

Ecological site R058DY012SD

Thin 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.

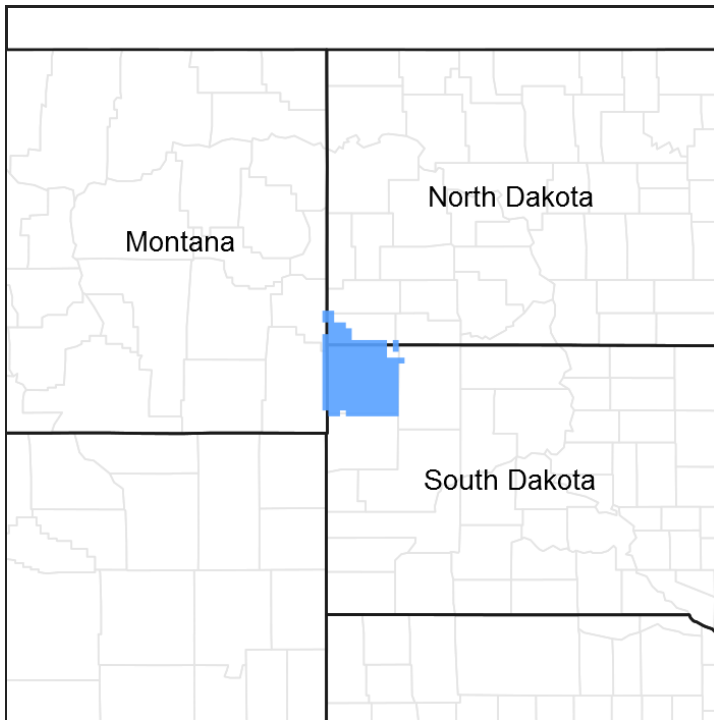


Figure 1. Mapped extent

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 Thin 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 9 to 30 percent. Soils are deep (greater than 20 inches) with a surface layer 4 to 7 inches thick and textures of loam to clay loam. The soils on this site are weakly developed typically having carbonates at or within 6 inches of the soil surface. The texture of the subsurface layer's ranges from silty loam to silty clay.

The vegetation in the Reference State (1.0) consists of a mixture of cool- and warm-season grasses. The major grasses include western wheatgrass, needle and thread, and little bluestem. Forbs are common and diverse. The significant shrubs found in this plant community include leadplant, sagebrush, and western snowberry.

In other MLRAs in South Dakota, this ecological site is comparable to the Thin Upland ecological site.

Associated sites

R058DY009SD	Sandy The Sandy ecological site is found on level to slightly sloping landscapes adjacent to the Thin Loamy ecological site.
R058DY010SD	Loamy The Loamy ecological site is found on level to slightly sloping landscapes adjacent to the Thin Loamy ecological site.
R058DY011SD	Clayey The Clayey ecological site is found on level to slightly sloping landscapes adjacent to the Thin Loamy ecological site.
R058DY024SD	Shallow Loamy The Shallow Loamy ecological site has shallow soils (10 to 20" in depth) and is found adjacent to the Thin Loamy ecological site.

Similar sites

R058DY024SD	<p>Shallow Loamy</p> <p>The Shallow Loamy ecological site will have less little bluestem; and less vegetative production than the Thin Loamy ecological site.</p>
R058DY010SD	<p>Loamy</p> <p>The Loamy ecological site will have more western wheatgrass; less needle and thread; and have greater vegetative production than the Thin Loamy ecological site.</p>
R058DY028SD	<p>Shallow Sandy</p> <p>The Shallow Sandy ecological site will have more prairie sandreed; and less vegetative production than the Thin Loamy ecological site.</p>

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Hesperostipa comata ssp. comata</i> (2) <i>Pascopyrum smithii</i>

Physiographic features

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

Table 2. Representative physiographic features

Landforms	(1) Upland > Hill (2) Upland > Ridge
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	2,300–4,000 ft
Slope	9–30%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

The climate in MLRA 58D is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland to the east. Average annual precipitation ranges from 14 to 17 inches with most falling in the early growing season. Some high intensity, convective thunderstorms occur in the summer. Precipitation in winter

occurs as snow. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This wide range is due to the high elevation and dry air, which permit rapid incoming and outgoing radiation. Outbreaks of cold air from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter but have the most severe effect on ranching operations during late winter and in spring.

