USDA Natural Resources Conservation Service

Ecological site R058DY015SD
Thin Claypan

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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.

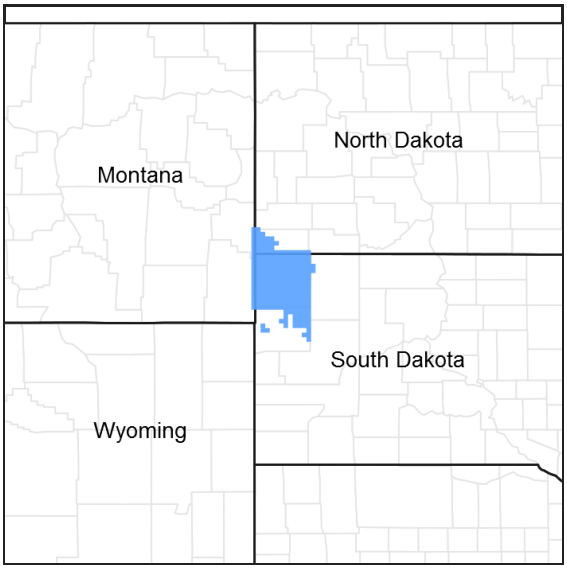

Figure 1. Mapped extent

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 Claypan ecological site occurs throughout MLRA 58D. It is located on level to gently undulating or rolling uplands. The slopes range from 0 to 12 percent. The soil surface layers are 1 to 4 inches thick with fine sandy loam textures. A Btn horizon typically occurs within 4 inches of the surface and is extremely hard clay. The columnar- or prismatic-structured subsoil has a rounded or “biscuit-shaped” top. The Btn horizon is high in sodium and can have a whitish coloration.

The vegetation in the Reference State (1.0) is a mix of cool- and warm-season grasses, mostly rhizomatous wheatgrass and blue grama. Brittle cactus is often present as is Wyoming big sagebrush. Bare ground will increase with erosion, resulting in exposed whitish “biscuit-tops.”

Slick spots (Non-Site) are typically associated with the Thin Claypan ecological site, but technically are not a plant community phase or State within the Thin Claypan site. For accurate representation of this overall landscape, the “Slick Spot” is included in the State-and-Transition model.

NOTE: Slick Spot areas should not be sampled, other than to determining the percent of total area, when inventorying the Thin Claypan ecological site.

Associated sites

R058DY009SD	**Sandy** The Sandy ecological site is found on level to slightly sloping landscapes typically upslope of the Thin Claypan ecological site.
R058DY010SD	**Loamy** The Loamy ecological site is found on level to slightly sloping landscapes typically upslope of the Thin Claypan ecological site.
R058DY011SD	**Clayey** The Clayey ecological site is found on level to slightly sloping landscapes typically upslope of the Thin Claypan ecological site but the Thin Claypan site can be found intermixed with the Clayey ecological site.
R058DY013SD	**Claypan** The Claypan ecological site has is found adjacent or intermixed with the Thin Claypan ecological site.

Similar sites

R058DY011SD	**Clayey** The Clayey ecological site will have more western wheatgrass; less blue grama; and have greater vegetative production than the Thin Claypan ecological site.
R058DY010SD	**Loamy** The Loamy ecological site will have more western wheatgrass and needle and thread; and more vegetative production than the Thin Claypan ecological site.
R058DY013SD	**Claypan** The Claypan ecological site will have more western wheatgrass; more cactus; and more vegetative production than the Thin Claypan ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis*
Herbaceous	(1) *Pascopyrum smithii* (2) *Bouteloua gracilis*

Physiographic features

The Thin Claypan ecological site occurs nearly level to gently undulating uplands.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Hill
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	701–1,219 m
Slope	0–12%
Water table depth	203 cm
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)	381-432 mm
Frost-free period (actual range)	93-115 days
Freeze-free period (actual range)	120-132 days
Precipitation total (actual range)	356-432 mm
Frost-free period (average)	104 days
Freeze-free period (average)	125 days
Precipitation total (average)	406 mm

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 Claypan ecological site.

