USDA Natural Resources
Conservation Service

Ecological site R063BY012SD
Thin Upland

Last updated: 11/18/2022
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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.

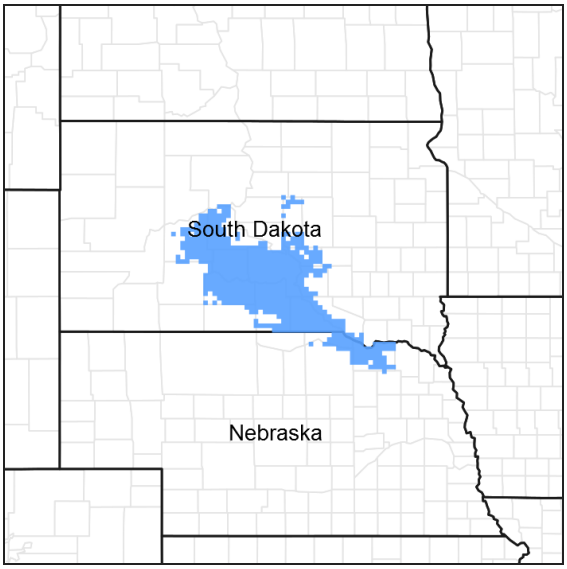


Figure 1. Mapped extent

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): 063B–Southern Rolling Pierre Shale Plains

MLRA Notes:
The Southern Rolling Pierre Shale Plains (MLRA 63B) is approximately 4,460 square miles in size. The majority of the MLRA is located in South Dakota (82 percent), and the remaining 18 percent is located in Nebraska. Interstate 90 crosses the northern portion through Chamberlin, SD. There are several American Indian Reservations, including the Lower Brule, Crow Creek, Santee, and Yankton Reservations.
This MLRA is an area of old plateaus and terraces that have been deeply eroded, with nearly level to rolling long slopes and well-defined dendritic drainage systems. The rivers and creek valleys have smooth floors and steep walls. The majority of the MLRA is located in the unglaciated section of the Missouri Plateau, Great Plains Province. The northeast corner of the MLRA, east of the Missouri River, is located in the glaciated section with higher areas having deposits of glacial drift. The southwestern tip is located in the High Plains Section.
Elevations range from 1,310 feet to 1,640 feet on the bottom lands along the Missouri River, and from 1,310 feet to 1,970 feet on the shale plains uplands.
The Missouri and Niobrara Rivers, and the confluence of the White and Missouri Rivers, occur within this MLRA. Lake Francis Case, Fort Randall Dam, and Lewis and Clark Lake are also within the borders of MLRA 63B.
Cretaceous Pierre Shale underlies most of the area. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clays. These clays shrink as they dry and swell as they become wet, causing significant problems for road and structural foundations.

Younger Niobrara chalk occurs in the southern part of the MLRA. Alluvial sand and gravel underlie the valley floors along major streams.
Soils are shallow to very deep, generally well drained, and have loamy or clayey textures. Annual precipitation is 19 to 26 inches, mostly falling during the growing season, as frontal storms during the spring and convective thunderstorms in summer. The average annual temperature is 45°-50°F. The freeze-free period averages 165 days, and ranges from 145 to 185 days.

Vegetation is a transition between tall prairie grasses and mixed prairie grasses. Green needlegrass, porcupinegrass, western wheatgrass, and big bluestem are the major species. Little bluestem, buffalograss, sideoats grama, and sedges are dominant on the shallow soils. Buffaloberry, skunkbush sumac, and prairie rose are common on steep slopes along the major streams. Prairie cottonwood and a variety of willow species are common on flood plains along the major streams. Green ash, boxelder, chokecherry, bur oak, and buffaloberry occur in draws and narrow valleys. Encroachment of Rocky Mountain juniper and eastern redcedar onto the river breaks is becoming a concern.
The majority of the land is utilized for ranching (60 percent) and farming (27 percent). Major resource concerns for the area are the hazards of wind and water erosion, maintenance of the content of organic matter and soil productivity, and management of soil moisture.

Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 63B – Southern Rolling Pierre Shale Plains (USDA-NRCS, Ag Handbook 296).

EPA - Level IV Ecoregions of the Continental United States:

Northwestern Glaciated Plains - 42f – Southern Missouri Coteau Slopes, 42g – Ponca Plains, 42h – Southern River Breaks, 42p – Holt Tablelands

North Western Great Plains - 43C – River Breaks, 43f – Subhumid Pierre Shale Plains, 43r – Niobrara River Breaks.