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

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Cool-season plants may green-up in September and October if adequate soil moisture is present.

Table 3. Representative climatic features

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

Climate stations used

- (1) BAKER 1 E [USC00240412], Baker, MT
- (2) LADNER 9SW [USC00394671], Camp Crook, SD
- (3) CAMP CROOK [USC00391294], Camp Crook, SD
- (4) BUFFALO ASOS [USW00094037], Buffalo, SD
- (5) BUFFALO 13 ESE [USW00094081], Reva, SD

- (6) REDIG 11 NE [USC00397062], Buffalo, SD
- (7) HOOVER [USC00393945], Newell, SD

Influencing water features

No significant water features influence the Thin Loamy ecological site.

Soil features

Soils common to the Thin Loamy ecological site have a surface layer that is 4 to 7 inches thick with loam to clay loam textures. Slopes range from 9 to 30 percent. Soils are deep (greater than 20 inches) and formed in residuum weathered from shale and siltstone. Soils are classified as Entisols, and are weakly developed other than a recognizable A horizon. Carbonates will typically occur at or within 6 inches of the soil surface. The texture of the subsurface layer's ranges from silty loam to silty clay. Subsurface layers are nonrestrictive to water movement and root penetration. The soils in this site are well drained and have a moderately slow infiltration rate.

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 Thin Loamy ecological site include, Cherry, Delridge, and Patent.

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–shale and siltstone
Surface texture	(1) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	20–50 in
Surface fragment cover <=3"	0–5%

Surface fragment cover >3"	0%
Available water capacity (0-40in)	3–5 in
Calcium carbonate equivalent (0-40in)	0–25%
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)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Thin 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 Needlegrass-Western Wheatgrass-Bluestem 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; continuous seasonal (spring) grazing, without adequate recovery periods following each grazing occurrence; or heavy grazing in combination with drought will cause this site to depart from the Needlegrass-Western Wheatgrass-Bluestem Plant Community (1.1). Blue grama will begin to increase. Western wheatgrass will increase initially and then begin to decrease. Needle and thread will decrease in frequency and production. In time, continuous season-long grazing will likely cause upland

sedges and blue grama to dominate and clubmoss to increase. This resulting plant community is relatively stable and the competitive advantage prevents other species from establishing. This plant community is less productive than the Needlegrass-Western Wheatgrass-Bluestem Plant Community. 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

