USDA Natural Resources Conservation Service

Ecological site R102BY016SD
Very Shallow

Last updated: 2/01/2024
Accessed: 05/11/2025

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): 102B–Till Plains

The Till Plains (102B) is located within the Western Lake Section of the Central Lowland Province of the Interior Plains. It is entirely in South Dakota, encompassing 2,215 square miles (Figure 1). The elevation ranges from 1,140 to 1,880 feet. The MLRA is characterized by glaciated, nearly level to hilly plains populated by stagnation and end moraines, glacial outwash terraces, and floodplains as the major landforms. The dominant parent materials are silty drift, glacial till, glacial outwash, and alluvium. (USDA-NRCS, 2006)

The dominant soil order in this MLRA is Mollisols. The soils in the area dominantly have a mesic temperature regime, a udic ustic moisture regime and mixed or smectitic mineralogy. They generally are very deep, well drained to poorly drained, and clayey or loamy. This area is in the western area of the tall grass prairie and supports big bluestem (Andropogon gerardi), little bluestem (Schizachyrium scoparium), Indiangrass (Sorghastrum nutans), porcupine grass (Hesperostipa spartea), and green needlegrass (Nassella viridula) as the dominant native species. Cattails (Typha), prairie cordgrass (Spartina pectinate), bulrush (Cyperaceae) and reed canarygrass (Phalaris arundinacea) are commonly found on the poorly drained soils. (USDA-NRCS, 2006).

Classification relationships

Major Land Resource Area (MLRA): Till Plains (102B) (USDA-NRCS, 2006)

USFS Subregions: North Central Glaciated Plains Section (251B); Outer Coteau des Prairies (251Bb); Yankton Hills and Valleys (251Bf); Northwest Iowa Plains (251Bd); (Cleland et al., 2007).

US EPA Level IV Ecoregion: Prairie Coteau (46k); James River Lowland (46n); Loess Prairies (47a); Big Sioux Basin (46m) - (USEPA, 2013)

Ecological site concept

The Very Shallow ecological site occurs on the shoulder slopes in the upland areas. Soils are well to excessively drained and have root restricting layers such as sand and gravel or bedrock within 10 inches of the soil surface. Along with the root restricting layer, precipitation tends to runoff, leaving less soil moisture for plant growth, production is lower, and species composition will tend towards more drought tolerant. In some areas the surface layer may consist of stony to extremely stony. Slopes can range from zero to 40 percent.

Vegetation in the Reference State includes needle and thread, blue grama, and threadleaf sedge. Forbs include sageworts, scurfpeas, and asters. Non-native grasses such as annual bromes may invade the site due to changes in disturbance regime.

Associated sites

R102BY010SD	**Loamy** These sites occur on upland areas. The soils are well drained and have sand and gravel at a depth of greater than 20 inches below the soil surface. The central concept soil series is Enet, but other series are included.
R102BY014SD	**Shallow To Gravel** These sites occur on upland areas. The soils are excessively drained and have sand and gravel within 10 to 20 inches of the soil surface. The central concept soil series is Delmont, but other series are included.

Similar sites

R102BY014SD	**Shallow To Gravel** The Shallow To Gravel site occurs in a backslope landscape position and does not have a root restricting layer, such as sand and gravel, within 10 inches of the soil surface. The Shallow to Gravel site will have more bluestem and higher production than the Very Shallow site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Hesperostipa comata ssp. comata* (2) *Hesperostipa spartea*

Physiographic features

This site occurs on gently to steeply sloping uplands.

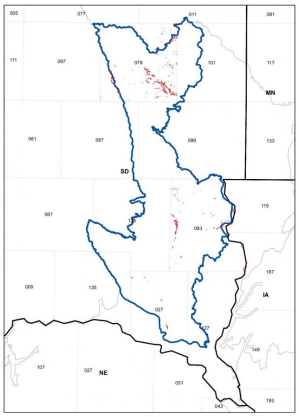


Figure 2. Site Distribution Map of the Very Shallow site in MLRA 102B.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Moraine (3) Outwash terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,100–1,900 ft
Slope	3–35%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

Major Land Resource Area 102B is considered to have a continental climate with cold winters and relatively hot summers, low to moderate humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of the location of this MLRA 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 24 to 26 inches per year. The average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 14°F (Wentworth 2 WNW, South Dakota, to about 18°F (Canton 4 WNW, SD). July is the warmest month with temperatures averaging from about 72°F (Wentworth 2 WNW, SD), to about 73°F (Canton 4 WNW, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 57°F. This large annual range attests to the continental nature of the climate of this area. 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 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)	124-127 days
Freeze-free period (characteristic range)	138-140 days
Precipitation total (characteristic range)	26 in

Frost-free period (actual range)	123-128 days
Freeze-free period (actual range)	137-141 days
Precipitation total (actual range)	26-27 in
Frost-free period (average)	126 days
Freeze-free period (average)	139 days
Precipitation total (average)	26 in

Climate stations used

- (1) WENTWORTH 2.5 WNW [USC00399042], Wentworth, SD
- (2) MADISON 2SE [USC00395090], Madison, SD
- (3) MONTROSE 8N [USC00395738], Montrose, SD
- (4) CANTON [USC00391392], Canton, SD
- (5) CENTERVILLE 6 SE [USC00391579], Beresford, SD

Influencing water features

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

Soil features

The common features of soils in this site are the loamy sand to extremely gravelly sand textured subsoil and slopes of three to 35 percent. The soils in this site are excessively well-drained and formed in till outwash materials. The loam or gravelly loam surface layer is seven to nine inches thick. The soils have a moderate to rapid infiltration rate. This site should show no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is very unstable but intact. Subsurface soil layers are restrictive to root penetration.