Ecological site concept

The Thin Upland ecological site occurs throughout MLRA 63B. It is located on upland landscapes, is a runoff site and does not receive additional water from overflow. The typical slope range from 3 to 35 percent but may be up to 60 percent. The soils are moderately deep to very deep, exceeding 20 inches in depth. The surface layer, or “A” horizon, is 3 to 8 inches in depth with a clay loamy texture. Carbonates are present at or near the soil surface (within 6 inches). The vegetation in Reference is a mix of warm- and cool-season grasses. Forbs are common and diverse but never dominant; shrubs can be present but are in minor or trace amounts.

Associated sites

R063BY010SD	**Loamy** The Loamy ecological site can be located adjacent to the Thin Upland site, but typically is on lower landscape positions with more gradual slopes.
R063BY011SD	**Clayey** The Clayey ecological site can be located adjacent to the Thin Upland site, but typically is on lower landscape positions with more gradual slopes.
R063BY024SD	**Shallow** The Shallow ecological site can be found adjacent to the Thin Upland site, but typically is on higher landscape positions.

Similar sites

R063BY024SD	**Shallow** Shallow ecological site will have less little bluestem and needlegrass, and lower forage production. Carbonate typically will not occur on the surface but can occur lower in the soil profile.

R063BY010SD	**Loamy** Loamy ecological site will have less little bluestem, more needle and thread, higher forage production, and little to no carbonates in the soil surface layer.
R063BY011SD	**Clayey** Clayey ecological site will have less big bluestem, higher forage production, and little, if any, carbonates in the soil surface layer.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Schizachyrium scoparium*

Physiographic features

This ecological site occurs on moderately to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Valley
Flooding frequency	None
Elevation	396–610 m
Slope	3–35%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 63B is considered to have a continental climate: cold winters and hot summers, low humidity, light rainfall, and ample sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains, and air masses move freely across the plains and account for rapid changes in temperature. Annual precipitation typically ranges from 18 to 25 inches per year. The average annual temperature is about 48°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, SD), to about 22°F (Winner, SD). July is the warmest month with temperatures averaging from about 73°F (Stephan, SD), to about 76°F (Winner, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 56°F. This large annual range attests to the continental nature of this area's climate. Hourly winds 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, and occasional strong storms may bring brief periods of high winds with gusts to 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 in about mid-May and continue to early or mid-September. Green-up of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	113-122 days
Freeze-free period (characteristic range)	130-154 days
Precipitation total (characteristic range)	533-610 mm
Frost-free period (actual range)	110-126 days
Freeze-free period (actual range)	127-155 days

Precipitation total (actual range)	508-635 mm
Frost-free period (average)	118 days
Freeze-free period (average)	141 days
Precipitation total (average)	584 mm

Climate stations used

- (1) PICKSTOWN [USC00396574], Lake Andes, SD
- (2) LYNCH [USC00255040], Lynch, NE
- (3) WINNER [USC00399367], Winner, SD
- (4) NIOBRARA [USC00255960], Niobrara, NE
- (5) GANN VALLEY 4NW [USC00393217], Gann Valley, SD
- (6) WOOD [USC00399442], Wood, SD
- (7) STEPHAN 2 NW [USC00397992], Highmore, SD

Influencing water features

No riparian areas or wetland features are directly associated with this site.

Soil features

The features common to soils on this site are the surface textures that range from clay to loam and slopes of 3 to 35 percent. They are moderately deep to very deep, well-drained, and formed in residuum from shale or from glacial till, alluvium, or loess. The surface layer is 3 to 8 inches thick and has moderate to slow permeability and moderately high to low saturated hydraulic conductivity. These soils are typically calcareous at or near the surface; however, carbonates are not always distinguishable in the surface layer. The texture of the subsoil ranges from clay to very fine sandy loam, depending upon parent material. Carbonates, gypsum, or other salts are typically found in the subsoil or underlying layers in most soils. Subsurface soil layers are non-restrictive to water movement and root penetration. The subsoil has a moderate to very slow permeability rate and moderately high to low saturated hydraulic conductivity. In the moderately deep soils, the upper part of the bedrock, which starts at 30 to 40 inches below the surface, is highly degraded, soft shale that some plant roots can penetrate. Typically around 50 to 55 inches below the surface, the bedrock becomes more consolidated and this harder, impervious shale is virtually impenetrable to plant roots. Available water capacity ranges from moderately high to low throughout the soils, depending upon the soils and parent materials.

When the soils are wet, surface compaction can occur with heavy traffic. This site is not flooded or ponded and there is no zone of water saturation within a depth of 72 inches. The soil profile should show evidence of weak development (i.e., thin A horizon, pale colors, lack of an argillic horizon). This site should show slight to no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

Major soils correlated to the Thin Upland ecological site include Betts, Coly, Gavins, Gettys, Monowi, Mitchell, Sully, and Westover.

Lakoma soil is also correlated to the Thin Upland ecological site but is proposed to be recorrelated to a new ecological site called Limy Clay - R063BY030SD.

