels for small and large herbivores including voles, mice, thirteen-lined ground squirrel, and white-tailed jackrabbit. This plant community provides adequate 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, western rattlesnake, and short-horned lizard.

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

The predominance of short grass and grass-like species and the loss of forbs in this community cause a reduction in 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 provide adequate nutrition levels for small and large herbivores including voles, mice, thirteen-lined ground squirrel, and white-tailed jackrabbit. 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, western rattlesnake, and short-horned lizard..

Grama/Sedge/Clubmoss (2.1): This plant community develops under heavy, continuous season-long grazing. The forb diversity has decreased. Species such as the horned lark, upland sandpiper, and white-tailed jackrabbit will increase due to shrub loss. Species such as Brewer’s sparrow, greater sage-grouse, as well as, desert cottontail will rarely use this site.

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

Extreme impairment of the ecological processes impacts offsite aquatic habitats through excessive runoff, nutrient, and sediment loads. Elevated surface temperatures resulting from reduced cover and litter will greatly reduce habitat for most amphibian species, grassland birds, and mammals.

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

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

Plant Community: Needle and Thread-Little Bluestem-Grama (1.1)
Average Production (lb/acre, air-dry): 800
Stocking Rate (AUM/acre): 0.22

Plant Community: Grama/Sedge/Needle and Thread (1.2)
Average Production (lb/acre, air-dry): 600
Stocking Rate (AUM/acre): 0.16

Plant Community: Grama/Sedge/Clubmoss (2.1)
Average Production (lb/acre, air-dry): 400*
Stocking Rate (AUM/acre): 0.11*

* 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

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, RMS, NRCS; Jeff Printz, RMS, NRCS; Mike Stirling, RMS, NRCS; Dan Svingen, BIO, USFS; Darrell Vanderbusch, Soil Scientist, NRCS; Cindy Zachmeier, BIO, NRCS; and Tim Zachmeier, BIO, BLM.

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Contributors

Stan C. Boltz
Travis Patient
Rick L. Peterson

Approval

Suzanne Mayne-Kinney, 7/18/2024

Acknowledgments

This ecological site description was updated by Rick L. Peterson on January 21, 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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(2) fax: (202) 690-7442; or
(3) email: program.intake@usda.gov.

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Rangeland health reference sheet

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

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

Indicators

1. **Number and extent of rills:** None on slopes of about 15% or less, slight to none and discontinuous on slopes greater than 15%.

---

2. **Presence of water flow patterns:** None on slopes of about 15% or less; barely visible and discontinuous with numerous debris dams on slopes greater than 15%.

---

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

---

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.

---

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

---

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

---

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 3 or greater. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure for 1 minute or longer 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 1 to 3 inches thick with light to dark brownish gray colors, but not typically mollic. Structure should typically be weak fine granular at least in the upper A-horizon.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration. Infiltration is typically high due to gravelly nature of soils.

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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 – very shallow to gravel, but no platy structure will be present.

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

    Dominant: Mid cool-season bunchgrasses = Mid/tall warm-season grasses = Short warm-season grasses >

    Sub-dominant: Rhizomatous cool-season grasses = Grass-likes = Forbs = Shrubs >

    Other: Short cool-season bunchgrasses

    Additional:

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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 500-1,100 lbs./acre (air-dry weight). Reference value production is 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

17. **Perennial plant reproductive capability:** Species exhibit somewhat lower vigor than what would normally be expected for these species on other ecological sites. The droughty nature of the soils of this site causes plant stress even in typical precipitation patterns. Do not rate based solely on seed production.