Thin Loamy – R058DY012SD 1/10/2020

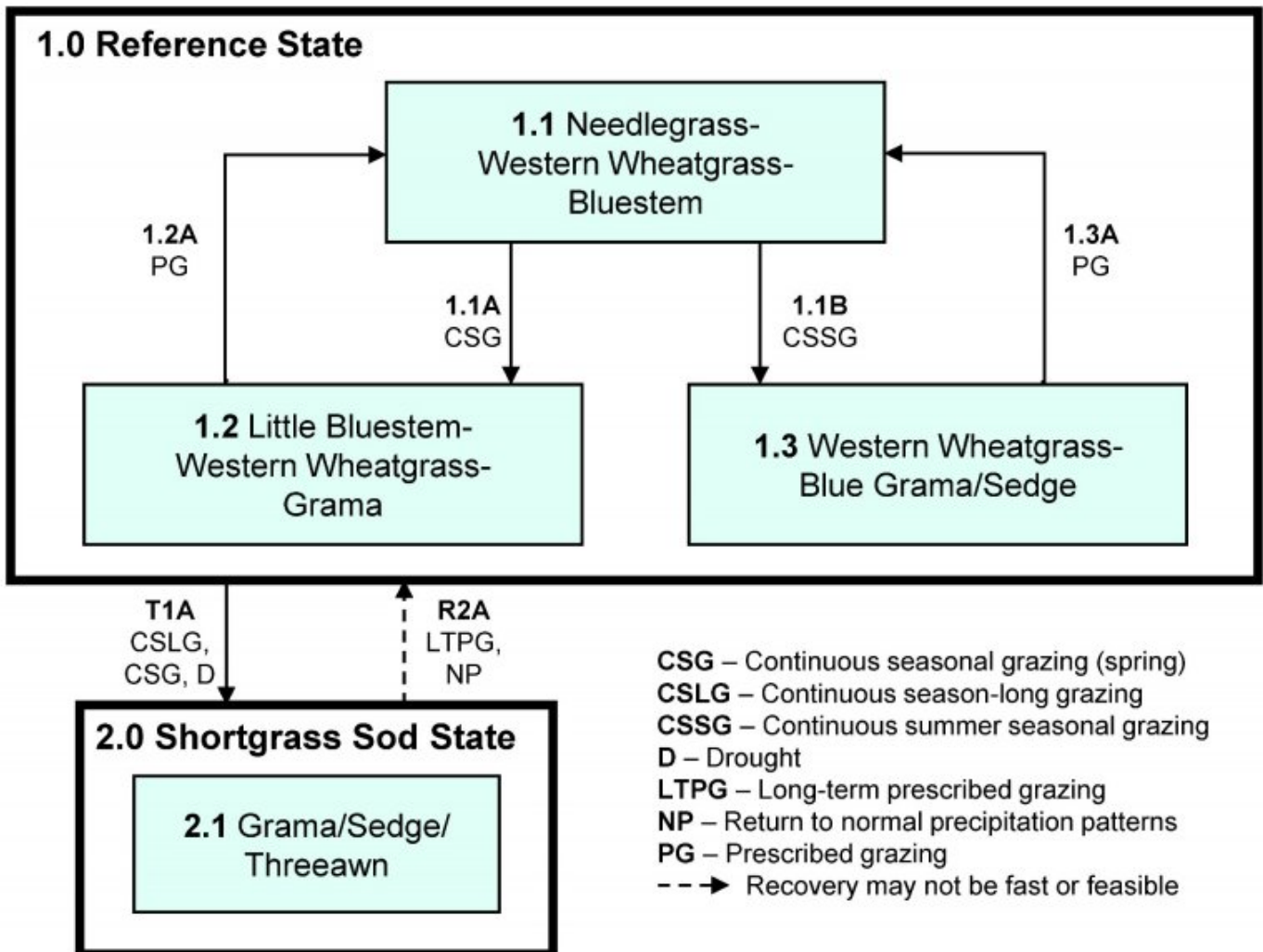


Diagram Legend: Thin Loamy - R058DY012SD

T1A	1.0 to 2.0	Continuous seasonal grazing (spring or winter grazing); continuous season-long grazing; or heavy grazing in combination with drought.
R2A	2.0 to 1.0	Long-term prescribed grazing including proper stocking rates, change in season of use, and adequate time for recovery; a return to normal precipitation patterns following drought. Transition may not be fast or feasible.
1.1A	1.1 to 1.2	Continuous seasonal grazing (repeated spring or early winter grazing).
1.1B	1.1 to 1.3	Continuous summer season-long grazing (repeated summer grazing).
1.2A	1.2 to 1.1	Prescribed grazing, including proper stocking rates, change in season of use, and adequate time for recovery.
1.3A	1.3 to 1.1	Prescribed grazing, including proper stocking rates, change in season of use, and adequate time for recovery.

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 a mix of cool-season and 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. Taller warm-season grasses and cool-season wheatgrasses and needlegrasses would have declined and a corresponding increase in short statured grass and grass-like species would have occurred. Today, a similar state can be found on areas that are properly managed with grazing and sometimes on areas receiving occasional short periods of rest.

Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- big sagebrush (*Artemisia tridentata*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- green needlegrass (*Nassella viridula*), grass
- big bluestem (*Andropogon gerardii*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass
- sedge (*Carex*), grass
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- scurfpea (*Psoraleidium*), other herbaceous
- purple coneflower (*Echinacea*), other herbaceous
- prairie clover (*Dalea*), other herbaceous

Community 1.1 Needlegrass-Western Wheatgrass-Bluestem

The interpretive plant community for this site is the Needlegrass-Western Wheatgrass-Bluestem 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 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. A mixture of cool- and warm-season grasses dominates the plant community. Major grasses include western wheatgrass, needle and thread, and little bluestem. Other grasses and grass-like species include green needlegrass, big bluestem, sideoats grama, blue grama, and sedge. Significant forbs include purple coneflower, cudweed sagewort, scurfpea, and prairie clover. Significant shrubs found in this plant community include leadplant, sagebrush, and western snowberry. This plant community is extremely resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	860	1275	1690
Shrub/Vine	70	113	155
Forb	70	112	155
Total	1000	1500	2000

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 Little Bluestem-Western Wheatgrass-Grama

This plant community develops under continuous seasonal grazing (spring or late winter) and a low fire frequency. Little bluestem increases and sometimes dominates this plant community, as it takes advantage of soil disturbance (resulting from hoof action or increased bare ground due to reduced plant vigor). Other significant grasses or grass-like species include western wheatgrass, blue grama, threadleaf sedge, and needle and thread. Forbs commonly found in this plant community include cudweed sagewort, green

sagewort, scurfpea, and purple coneflower. Significant shrubs include fringed sagewort and sagebrush. The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. Although production remains relatively high, little bluestem plants often become “wolfy,” and largely not grazed due to lower palatability. Compared to the Needlegrass-Western Wheatgrass-Bluestem Plant Community (1.1), the little bluestem and shortgrass species including blue grama and threadleaf sedge have increased. Needlegrasses and 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 moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. Also, certain species or classes of livestock will readily consume the little bluestem in any condition and result in a shift away from this plant community phase. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	690	1020	1350
Shrub/Vine	55	90	125
Forb	55	90	125
Total	800	1200	1600

Figure 11. Plant community growth curve (percent production by month). SD5804, Northern Rolling High Plains, warm-season dominant, cool-season sub-dominant.. Warm-season dominant, cool-season sub-dominant, uplands..

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

Community 1.3 Western Wheatgrass-Blue Grama/Sedge

This plant community develops under continuous summer seasonal grazing (grazing later in the growing season every year for extended periods) and a low fire frequency. This pattern of grazing reduces the warm-season grasses with the exception of the short warm-season species. Significant grasses or grass-like species include western wheatgrass, blue grama, threadleaf sedge, and needle and thread. Forbs commonly found in this plant community include cudweed sagewort, green sagewort, scurfpea, and purple coneflower. Significant shrubs include fringed sagewort, sagebrush, and yucca. The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. Compared to the Needlegrass-Western Wheatgrass-Bluestem Plant

Community (1.1), western wheatgrass, shortgrass species, and grass-likes have increased in composition. Tall and mid-statured warm-season grasses 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 moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	600	935	1260
Shrub/Vine	50	83	120
Forb	50	82	120
Total	700	1100	1500

Figure 13. Plant community growth curve (percent production by month). SD5804, Northern Rolling High Plains, warm-season dominant, cool-season sub-dominant.. Warm-season dominant, cool-season sub-dominant, uplands..

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

Pathway 1.1A Community 1.1 to 1.2

Continuous seasonal grazing (early spring, every year for extended periods) will lead the Reference Plant Community (1.1) to the Little Bluestem-Western Wheatgrass-Grama Plant Community (1.2).

Pathway 1.1B Community 1.1 to 1.3

Continuous summer seasonal grazing (grazing later in the growing season every year for extended periods) will lead the Reference Plant Community (1.1) to the Western Wheatgrass-Blue Grama/Sedge Plant Community (1.3).

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 will convert the Little Bluestem-Western Wheatgrass-Grama Plant Community (1.2) to the Needle and Thread-Western Wheatgrass-Bluestem Plant Community (1.1).