These soils are susceptible to wind and water erosion. 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/or production.

Access Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm) for specific local soils information.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Residuum (3) Subglacial till
Surface texture	(1) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to moderate
Soil depth	61–203 cm
Surface fragment cover <=3"	0–9%
Surface fragment cover >3"	0–3%
Available water capacity (0-203.2cm)	10.16–20.32 cm
Calcium carbonate equivalent (0-203.2cm)	10–40%
Electrical conductivity (0-203.2cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-203.2cm)	0–3
Soil reaction (1:1 water) (0-203.2cm)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–11%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

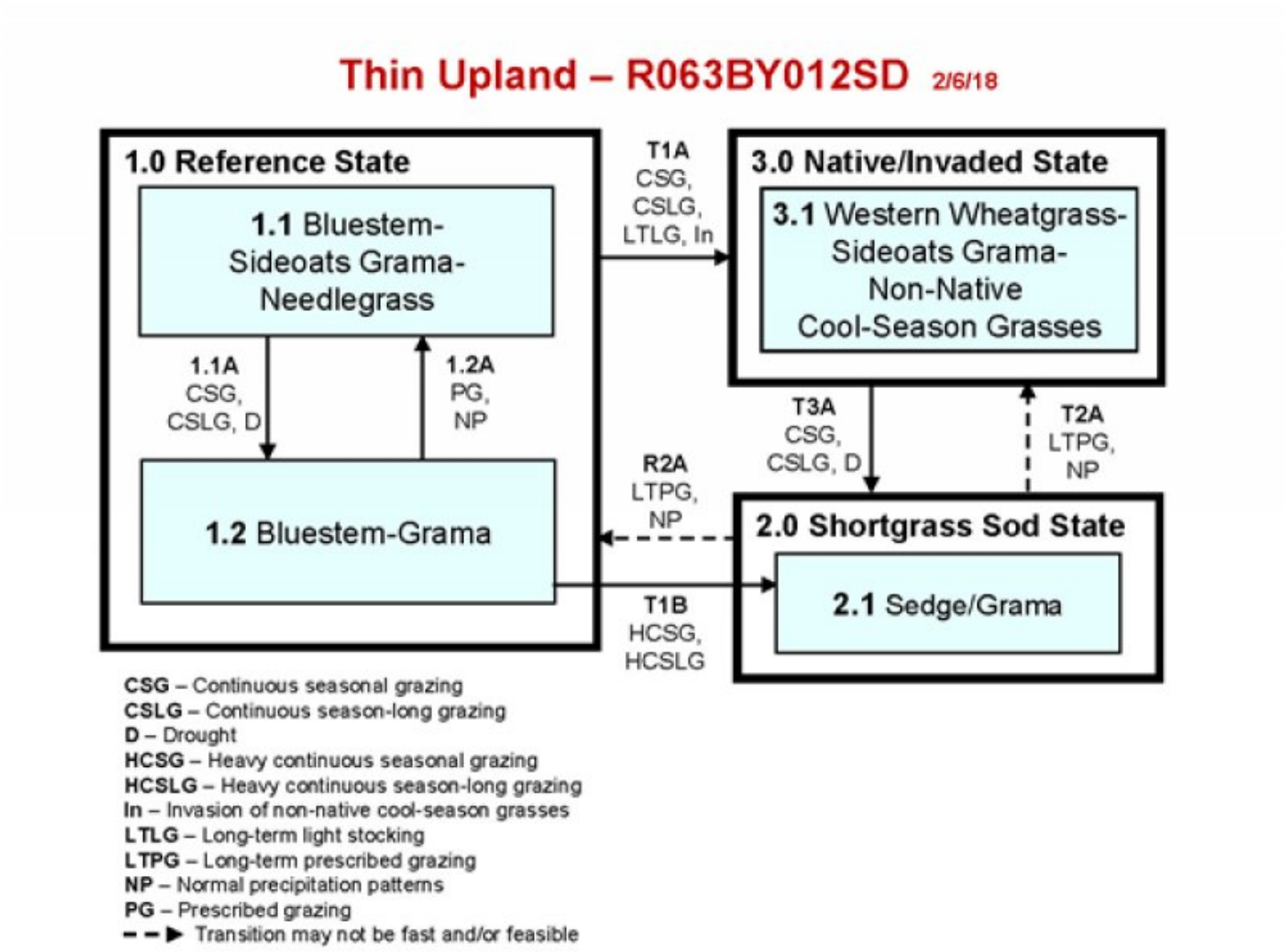
This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions specify more typical transitions between communities that will occur, severe disturbances, such as periods of well-below average precipitation, can cause significant shifts in plant communities and/or species composition.