Soil features

Soils common to the Thin Claypan ecological site have a fine sandy loam surface layer that is 1 to 4 inches thick. Slopes range from 0 to 12 percent. Soils are deep (greater than 20 inches) and formed in residuum derived from soft sandstone and shale. The extremely hard clayey Btn horizon has round-topped or “biscuit-shaped” columnar- or prismatic-structured subsoil. These Btn horizons are high in sodium. The soils in this site are well drained and have a very slow infiltration rate and very slow saturated hydraulic conductivity.

This site should show slight to no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow patterns are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. These soils are mainly susceptible to water erosion, and when wet, heavy traffic, can cause surface compaction.

Major Soils correlated to the Thin Claypan ecological site include, Absher, Bullock, Dogtooth, and Rhoades.

The Slick Spot portion of the Thin Claypan ecological site does not have a corresponding soil component and is currently considered a “Non-Site”.
More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your area of interest, or use the internet to access USDA’s Web Soil Survey.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone and shale (2) Alluvium–sandstone and shale
Surface texture	(1) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow
Soil depth	51–102 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	10.16–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–20
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Thin Claypan 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.

In association with this site are areas of slick spots that usually have considerably more bare ground and are typically dominated by cactus. Slick spots are bare ground areas that are affected by high sodium concentrations. The soil factors are the dominant influence and grazing management is not necessarily the primary influence of these areas. These areas can occur as a complex with this site, sometimes being difficult to differentiate between the two.

The plant community upon which the interpretations are primarily based is the Western Wheatgrass-Blue Grama/Big Sagebrush 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 which includes grazing at moderate to heavy stocking levels for the full growing season each year; continuous seasonal grazing which includes grazing at moderate to heavy stocking levels at the same time of year each year (spring), without adequate recovery periods following each grazing occurrence; or heavy grazing in combination with drought will causes this site to depart from the Western Wheatgrass-Blue Grama/Wyoming Big Sagebrush Plant Community (1.1). Blue grama and cactus will begin to increase, and western wheatgrass will decrease in frequency and production.

The following state-and-transition diagram illustrates the common plant communities on the site and the transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model