Conservation practices

Prescribed Grazing

Pathway 1.3A

Community 1.3 to 1.1

Prescribed grazing with proper stocking rate, change in season of use, and adequate time for plant recovery will convert the Western Wheatgrass-Grama/Sedge Plant Community (1.3) to the Needle and Thread-Western Wheatgrass-Bluestem Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2

Shortgrass State

The Shortgrass Sod State (2.0) is dominated by shortgrass species, and upland sedges. 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

- prairie sagewort (*Artemisia frigida*), shrub
- silver sagebrush (*Artemisia cana*), shrub
- blue grama (*Bouteloua gracilis*), grass
- sedge (*Carex*), grass
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- tarragon (*Artemisia dracunculoides*), other herbaceous
- scurfpea (*Psoralea*), other herbaceous
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous

Community 2.1

Grama/Sedge/Threeawn

This plant community is a result from long-term continuous seasonal grazing or continuous season-long grazing. Diversity is diminished, as the short grasses and sedges

become dominant in the plant community. The grazing tolerant blue grama and sedges replace little bluestem, western wheatgrass, and the needlegrasses. Sideoats grama remains in the plant community, but is less productive because of competition and grazing pressure. Due to low palatability, cudweed sagewort, green sagewort, scurfpea, western ragweed, and western yarrow become more prevalent in the plant community. Fringed sagewort is the dominant shrub in this plant community. Other shrubs commonly found in this plant community include cactus, yucca, and silver sagebrush. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. This plant community is resistant to change. The herbaceous species present are less palatable or more grazing tolerant than the dominant species in the Needlegrass-Western Wheatgrass-Bluestem Plant Community. The dominant grass and grass-like species typically have short, compact rooting systems near the soil surface. This results in reduced infiltration and increased runoff. Onsite soil erosion may remain low, but the increased runoff may have damaging effects on adjacent ecological sites.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	520	743	965
Shrub/Vine	40	90	140
Forb	40	68	95
Total	600	901	1200

Figure 15. Plant community growth curve (percent production by month). SD5804, Northern Rolling High Plains, warm-season dominant, cool-season sub-dominant.. Warm-season dominant, cool-season sub-dominant, uplands..

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

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 allow for a transition from the Shortgrass Sod State (2.0) to the Reference State (1.0). This transition

may not be rapid or in the end meet management goals.

Conservation practices

Prescribed Grazing

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Cool-Season Bunchgrass			225–375	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	150–300	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	30–300	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–75	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–75	–
2	Rhizomatous Wheatgrass			150–300	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	150–300	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–150	–
3	Mid- Warm-Season Grasses			150–300	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	75–225	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	30–150	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	15–75	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–45	–
4	Tall Warm-Season Grasses			30–150	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	30–150	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–75	–
5	Short Warm-Season Grasses			75–150	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	30–150	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–75	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–75	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	0–15	–
6	Other Native Grasses			15–75	

	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	15–75	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–45	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–45	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–45	–
7	Grass-Likes			75–150	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	30–150	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–75	–
8	Non-Native Cool-Season Grasses			0	
Forb					
9	Forbs			75–150	
	Forb, native	2FN	<i>Forb, native</i>	15–75	–
	scurfpea	PSORA2	<i>Psoralegium</i>	15–45	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	15–45	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	15–45	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0–30	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	15–30	–
	beardtongue	PENST	<i>Penstemon</i>	15–30	–
	prairie clover	DALEA	<i>Dalea</i>	15–30	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–30	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	0–30	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–30	–
	goldenrod	SOLID	<i>Solidago</i>	15–30	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–30	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	15–30	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	15–30	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–15	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–15	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–15	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	0–15	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–15	–
	antennaria	ANTEN	<i>Antennaria</i>	0–15	–

	pussytoes	ANTLIN	<i>Antennaria</i>	0-15	-
	cutleaf anemone	PUPAM	<i>Pulsatilla patens ssp. multifida</i>	0-15	-
Shrub/Vine					
10	Shrubs			75-150	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0-75	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-75	-
	leadplant	AMCA6	<i>Amorpha canescens</i>	15-60	-
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0-45	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-45	-
	rose	ROSA5	<i>Rosa</i>	15-30	-
	dwarf false indigo	AMNA	<i>Amorpha nana</i>	15-30	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	15-30	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-15	-
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-15	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-15	-