This ecological site is naturally resilient, and quite resistant to change. Also, due to the relatively steep slopes and naturally low fertility of the soils, this site generally avoids more intensive disturbances such as farming. However, continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence can cause this site to depart from the Bluestem-Sideoats Grama-Needlegrass Plant Community (1.1). Sedges and gramas can increase and eventually develop into a sod, while many of the tall and mid-statured grasses will decrease (e.g., big bluestem, little bluestem, green needlegrass, needle and thread, porcupinegrass, switchgrass, and western wheatgrass). Even with these disturbances, many of the tall and mid-statured grasses will remain in the community at reduced levels, allowing recovery to occur once the disturbances are removed. This site is susceptible to invasion and establishment of non-native cool-season grasses. There also is the potential of eastern redcedar to encroach and become established on this site, but not to the extent that occurs on the Shallow Clay (R063BY017SD) site.

Interpretations are primarily based on the Bluestem-Sideoats Grama-Needlegrass Plant Community. It has been determined by study of 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 community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current knowledge and experience, and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

State and transition model



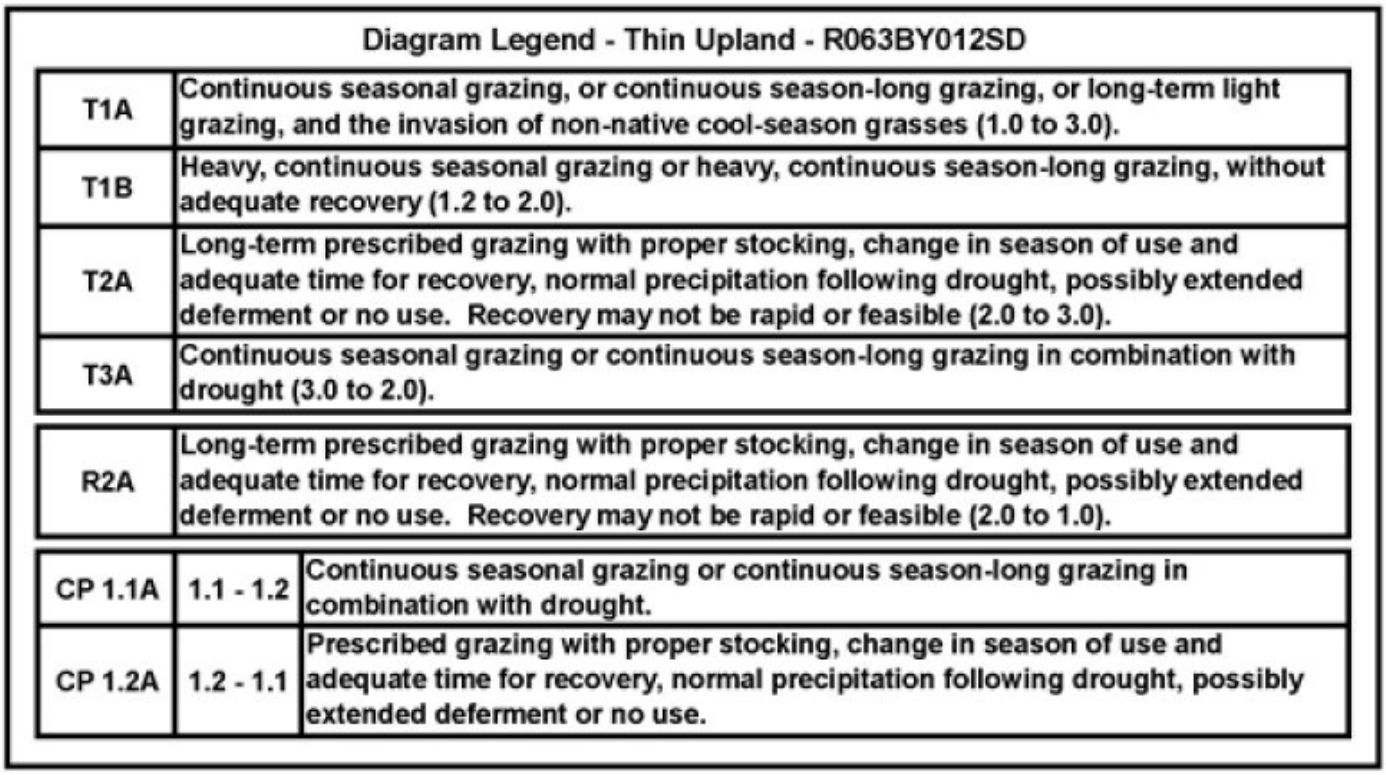


Diagram Legend - Thin Upland - R063BY012SD

T1A	Continuous seasonal grazing, or continuous season-long grazing, or long-term light grazing, and the invasion of non-native cool-season grasses (1.0 to 3.0).
T1B	Heavy, continuous seasonal grazing or heavy, continuous season-long grazing, without adequate recovery (1.2 to 2.0).
T2A	Long-term prescribed grazing with proper stocking, change in season of use and adequate time for recovery, normal precipitation following drought, possibly extended deferment or no use. Recovery may not be rapid or feasible (2.0 to 3.0).
T3A	Continuous seasonal grazing or continuous season-long grazing in combination with drought (3.0 to 2.0).