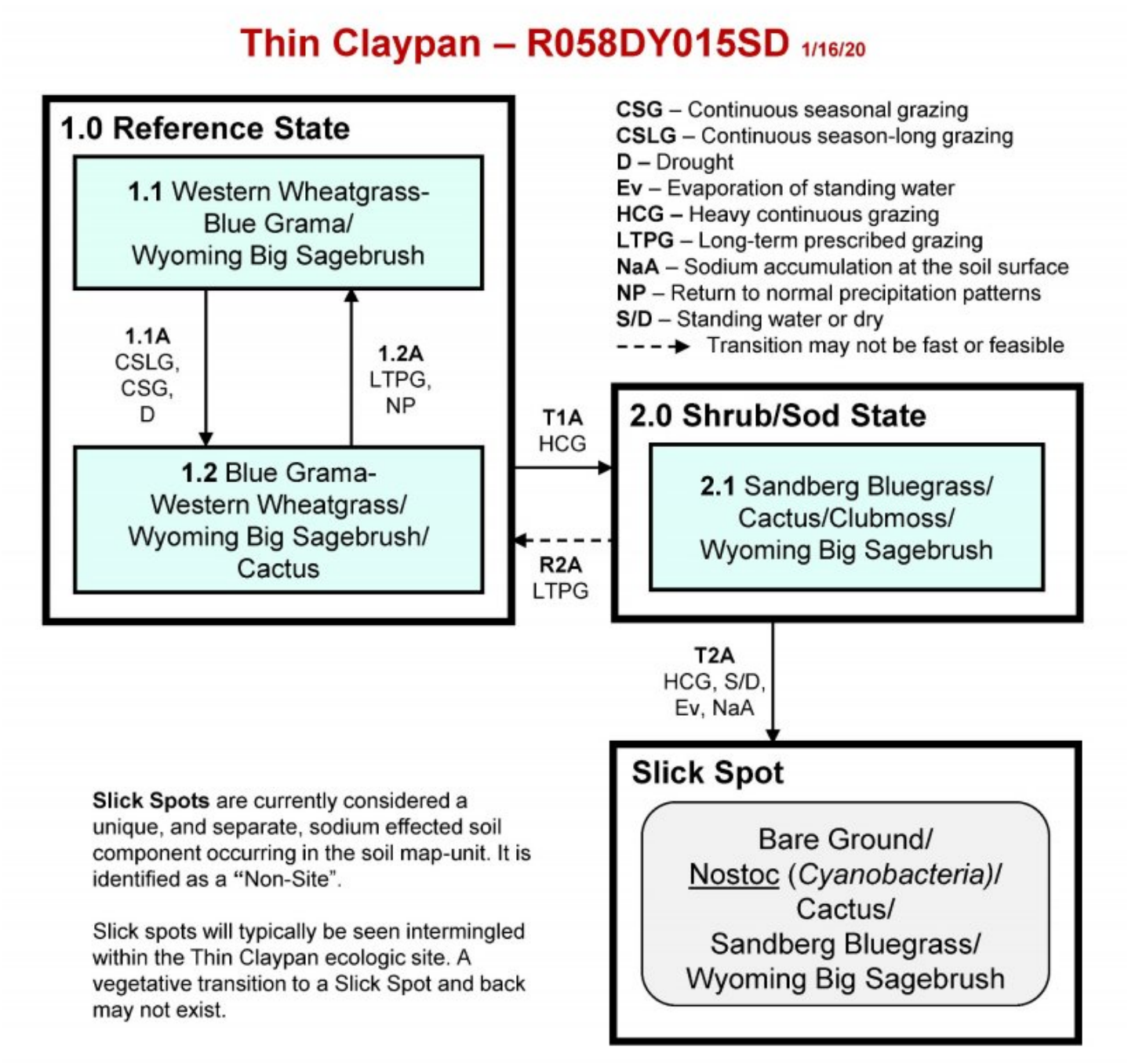

Diagram Legend: Thin Claypan - R058DXY015SD

T1A	1.0 to 2.0	Heavy continuous grazing without adequate time for plant recovery.
T2A	2.0 to Slick Spot	Heavy continuous grazing; repeated wetting and drying of the soil surface; evaporation of standing water; accumulation of sodium on the soil surface and in the soil profile.
R2A	2.0 to 1.0	Long-term prescribed grazing, including proper stocking rates, change in season of use, and adequate time for plant recovery.
1.1A	1.1 to 1.2	Continuous season-long grazing; continuous seasonal grazing; or heavy grazing in combination with drought.
1.2A	1.2 to 1.1	Long-term prescribed grazing including proper stocking rates, change in season of use, adequate time for recovery, and a return to normal precipitation patterns following drought.

State 1
Reference State

The Reference State (1.0) represents what is believed to show the natural range of variability that dominated the dynamics of this ecological site prior to European settlement. This site in the Reference State (1.0) is dominated by a mix of cool-season and warm-season grasses and shrubs. 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 cool-season grasses would have declined and a corresponding increase in short statured grass and clubmoss 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

- Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- blue grama (*Bouteloua gracilis*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- sedge (*Carex*), grass
- scarlet globemallow (*Sphaeralcea coccinea*), other herbaceous
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- white heath aster (*Symphyotrichum ericoides*), other herbaceous
- yucca (*Yucca*), other herbaceous
- saltbush (*Atriplex*), other herbaceous
- prairie sagewort (*Artemisia frigida*), other herbaceous

Community 1.1
Western Wheatgrass-Blue Grama/Wyoming Big Sagebrush

The interpretive plant community for this site is the Western Wheatgrass-Blue Grama/Wyoming Big Sagebrush Plant Community. This is also considered to be Reference Plant Community (1.1). This plant community can be found on areas having a history of proper grazing management, including adequate recovery periods between grazing events. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. The rhizomatous wheatgrasses dominate the plant community, while blue grama is also prevalent. Other grasses and grass-like plants occurring on the site include needle and thread, buffalograss, Sandberg bluegrass, and sedges. Significant forbs include scarlet globemallow, cudweed sagewort, and heath aster. Shrubs occurring in this plant community include cactus, Wyoming big sagebrush, saltbush, and fringed sagewort. 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's potential. Plant litter is properly distributed with some movement offsite and natural plant mortality is low. Low to moderate available water capacity coupled with high accumulations of sodium and slow permeability strongly influences the soil-water-plant relationships.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	482	735	986
Shrub/Vine	39	90	140
Forb	39	67	95
Moss	–	4	11
Total	**560**	**896**	**1232**