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Cool-Season Bunchgrass			24-120	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	24-120	-
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0-60	-
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0-24	-
2	Rhizomatous Wheatgrass			60-180	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	60-180	-
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-60	-
3	Mid- Warm-Season Grasses			120-240	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	120-240	-
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	24-120	-
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0-36	-
	prairie dropseed	SDHE	<i>Sporobolus heterolepis</i>	0-12	-

	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0-12	-
4	Tall Warm-Season Grasses			0-60	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-60	-
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0-36	-
5	Short Warm-Season Grasses			120-240	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	60-180	-
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	12-120	-
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	12-120	-
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	0-36	-
6	Other Native Grasses			12-60	
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	12-60	-
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-36	-
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0-36	-
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-36	-
7	Grass-Likes			60-180	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	60-180	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-60	-
8	Non-Native Cool-Season Grasses			0-60	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0-60	-
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0-60	-
	field brome	BRAR5	<i>Bromus arvensis</i>	0-24	-
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0-12	-
Forb					
9	Forbs			60-120	
	Forb, native	2FN	<i>Forb, native</i>	12-60	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	12-48	-
	field sagewort	ARCA12	<i>Artemisia campestris</i>	12-36	-
	Forb, introduced	2FI	<i>Forb, introduced</i>	0-36	-
	scurfpea	PSORA2	<i>Psoralidium</i>	12-36	-
	goldenrod	SOLID	<i>Solidago</i>	12-24	-
	prairie clover	DALEA	<i>Dalea</i>	0-24	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	12-24	-

	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	12–24	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	12–24	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	12–24	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	12–24	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–12	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–12	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–12	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	0–12	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–12	–
	beardtongue	PENST	<i>Penstemon</i>	0–12	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–12	–
	cutleaf anemone	PUPAM	<i>Pulsatilla patens</i> ssp. <i>multifida</i>	0–12	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0–12	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–12	–
Shrub/Vine					
10	Shrubs			60–120	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	12–48	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0–48	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–48	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–36	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–24	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–24	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–24	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–24	–
	rose	ROSA5	<i>Rosa</i>	12–24	–
	dwarf false indigo	AMNA	<i>Amorpha nana</i>	0–12	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–12	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
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Grass/Grasslike					
1	Cool-Season Bunchgrass			55–165	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	55–165	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–55	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–22	–
2	Rhizomatous Wheatgrass			110–275	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	110–275	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–55	–
3	Mid- Warm-Season Grasses			22–88	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	11–55	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	11–55	–
4	Tall Warm-Season Grasses			0	
5	Short Warm-Season Grasses			165–275	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	110–220	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	11–110	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	11–110	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	0–33	–
6	Other Native Grasses			11–55	
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	11–55	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–33	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–33	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–33	–
7	Grass-Likes			55–165	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	55–165	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–55	–
8	Non-Native Cool-Season Grasses			0–55	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–55	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–55	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–22	–
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–11	–

Forb					
9	Forbs			55–110	
	Forb, native	2FN	<i>Forb, native</i>	11–55	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	11–44	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	11–33	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	0–33	–
	scurfpea	PSORA2	<i>Psoralidium</i>	11–33	–
	goldenrod	SOLID	<i>Solidago</i>	11–22	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	11–22	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–22	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	11–22	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	11–22	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	11–22	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	11–22	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–11	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–11	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–11	–
	beardtongue	PENST	<i>Penstemon</i>	0–11	–
	prairie clover	DALEA	<i>Dalea</i>	0–11	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–11	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	0–11	–
	cutleaf anemone	PUPAM	<i>Pulsatilla patens</i> ssp. <i>multifida</i>	0–11	–
	Nuttall's sensitive- briar	MINU6	<i>Mimosa nuttallii</i>	0–11	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–11	–
Shrub/Vine					
10	Shrubs			55–110	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	11–44	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0–44	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–44	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–33	–
	Shrub (> .5m)	2SHRUB	<i>Shrub (> .5m)</i>	0–33	–