R2A	Long-term prescribed grazing with proper stocking, change in season of use and adequate time for recovery, normal precipitation following drought, possibly extended deferment or no use. Recovery may not be rapid or feasible (2.0 to 1.0).

CP 1.1A	1.1 - 1.2	Continuous seasonal grazing or continuous season-long grazing in combination with drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing with proper stocking, change in season of use and adequate time for recovery, normal precipitation following drought, possibly extended deferment or no use.

State 1
Reference State

This State represents the natural range of variability that dominates the dynamics of this ecological site. This State is dominated by warm- season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included relatively frequent 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. Today, the Reference State can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Bluestem-Sideoats Grama-Needlegrass

Interpretations are based primarily on the Bluestem-Sideoats Grama-Needlegrass Plant Community. This is also considered to be Reference Plant Community (1.1). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by tall and mid-statured warm-season grasses. The major grasses include big bluestem, little bluestem, green needlegrass, sideoats grama, switchgrass, and needle and thread or porcupinegrass. Other grass and grass-like species include western wheatgrass, blue grama, sedges, Indiangrass, prairie sandreed, Canada wildrye, and buffalograss. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high tolerance to drought. This is a sustainable plant community in regard to site/soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1653	2408	3133
Forb	118	202	308
Shrub/Vine	22	81	146
Total	**1793**	**2691**	**3587**

Figure 9. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Community 1.2
Bluestem-Grama

This plant community developed under continuous seasonal grazing, continuous season-long grazing, or from overutilization during extended drought periods. This community can also develop where this site occurs near water sources. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 15 percent forbs, and 5 percent shrubs. Dominant grass and grass-like species include little bluestem, sideoats grama, big bluestem, blue grama, and sedges. Grasses of secondary importance include green needlegrass, needle and thread, porcupinegrass, western wheatgrass, and buffalograss. Forbs commonly found in this plant community include white sagebrush (cudweed sagewort), goldenrod, heath aster, scurfpea, and Cuman ragweed (western ragweed). When compared to the Bluestem-Sideoats Grama-Needlegrass Plant Community (1.1), blue grama, sideoats grama, sedge, and buffalograss have increased. Needlegrasses and tall warm-season grasses have decreased, and production has also been reduced. This plant community is moderately resistant to change. This is due in part to the shallow-rooted nature of the shortgrass species, which decreases infiltration, especially to the deeper-rooted tall and mid-grass species. The herbaceous species present are well adapted to grazing; however, species composition can be altered through continued overgrazing. 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1227	1853	2320
Forb	101	213	370
Shrub/Vine	17	64	112
Total	**1345**	**2130**	**2802**

Figure 11. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year), continuous season-long grazing (grazing at light to moderate stocking levels for the entire growing season), or a combination of disturbances, such as extended periods of below average precipitation coupled with periodic heavy grazing, will shift this community to the 1.2 Bluestem-Grama Plant Community (1.2). In all cases, recovery periods are inadequate for the health and vigor of the dominant grass species.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the Bluestem-Sideoats Grama-Needlegrass Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2
Shortgrass Sod State

The Shortgrass Sod State is dominated by shortgrass species and upland sedges. This State is the result of grazing patterns that do not provide adequate recovery time for warm-and cool-season grasses. The hydrologic function of this site is dramatically altered. Runoff is high and infiltration is low. This State is very resistant to change through grazing management alone.

Community 2.1
Sedge/Grama

This plant community evolved under heavy, continuous seasonal grazing, heavy, continuous season-long grazing or from overutilization during extended drought periods. The potential plant community is made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grass and grass-like species include sedge, blue grama, sideoats grama, buffalograss, and sand dropseed. Grasses of secondary importance include big bluestem, little bluestem, western wheatgrass, green needlegrass, and needle and thread. Forbs commonly found in this plant community include white sagebrush (cudweed sagewort), goldenrod, and sweetclover. When compared to the Bluestem-Sideoats Grama-Needlegrass Plant Community (1.1), short-statured species are dominant on this plant community. Tall and mid- grasses have decreased significantly. This vegetation state is very resistant to change due to the increase in the root mat near the surface of the soil which further reduces infiltration. The herbaceous species present are well adapted to grazing; however, composition can be altered through long-term prescribed grazing. This plant community is less productive than most other plant community phases. The thick sod prevents other species from getting established. Lack of litter and reduced plant vigor causes higher soil temperatures, poor water infiltration rates, and high evapotranspiration which gives the short-statured species a competitive advantage. Soil erosion will be minimal due to the sod-forming habit of dominant species in this phase.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	712	1204	1799
Forb	62	101	146
Shrub/Vine	118	40	73
Total	**892**	**1345**	**2018**