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

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

Community 1.2
Blue Grama-Western Wheatgrass/Wyoming Big Sagebrush/Cactus

This plant community can develop from the adverse effects of continuous season-long grazing which includes grazing at moderate to heavy stocking levels for the full growing season, every year; continuous seasonal grazing which includes grazing at moderate to heavy stocking levels at the same time of year each year; or heavy grazing in combination with drought. While western wheatgrass remains a subdominant, short grasses, Wyoming big sagebrush, and cactus increase to become prominent and annual production decreases. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives blue grama a competitive advantage over cool-season mid-grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Blue grama, western wheatgrass, and cactus are the dominant species, while Wyoming big sagebrush can also express itself strongly. Other grasses and grass-likes occurring include sedge, Sandberg bluegrass, inland saltgrass, needle and thread, prairie Junegrass, and annual grasses. Forbs such as broom snakeweed, cudweed sagewort, heath aster, and western yarrow may also be present. Some non-native species will begin to invade this plant community including salsify, sweetclover, and annual bromes. There is usually more than 15 percent bare ground. This plant community is somewhat resilient. Runoff increases and infiltration will decrease. Soil erosion will be minimal due to the sod forming habit of blue grama. While less productive, a return to longer recovery periods and alternating season of use can easily result in a shift back to the Western Wheatgrass-Blue Grama/Wyoming Big Sagebrush Plant Community (1.1).

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	247	481	712
Shrub/Vine	62	135	207
Forb	28	50	73
Moss	–	7	17
Total	**337**	**673**	**1009**

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 convert the Reference Plant Community (1.1) to the Blue Grama-Western Wheatgrass/Wyoming Big Sagebrush/Cactus Plant Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Long-term prescribed grazing that includes proper stocking rates, change in season of use, and adequate time for plant recovery following grazing, and a return to normal precipitation patterns following drought, will convert the Blue Grama-Western Wheatgrass/Wyoming Big Sagebrush/Cactus Plant Community (1.2) to the Western Wheatgrass-Blue Grama/Wyoming Big Sagebrush Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2
Shrub/Sod State

The Shrub/Sod State (2.0) is dominated by shortgrass species, cactus, clubmoss, and shrubs. This State is the result of grazing management that does not provide adequate recovery time for mid-statured cool-season grasses. The hydrologic function of this state is dramatically altered. This State is very resistant to change through grazing management alone.

Dominant plant species

- Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- Sandberg bluegrass (*Poa secunda*), grass
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- sedge (*Carex*), grass
- saltgrass (*Distichlis spicata*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass
- prairie Junegrass (*Koeleria macrantha*), grass
- yucca (*Yucca*), other herbaceous
- clubmoss (*Lycopodiella*), other herbaceous
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- white heath aster (*Symphyotrichum ericoides*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous

Community 2.1
Sandberg Bluegrass/Cactus/Clubmoss/Wyoming Big Sagebrush

This plant community can develop from the adverse effects of heavy continuous grazing. Short grasses and cactus increase to dominate the site and annual production continues to decrease. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives Sandberg bluegrass, cactus, and clubmoss a competitive advantage over cool-season mid-grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Sandberg bluegrass and cactus are the dominant species. Other grasses and grass-likes occurring include blue grama, western wheatgrass, sedge, inland saltgrass, needle and thread, prairie Junegrass, and annual

grasses. Forbs such as brome snakeweed, cudweed sagewort, heath aster, and western yarrow may also be present. Non-native species will continue to invade this plant community including salsify, sweetclover, and annual bromes. There is usually more than 25 percent bare ground. This plant community is quite resilient. Reduced infiltration prevents the cool-season mid-grasses from increasing and competing with the cactus and clubmoss. This plant community is less productive than the Blue Grama-Western Wheatgrass/Wyoming Big Sagebrush/Cactus Plant Community (1.1). Runoff continues to increase, and infiltration will decrease. Soil erosion will begin to be more evident and water flow patterns may be fairly obvious.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	179	267	409
Shrub/Vine	84	123	163
Forb	17	45	73
Moss	–	13	28
Total	**280**	**448**	**673**