	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–22	–
	rose	ROSA5	<i>Rosa</i>	11–22	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–22	–
	dwarf false indigo	AMNA	<i>Amorpha nana</i>	0–11	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–11	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–11	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Cool-Season Bunchgrass			0–45	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0–45	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–9	–
2	Rhizomatous Wheatgrass			0–45	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–45	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–18	–
3	Mid- Warm-Season Grasses			0–45	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–45	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–27	–
4	Tall Warm-Season Grasses			0	
5	Short Warm-Season Grasses			180–405	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	135–315	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	9–90	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	18–90	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–45	–
6	Other Native Grasses			9–45	
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	9–27	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–18	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–18	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–18	–

7	Grass-Likes			90–225	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	90–225	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–45	–
8	Non-Native Cool-Season Grasses			9–45	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	9–45	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	9–45	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–18	–
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–9	–
Forb					
9	Forbs			45–90	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	9–45	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	9–45	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	9–45	–
	Forb, native	2FN	<i>Forb, native</i>	9–36	–
	scurfpea	PSORA2	<i>Psoralidium</i>	9–27	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	9–27	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	9–27	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	9–18	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	9–18	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–18	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–18	–
	goldenrod	SOLID	<i>Solidago</i>	9–18	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–9	–
	prairie clover	DALEA	<i>Dalea</i>	0–9	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–9	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–9	–
Shrub/Vine					
10	Shrubs			45–135	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	18–72	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–54	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	9–45	–

	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–36	–
	pricklypear	OPUNT	<i>Opuntia</i>	9–36	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–27	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	0–27	–
	rose	ROSA5	<i>Rosa</i>	9–18	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–9	–

Animal community

Wildlife Interpretations

MLRA 58D lies within the drier portion of the northern mixed-grass prairie ecosystem where sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this area consisted of diverse grass- and shrubland habitats interspersed with varying densities of depressional instream wetlands and woody riparian corridors. These habitats provided critical life cycle components for many users. Many species of grassland birds, small mammals, reptiles, amphibians, and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as several small mammal and insect species, were the primary consumers linking the grassland resources to predators such as the gray wolf, mountain lion, and grizzly bear, and smaller carnivores such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant; however, the species remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox were associated with prairie dog complexes.

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

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

This site provided habitat for species requiring unfragmented grassland. Important habitat features, and components found commonly or exclusively on this site may include sharp-

tailed grouse leks; upland nesting habitat for grassland birds, forbs and insects for brood habitat; and a forage source for small and large herbivores. Many grassland and shrub steppe nesting bird populations are declining. Extirpated species include free-ranging American bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Thin 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 sagegrouse. 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.

Needlegrass-Western Wheatgrass-Bluestem (1.1): The predominance of grasses plus high diversity of forbs and shrubs in this community favors grazers and mixed-feeders, such as deer and pronghorn. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. The complex plant structural diversity provides habitat for a wide array of migratory and resident birds. Grasshopper sparrow, lark bunting, western meadowlark, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides. 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 ecological site provides excellent wintering habitat for pronghorn. The higher stature of this plant community provides thermal, protective and escape cover for herbivores and grassland birds. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for herptiles such as the spade foot toad, bull snake, and western rattlesnake.

Little Bluestem-Western Wheatgrass-Grama (1.2): This plant community develops under continuous seasonal grazing and a low fire frequency. 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 increase in little bluestem, a medium height bunchgrass, provides complex plant structural diversity for a wide array of migratory and resident birds. Grasshopper sparrow, lark bunting, western meadowlark, and sharp-tailed grouse are common. 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. 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 and Great Plains toad; and bull snake and western rattlesnake.