Figure 13. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

State 3
Native/Invaded State

This State has been invaded by smooth brome and/or Kentucky bluegrass, but not at the levels where the plant community is dominated by these species. Prescribed burning and/or chemical herbicides, and targeted grazing can be used to reduce the amount of smooth brome and Kentucky bluegrass in the plant community, but it will not be completely removed. At this point, a restoration pathway to the Reference State (1.0) does not exist.

Community 3.1

Western Wheatgrass-Sideoats Grama-Non-Native Cool-Season Grasses

This plant community evolved under continuous seasonal grazing, continuous season-long grazing, or long-term light grazing, and the invasion of non-native cool-season grasses, (e.g. smooth bromegrass, Kentucky bluegrass, annual bromegrass). The potential plant community is made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. The dominant species are variable in this phase, but often consist of sideoats grama, blue grama, western wheatgrass, smooth bromegrass, Kentucky bluegrass, annual bromegrass, sedge, buffalograss, and sand dropseed. Other plant species from adjacent ecological sites can become minor components of this plant community. Compared to the Bluestem-Sideoats Grama-Needlegrass Plant Community (1.1), sideoats grama, western wheatgrass, and blue grama have increased, as have various non-native species such as smooth bromegrass, Kentucky bluegrass, annual bromegrass, field pennycress, kochia, and sweetclover. Many of the previously dominant tall and mid-grass species have been significantly reduced and may not be present.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1227	1905	2449
Forb	101	160	241
Shrub/Vine	17	64	112
Total	**1345**	**2129**	**2802**

Figure 15. Plant community growth curve (percent production by month). SD6302, Pierre Shale Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, uplands..

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

Transition T1B
State 1 to 2

Heavy, continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning early in the season) or heavy, continuous season-long grazing or overutilization during extended drought periods, will convert the Bluestem-Grama Plant Community (1.2) to the Shortgrass Sod State (2.0).

Transition T1A
State 1 to 3

Continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year), continuous season-long grazing (grazing at light to moderate stocking levels for the entire growing season), or long-term light grazing and the invasion of non-native cool-season grasses can cause a transition to the Native/Invaded State (3.0).

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high- density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the Reference State (1.0). This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable.

Conservation practices

Prescribed Grazing

Transition T2A
State 2 to 3

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high- density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the Native/Invaded State (3.0). This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable.

Transition T3A
State 3 to 2

Continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year), continuous season-long grazing (grazing at light to moderate stocking levels for the entire growing season), or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this State to the Shortgrass Sod State (2.0).

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			538–1076	
	big bluestem	ANGE	*Andropogon gerardii*	404–942	–
	switchgrass	PAVI2	*Panicum virgatum*	54–269	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–135	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–135	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–81	–
2	**Mid Warm-Season Grasses**			404–807	
	little bluestem	SCSC	*Schizachyrium scoparium*	269–673	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	135–404	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–135	–
3	**Cool-Season Bunchgrass**			269–404	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	54–269	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	54–269	–
	green needlegrass	NAVI4	*Nassella viridula*	54–269	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–135	–
4	**Wheatgrass**			135–269	
	western wheatgrass	PASM	*Pascopyrum smithii*	135–269	–
5	**Short Warm-Season Grasses**			54–269	
	blue grama	BOGR2	*Bouteloua gracilis*	54–215	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–135	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–135	–
6	**Other Native Grasses**			27–135	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–135	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	27–81	–

	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–54	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–54	–
7	**Grass-Likes**			27–135	
	sedge	CAREX	*Carex*	27–135	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–81	–
Forb					
9	**Forbs**			135–269	
	Forb, native	2FN	*Forb, native*	27–81	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–54	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–54	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–54	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–54	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	27–54	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	27–54	–
	dotted blazing star	LIPU	*Liatris punctata*	27–54	–
	scurfpea	PSORA2	*Psoralidium*	27–54	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–54	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	27–54	–
	goldenrod	SOLID	*Solidago*	27–54	–
	white heath aster	SYER	*Symphyotrichum ericoides*	27–54	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–27	–
	American vetch	VIAM	*Vicia americana*	0–27	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–27	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	0–27	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–27	–
	large Indian breadroot	PEES	*Pediomelum esculentum*	0–27	–
Shrub/Vine					
10	**Shrubs**			27–135	
	leadplant	AMCA6	*Amorpha canescens*	27–81	–
	rose	ROSA5	*Rosa*	27–54	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	27–54	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–54	–
	soapweed yucca	YUGL	*Yucca glauca*	0–27	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–27	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–27	–
	smooth sumac	RHGL	*Rhus glabra*	0–27	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			106–319	
	big bluestem	ANGE	*Andropogon gerardii*	43–319	–