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

State 3
Slick Spot

The soils definition of a slick spot is a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity. Sodium naturally occurs in the parent materials and soils of this site. Sodium accumulates at the surface of the slick spots through the processes of evaporation and evapotranspiration. When water stands on this site, it will eventually evaporate and draw more sodium near or to the surface. It can also be caused by evapotranspiration, wherein vegetation draws moisture from the soil profile, leaving sodium at or near the surface. Slick spots are currently considered a unique and separate sodium-affected soil component, occurring in a soil map unit, and is identified as a “Non-Site.” Slick spots will typically be seen intermingled within the Thin Claypan ecological site. A vegetation transition to and from the Slick Spot may or may not exist. The plant community on these soils is typically very sparse, and consists of shallow-rooted perennial grasses, grass-likes, forbs, and shrubs. Brittle cactus and pricklypear tend to persist on these soils, as do Sandberg bluegrass, sedges, blue grama, and inland saltgrass. Wyoming big sagebrush often persists on slick spots, as will black greasewood. The vegetative production will vary from almost none to 100 to 300 pounds per acre. Nostoc, a common genus of cyanobacteria, will almost always be found on slick spots. When dry, it is dark-colored and tends to look like a small, dry forb leaf. When wet, it swells up into a conspicuous, dark green jellylike mass. Nostoc species are native and are not considered a noxious plant or pest.

Dominant plant species

- Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), shrub
- greasewood (*Sarcobatus*), shrub
- Sandberg bluegrass (*Poa secunda*), grass
- sedge (*Carex*), grass
- blue grama (*Bouteloua gracilis*), grass
- saltgrass (*Distichlis spicata*), grass
- brittle pricklypear (*Opuntia fragilis*), other herbaceous
- pricklypear (*Opuntia*), other herbaceous

Transition T1A

State 1 to 2

Heavy continuous grazing, or heavy grazing in combination with drought will transition the Reference State (1.0) to the Shrub/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 Shrub/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

Transition T2A
State 2 to 3

Heavy, continuous grazing, repeated wetting and drying of the soil surface, evaporation of standing water, and the accumulation of sodium on the soil surface and in the soil profile may facilitate the transition the Shrub/Sod State (2.0) to a “Slick Spot”. It is highly unlikely that once this transition occurs there is a restoration pathway back to the Shrub/Sod State (2.0) or the Reference State (1.0).

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			224–359	
	western wheatgrass	PASM	*Pascopyrum smithii*	179–314	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	18–90	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	18–90	–
2	**Short Warm-Season Grasses**			135–269	
	blue grama	BOGR2	*Bouteloua gracilis*	90–224	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–45	–
	saltgrass	DISP	*Distichlis spicata*	0–45	–
3	**Cool-Season Bunchgrass**			45–135	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	9–45	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–45	–
	Sandberg bluegrass	POSE	*Poa secunda*	9–45	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–45	–
	green needlegrass	NAVI4	*Nassella viridula*	0–27	–
4	**Warm-Season Bunchgrass**			0–18	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–18	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–9	–
5	**Other Native Grasses**			0–45	
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–27	–
	Grass, perennial	2GP	*Grass, perennial*	0–27	–