Western Wheatgrass-Blue Grama/Sedge (1.3): This plant community results from continuous seasonal grazing later in the growing season and a low fire frequency. Western wheatgrass, buffalograss, and blue grama will dominate. A shift to shorter plant structure will favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, and swift fox. Species such as horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will increase due to the loss of big sagebrush. Brewer's sparrow and greater sage-grouse may be present depending on the frequency and distribution of big sagebrush. The shorter stature of this plant community limits suitable thermal, protective, and escape cover. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel.

Grama/Sedge/Threeawn (2.1): Resulting from heavy grazing over many years' grama, sedge, and threeawn will dominate. The forb diversity and abundance has decreased, while shrub diversity has decreased. A shift to short plant structure will favor prairie dog expansion with prairie dog town sites and associate species such as ferruginous hawk and burrowing owl. Species such as horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will increase. 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 suitable thermal, protective, and escape cover. Prey populations are reduced and are more vulnerable to raptor and mammalian predation. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel.

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-Western Wheatgrass-Bluestem (1.1)

Average Production (lb/acre, air-dry): 1,500

Stocking Rate (AUM/acre): 0.41

Plant Community: Little Bluestem-Western Wheatgrass-Grama (1.2)

Average Production (lb/acre, air-dry): 1,200

Stocking Rate (AUM/acre): 0.33

Plant Community: Western Wheatgrass-Blue Grama/Sedge (1.3)

Average Production (lb/acre, air-dry): 1,100

Stocking Rate (AUM/acre): 0.30

Plant Community: Grama/Sedge/Threeawn (2.1)

Average Production (lb/acre, air-dry): 900*

Stocking Rate (AUM/acre): 0.25*

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

Total onsite annual production may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may need to be reduced to reflect only preferred or desirable forage species.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for livestock. During the dormant period, the forage for livestock likely has insufficient protein to meet livestock requirements. Added protein allows ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

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

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

Harvesting the seeds of native plants can provide additional income on this site.

Other information

Revision Notes: "Previously Approved" Provisional

This provisional ecological site description (ESD) has passed quality control (QC) and quality assurance (QA) to ensure the it meets the 2014 NESH standards for a provisional ecological site description.

This ESD is an updated "Previously Approved" ESD that represented a first-generation tier of documentation that, prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirements as an "Approved" ESD as laid out in the 1997 National Range and Pasture Handbook (NRPH). The document fully described the reference state and community phase in the state-and-transition model. All other alternative states are at least described in narrative form. The "Previously Approved" ESD has been field-tested for a minimum of 5 years and is a proven functional document for conservation planning. The "Previously Approved" ESD may not contain all tabular and narrative entries as required in the current "Approved" level of documentation, but continued refinement toward an "Approved" status is expected.

Site Development and Testing Plan

Future work, as described in an official project plan, is necessary to validate the information in this provisional ecological site description. The plan will include field

activities for low-, medium-, and high-intensity sampling, soil correlations, and analysis of the data. Annual field reviews should be done by soil scientists and vegetation specialists. Final field review, peer review, quality control, and quality assurance reviews are required to produce the final document.

Inventory data references

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.

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

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This ecological site description was updated by Rick L. Peterson on January 13, 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:** Slight to none, typically on steeper slopes and discontinuous.
-

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

3. **Number and height of erosional pedestals or terracettes:** Few pedestalled 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):** 0 to 15 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.
-
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 6 inches thick with light to dark brownish gray colors. Structure should typically be fine granular at least in the upper A-horizon. Some soils have subangular blocky structure parting to weak fine granular.
-
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, subsoil 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: Mid/tall cool-season bunchgrasses > Mid warm-season grasses = Wheatgrass >

Sub-dominant: Tall warm-season grass = Short warm-season grass = Grass-likes = Forbs = Shrubs >

Other: Short cool-season bunchgrasses

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 1,000-2,000 lbs./acre (air-dry weight). Reference value production is 1,500 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:** 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.