	switchgrass	PAVI2	*Panicum virgatum*	0–106	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–106	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–43	–
2	**Mid Warm-Season Grasses**			319–639	
	sideoats grama	BOCU	*Bouteloua curtipendula*	213–532	–
	little bluestem	SCSC	*Schizachyrium scoparium*	43–213	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–21	–
3	**Cool-Season Bunchgrass**			0–213	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–106	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–106	–
	green needlegrass	NAVI4	*Nassella viridula*	0–106	–
4	**Wheatgrass**			21–149	
	western wheatgrass	PASM	*Pascopyrum smithii*	21–149	–
5	**Short Warm-Season Grasses**			106–426	
	blue grama	BOGR2	*Bouteloua gracilis*	106–319	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–149	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–106	–
6	**Other Native Grasses**			21–106	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–106	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–64	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–64	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	21–64	–
7	**Grass-Likes**			106–256	
	sedge	CAREX	*Carex*	106–256	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–64	–
8	**Non-Native Grasses**			0–21	
	smooth brome	BRIN2	*Bromus inermis*	0–21	–
	brome	BROMU	*Bromus*	0–21	–
	Kentucky bluegrass	POPR	*Poa pratensis*	0–21	–
Forb					
9	**Forbs**			106–319	
	sweetclover	MELIL	*Melilotus*	0–106	–
	Forb, introduced	2FI	*Forb, introduced*	0–106	–
	Forb, native	2FN	*Forb, native*	21–85	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	21–64	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	21–64	–
	scurfpea	PSORA2	*Psoralidium*	21–64	–
	goldenrod	SOLID	*Solidago*	21–64	–
	white heath aster	SYER	*Symphyotrichum ericoides*	21–64	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	21–43	–
	burningbush	BASC5	*Bassia scoparia*	0–43	–

	dotted blazing star	LIPU	*Liatris punctata*	0–43	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–21	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–21	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–21	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–21	–
	field pennycress	THAR5	*Thlaspi arvense*	0–21	–
Shrub/Vine					
10	**Shrubs**			21–106	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–64	–
	smooth sumac	RHGL	*Rhus glabra*	0–64	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	21–64	–
	soapweed yucca	YUGL	*Yucca glauca*	0–64	–
	rose	ROSA5	*Rosa*	21–43	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–43	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–43	–
	leadplant	AMCA6	*Amorpha canescens*	0–21	–

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			13–135	
	big bluestem	ANGE	*Andropogon gerardii*	13–94	–
2	**Mid Warm-Season Grasses**			67–269	
	sideoats grama	BOCU	*Bouteloua curtipendula*	67–269	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–67	–
3	**Cool-Season Bunchgrass**			0–67	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–40	–
	green needlegrass	NAVI4	*Nassella viridula*	0–40	–
4	**Wheatgrass**			0–67	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–67	–
5	**Short Warm-Season Grasses**			269–404	
	blue grama	BOGR2	*Bouteloua gracilis*	202–336	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	13–135	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–135	–
6	**Other Native Grasses**			13–67	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–67	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–27	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–27	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	13–27	–
7	**Grass-Likes**			135–404	
	sedge	CAREX	*Carex*	135–404	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–67	–

	grass)				
8	**Non-Native Grasses**			27–135	
	brome	BROMU	*Bromus*	13–135	–
	Kentucky bluegrass	POPR	*Poa pratensis*	13–135	–
	smooth brome	BRIN2	*Bromus inermis*	0–56	–
Forb					
9	**Forbs**			67–135	
	sweetclover	MELIL	*Melilotus*	0–108	–
	Forb, introduced	2FI	*Forb, introduced*	13–81	–
	Forb, native	2FN	*Forb, native*	13–40	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	13–40	–
	burningbush	BASC5	*Bassia scoparia*	0–40	–
	goldenrod	SOLID	*Solidago*	13–40	–
	white heath aster	SYER	*Symphyotrichum ericoides*	13–27	–
	field pennycress	THAR5	*Thlaspi arvense*	0–27	–
	scurfpea	PSORA2	*Psoralidium*	13–27	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	13–27	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–13	–
Shrub/Vine					
10	**Shrubs**			13–67	
	prairie sagewort	ARFR4	*Artemisia frigida*	13–54	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–40	–
	smooth sumac	RHGL	*Rhus glabra*	0–40	–
	soapweed yucca	YUGL	*Yucca glauca*	0–40	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–27	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	rose	ROSA5	*Rosa*	0–13	–

Animal community

Grazing Interpretations
The following table lists annual suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, 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 carrying capacity estimates 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. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

The following estimates are based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM: the amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month), and on 25 percent harvest efficiency of preferred and desirable forage species (refer to USDA NRCS, National Range and Pasture Handbook).