	Grass, annual	2GA	*Grass, annual*	0–9	–
6	**Grass-Likes**			9–45	
	needleleaf sedge	CADU6	*Carex duriuscula*	9–45	–
	threadleaf sedge	CAFI	*Carex filifolia*	9–45	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–9	–
7	**Non-Native Cool-Season Grasses**			–	
Forb					
8	**Forbs**			45–90	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	9–27	–
	Forb, native	2FN	*Forb, native*	9–27	–
	scurfpea	PSORA2	*Psoralidium*	9–18	–
	spiny phlox	PHHO	*Phlox hoodii*	9–18	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	9–18	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	9–18	–
	pussytoes	ANTEN	*Antennaria*	9–18	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	9–18	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–18	–
	woolly plantain	PLPA2	*Plantago patagonica*	9–18	–
	bighead pygmycudweed	EVPR	*Evax prolifera*	9–18	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	9–18	–
	white heath aster	SYER	*Symphyotrichum ericoides*	9–18	–
	littlepod false flax	CAMI2	*Camelina microcarpa*	9–18	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–9	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–9	–
	field sagewort	ARCA12	*Artemisia campestris*	0–9	–
	cinquefoil	POTEN	*Potentilla*	0–9	–
	American vetch	VIAM	*Vicia americana*	0–9	–
	onion	ALLIU	*Allium*	0–9	–
Shrub/Vine					
9	**Shrubs**			45–135	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	18–90	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–45	–
	silver sagebrush	ARCA13	*Artemisia cana*	9–27	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	9–27	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–27	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–18	–
	saltbush	ATRIP	*Atriplex*	0–18	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	9–18	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–9	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–9	–
Moss					

10	**Mat-Forming Forbs**			0–9	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–9	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			34–101	
	western wheatgrass	PASM	*Pascopyrum smithii*	34–101	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–34	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–34	–
2	**Short Warm-Season Grasses**			135–235	
	blue grama	BOGR2	*Bouteloua gracilis*	101–235	–
	saltgrass	DISP	*Distichlis spicata*	7–54	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–34	–
3	**Cool-Season Bunchgrass**			34–67	
	Sandberg bluegrass	POSE	*Poa secunda*	13–54	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–34	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	7–34	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–13	–
	green needlegrass	NAVI4	*Nassella viridula*	–	–
4	**Warm-Season Bunchgrass**			0–34	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–34	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–20	–
5	**Other Native Grasses**			0–20	
	Grass, perennial	2GP	*Grass, perennial*	0–20	–
	Grass, annual	2GA	*Grass, annual*	0–20	–
6	**Grass-Likes**			13–67	
	needleleaf sedge	CADU6	*Carex duriuscula*	7–54	–
	threadleaf sedge	CAFI	*Carex filifolia*	7–54	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–7	–
7	**Non-Native Cool-Season Grasses**			0–34	
	cheatgrass	BRTE	*Bromus tectorum*	0–34	–
	field brome	BRAR5	*Bromus arvensis*	0–27	–
Forb					
8	**Forbs**			34–67	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	7–34	–
	sweetclover	MELIL	*Melilotus*	0–34	–
	Forb, introduced	2FI	*Forb, introduced*	7–34	–
	scurfpea	PSORA2	*Psoralidium*	7–27	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	7–27	–
	pussytoes	ANTEN	*Antennaria*	7–20	–
	spiny phlox	PHHO	*Phlox hoodii*	7–20	–

	white heath aster	SYER	*Symphyotrichum ericoides*	7–20	–
	woolly plantain	PLPA2	*Plantago patagonica*	7–20	–
	Forb, native	2FN	*Forb, native*	7–20	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	7–20	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–20	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	7–20	–
	bighead pygmycudweed	EVPR	*Evax prolifera*	7–20	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	7–20	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–20	–
	field sagewort	ARCA12	*Artemisia campestris*	0–13	–
	onion	ALLIU	*Allium*	0–13	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–13	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–13	–
	littlepod false flax	CAMI2	*Camelina microcarpa*	7–13	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–13	–
Shrub/Vine					
9	**Shrubs**			67–202	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	13–101	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	7–54	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	13–54	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	13–34	–
	silver sagebrush	ARCA13	*Artemisia cana*	7–34	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–34	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–20	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–7	–
Moss					
10	**Mat-Forming Forbs**			0–13	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–13	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			4–45	
	western wheatgrass	PASM	*Pascopyrum smithii*	4–45	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–9	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–9	–
2	**Short Warm-Season Grasses**			22–67	
	blue grama	BOGR2	*Bouteloua gracilis*	22–67	–
	saltgrass	DISP	*Distichlis spicata*	9–45	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–22	–
3	**Cool-Season Bunchgrass**			22–81	