Plant Community: Bluestem-Sideoats Grama-Needlegrass (1.1)
Average Annual Production (lbs./acre, air-dry): 2,400
Stocking Rate (AUM/acre): 0.66

Plant Community: Bluestem-Grama (1.2)

Average Annual Production (lbs./acre, air-dry): 1,900
Stocking Rate (AUM/acre): 0.52

Plant Community: Sedge/Grama (2.1)
Average Annual Production (lbs./acre, air-dry): 1,200
Stocking Rate (AUM/acre): 0.33

Plant Community: Western Wheatgrass-Sideoats Grama-Non-Native Cool-Season Grasses (3.1)
Average Annual Production (lbs./acre, air-dry): 1,900
Stocking Rate (AUM/acre): 0.52

Total annual production on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may have been 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. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow 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. The Thin Upland ecological site is dominated by soils in hydrologic groups B and D. Infiltration is moderate to slow, 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 higher infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, and/or bluegrass will result in reduced infiltration and increased runoff. Areas with less than 50 percent ground cover have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting, hiking, photography, bird watching, and other recreational opportunities. The wide varieties of plants that bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

Seed harvest of native plant species can provide additional income on this site.

Other information

Revision Notes: “Previously Approved” Provisional
This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 National Ecological Site Handbook (NESH) standards for a Provisional ecological site. This is an updated “Previously Approved” ESD which represents a first-generation tier of documentation that, prior to the release of the 2014 National Ecological Site Handbook, met all requirements as an “Approved” ESD as laid out in the 1997, rev.1, 2003 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 five years and is a proven functional document for conservation planning. The “Previously Approved” ESD does not contain all tabular and narrative entries as required in the current “Approved” level of documentation, but it is expected that the “Previously Approved” ESD will continue refinement toward an “Approved” status.

Site Development and Testing Plan:
Future work, as described in a Project Plan, is necessary to validate the information in this Provisional Ecological Site Description. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. The final field review, peer review, quality control, and quality assurance reviews of the ESD will be required to produce the final document.

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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 include: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Rick Peterson, RMS, NRCS; and Dana Larsen, RMS, NRCS.

There are 10 SCS-Range-417s collected from 1970 to 2006 in Boyd, Brule, Buffalo, Charles Mix, Gregory, Knox, and Tripp Counties, South Dakota.

There were 14 NRI points collected from 2004 to 2016 in Brule, Gregory, Lyman, Mellette, and Tripp Counties, South Dakota, and 2 NRI points collected from in Boyed County Nebraska in 2014.

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Approval

Chris Tecklenburg, 11/18/2022

Acknowledgments

ESD updated by Rick L. Peterson on 02/07/2018.
Editorial Review by Carla Green Adams.

Rangeland health reference sheet

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

Author(s)/participant(s)	Stan Boltz
Contact for lead author	Stan Boltz, stanley.boltz@sd.usda.gov, 605-352-1236
Date	03/15/2011
Approved by	Chris Tecklenburg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present.

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2. **Presence of water flow patterns:** Barely observable if present.

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3. **Number and height of erosional pedestals or terracettes:** Essentially non-existent. Some bunchgrasses may be slightly pedestalled, but no exposed roots will be present.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 5 percent and pathces less than two inches in diameter.

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability normally a 5 to 6 rating. Typically high root content and organic matter in the soil surface. Soil surface is very resistant to erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically granular, and mollic (higher organic matter) colors of A-horizon down to about 3 to 6 inches. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep-rooted native grass and grass-like species enhance infiltration and reduce runoff.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should 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: Tall, warm-season grasses = mid, warm-season grasses >

    Sub-dominant: Mid and tall, cool-season bunchgrasses >

    Other: Wheatgrasses = forbs > short, warm-season grasses > grass-like species = shrubs

    Additional: Other native grasses occur in other functional groups in minor amounts.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality.

14. **Average percent litter cover (%) and depth (in):** 70-80 percent plant litter cover, roughly 0.25 to 0.5 inches in depth. Litter cover is in contact with the soil surface.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,400 pounds/acre (air-dry basis)

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:** Refer to State and local Noxious Weed List; also Kentucky bluegrass and smooth bromegrass.

17. **Perennial plant reproductive capability:** Perennial grasses have vigorous rhizomes and/or tillers.