	Sandberg bluegrass	POSE	*Poa secunda*	9–67	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	4–13	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–9	–
4	**Warm-Season Bunchgrass**			0–22	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–22	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–13	–
5	**Other Native Grasses**			0–13	
	Grass, perennial	2GP	*Grass, perennial*	0–13	–
	Grass, annual	2GA	*Grass, annual*	0–13	–
6	**Grass-Likes**			9–67	
	needleleaf sedge	CADU6	*Carex duriuscula*	4–45	–
	threadleaf sedge	CAFI	*Carex filifolia*	4–45	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–4	–
7	**Non-Native Cool-Season Grasses**			4–36	
	cheatgrass	BRTE	*Bromus tectorum*	4–36	–
	field brome	BRAR5	*Bromus arvensis*	0–22	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–4	–
Forb					
8	**Forbs**			22–67	
	sweetclover	MELIL	*Melilotus*	0–40	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	4–36	–
	scurfpea	PSORA2	*Psoralidium*	4–31	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–27	–
	white heath aster	SYER	*Symphyotrichum ericoides*	4–22	–
	spiny phlox	PHHO	*Phlox hoodii*	4–22	–
	pussytoes	ANTEN	*Antennaria*	4–22	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	4–22	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	4–22	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–22	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	4–22	–
	bighead pygmycudweed	EVPR	*Evax prolifera*	4–22	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	4–22	–
	woolly plantain	PLPA2	*Plantago patagonica*	4–22	–
	Forb, introduced	2FI	*Forb, introduced*	4–22	–
	onion	ALLIU	*Allium*	0–18	–
	field sagewort	ARCA12	*Artemisia campestris*	0–18	–
	Forb, native	2FN	*Forb, native*	4–13	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–9	–
	littlepod false flax	CAMI2	*Camelina microcarpa*	4–9	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–9	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–9	–
Shrub/Vine					

9	**Shrubs**			90–157	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	9–67	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	22–67	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	22–67	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–36	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–36	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–22	–
	silver sagebrush	ARCA13	*Artemisia cana*	4–22	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–13	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–4	–
Moss					
10	**Mat-Forming Forbs**			0–27	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–27	–

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 Claypan 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 Shallow Loamy, Shallow Clayey, Thin Loamy, Claypan, Sandy Claypan, Sandy, 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 greater sage-grouse and 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 bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Thin Claypan ES remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, the coyote, and a variety of reptiles, amphibians, and insects. Invasive species such as annual bromegrasses and crested wheat have impacted the biological integrity of the site for some grassland birds such as greater-sage grouse. Changes in historic fire regime and domestic grazing have impacted the forb/shrub/grass percentages. Greater sage-grouse and Brewer’s sparrow benefit when big sagebrush

increases.

Western Wheatgrass/Blue Grama/Wyoming Big Sagebrush (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. Brewer's and grasshopper sparrow, lark bunting, western meadowlark, greater sage-grouse, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides.

This ecological site provides important breeding habitat for loggerhead shrikes. This site provides excellent nesting and brood rearing habitat for greater sage-grouse and sharp-tailed grouse. 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.

Blue Grama-Western Wheatgrass/Wyoming Big Sagebrush/Cactus (1.2): This plant community develops after an extended period of continuous grazing by herbivores and exclusion of fire favoring nonnative grasses such as annual bromegrasses, and the expansion of woody species such as big sage brush. The predominance of grasses, but a lower diversity of forbs and an increase in shrub cover, favors grazers and mixed-feeders, such as deer, pronghorn, and small mammals. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. Chestnut-collared longspur, Brewer's and vesper sparrow, long-billed curlew, and western meadowlark, are common and benefit from the structure and composition this plant community provides. The Wyoming big sagebrush benefits pronghorn, as well as, greater sage-grouse nesting and brood rearing. Prey populations are likely less dense but may be more available for grassland raptors such as ferruginous hawk, Swainson's hawk, and northern harrier. This plant community provides lower quality habitat for Great Plains toad, bull snake, and western rattlesnake.

Sandberg Bluegrass/Cactus/Clubmoss/Wyoming Big Sagebrush (2.1): Resulting from continued heavy continuous season-long grazing without adequate recovery periods between grazing events or no fire for extended periods of time, Sandberg bluegrass will dominate. The forb diversity has decreased with cactus and clubmoss dominating the site. Annual bromegrasses are prevalent on this site. Increase in bare ground will increase soil erosion and sediment loads to associated water features. A shift to shorter plant structure will favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, mountain plover, and swift fox. Sharp-tailed grouse and greater sage-grouse may use this site for leks due to the shorter height structure. The plant community provides high early season nutrition value for white-tailed jackrabbit, deer, and pronghorn. The short stature of this plant community limits suitable thermal, protective, and escape cover. Predators utilizing this plant community include 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 eliminate habitat for most amphibian species, as well as, most grassland birds and mammals. The earlier green-up associated with Sandberg bluegrass will provide foraging habitat for upland sandpipers. The short stature provides habitat for killdeer, horned lark, white-tailed jackrabbit, and thirteen-lined ground squirrel species. Prey populations are limited due to increased vulnerability to raptor and mammalian predation.

Grazing Interpretations

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

improved harvest efficiencies and increased carrying capacity may be developed.

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

Plant Community: Western Wheatgrass-Blue Grama/Wyoming Big Sagebrush (1.1)
Average Production (lb/acre, air-dry): 800
Stocking Rate (AUM/acre): 0.22

Plant Community: Blue Grama-Western Wheatgrass/Wyoming Big Sage Brush/Cactus (1.2)
Average Production (lb/acre, air-dry): 600*
Stocking Rate (AUM/acre): 0.16*

Plant Community: Sandberg Bluegrass/Cactus/Clubmoss/Wyoming Big Sagebrush (1.3)
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 D. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Normally areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Revision Notes: “Previously Approved” Provisional
This provisional ecological site description (ESD) has passed quality control (QC) and quality assurance (QA) to ensure the it meets the 2014 NESH standards for a provisional ecological site description.

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

Site Development and Testing Plan
Future work, as described in an official project plan, is necessary to validate the information in this provisional ecological site description. The plan will include field activities for low-, medium-, and high-intensity sampling, soil correlations, and analysis of the data. Annual field reviews should be done by soil scientists and vegetation specialists. Final field review, peer review, quality control, and quality assurance reviews are required to produce the final document.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site description include: Ryan Beer, Range Management Specialist (RMS), NRCS; Chuck Berdan, Biologist (BIO), Bureau of Land Management (BLM); Stan Boltz, RMS, NRCS; Dave Dewald, Wildlife BIO, NRCS; Mitch Faulkner, RMS, NRCS; Jody Forman, RMS, NRCS; Dennis Froemke, RMS, NRCS; Tom Juntti, BIO, United States Forest Service (USFS); Cheryl Nielsen, 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 are 2 SCS-RANGE-417's collected from 1981-1985 in Harding County, South Dakota.

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Approval

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This ecological site description was updated by Rick L. Peterson on January 16, 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
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Rangeland health reference sheet

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

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Date	05/07/2010
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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2. **Presence of water flow patterns:** Broken or irregular in appearance or discontinuous with numerous debris dams.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are somewhat common, but few exposed roots would occur.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10 to 30 percent is typical; this does not include associated slickspots that are not a soil/ecological site.

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 3 or greater. Surface organic matter adheres to the soil surface in most cases. Soil surface fragments will typically retain structure for short periods when dipped in distilled water. Some fragments will dissolve in less than 1 minute.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon not present at the surface, but has light colored E-horizon 1 to 4 inches thick. Structure is thin platy parting to 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-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 – natural pan appears at roughly 1 to 4 inches with “biscuit-top” appearance at top of pan.

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 rhizomatous grasses > Short warm-season grasses >

    Sub-dominant: Mid/short cool-season grasses = Shrubs >

    Other: Forbs > Tall cool-season grasses = Grass-likes

    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):**

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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).

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

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