The central concept soil series for this site is Talmo, but other series are included.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 15 percent. Low available water capacity caused by the shallow rooting depth strongly influences the soil-water-plant relationship. With the high amounts of gravel throughout the profile, erosion is typically not a concern.

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

Table 4. Representative soil features

Surface texture	(1) Loam
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Moderate to rapid
Soil depth	7–10 in
Surface fragment cover <=3"	5–13%
Surface fragment cover >3"	1–2%
Available water capacity (0-40in)	3 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0–2 mmhos/cm

Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	30–41%
Subsurface fragment volume >3" (Depth not specified)	2–3%

Ecological dynamics

State and Community Phases
The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

The site which is located in the Southern Black Glaciated Plains Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Needle and Thread-Blue Grama-Threadleaf Sedge Plant Community Phase. This community phase and the Reference State have 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 considered.

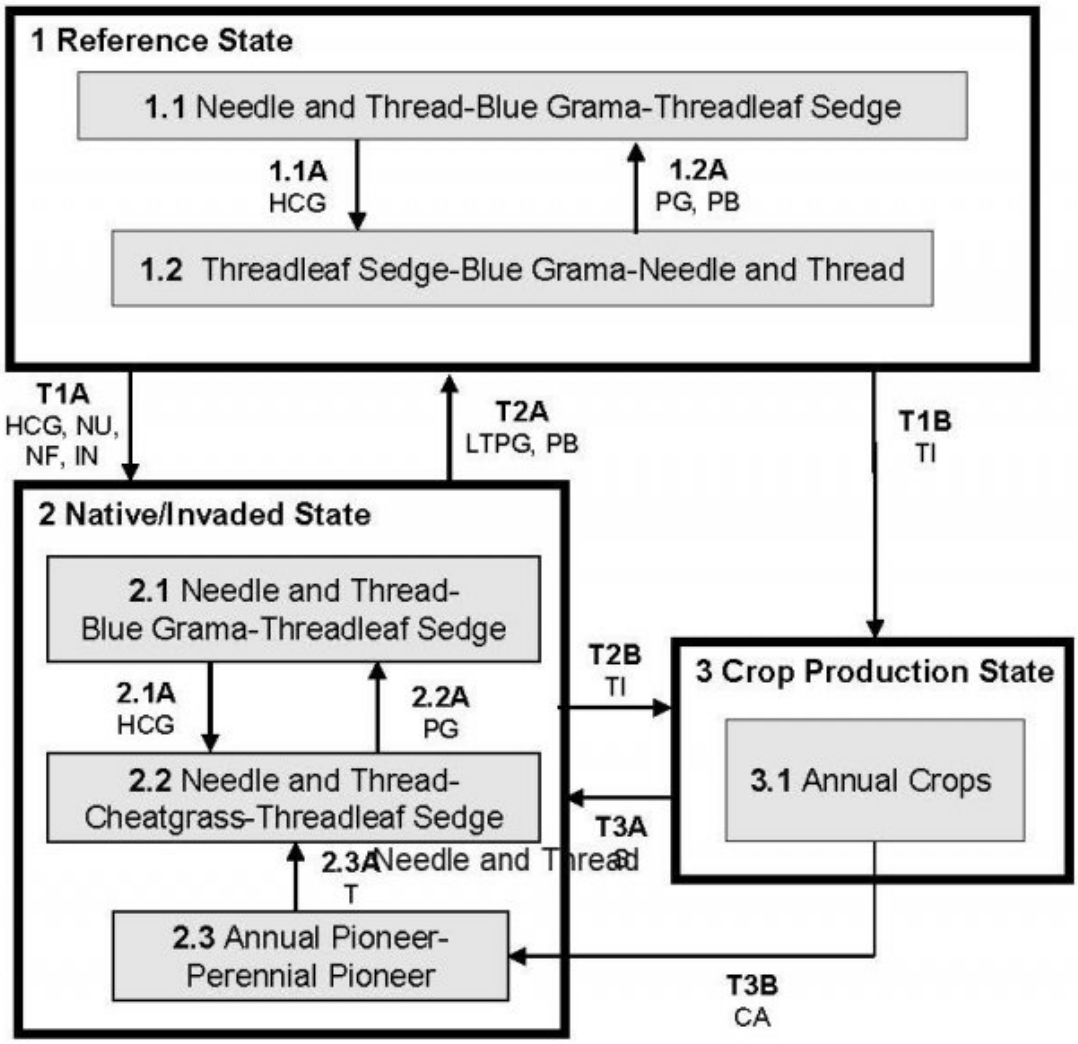
This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. This ecological site is naturally resilient, and quite resistant to change. Also, due to the relatively steep slopes and naturally low fertility of the soils, this site generally avoids more intensive disturbances such as farming. However, continuous season-long grazing (during the typical growing season of May through October) and 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 1.1 Needlend Thread-Blue Grama-Threadleaf Sedge Plant Community Phase. Sedges and gramas can increase and eventually develop into a sod while many of the tall and mid-statured grasses will decrease [e.g., little bluestem, green needlegrass, needle and thread, porcupinegrass, and western wheatgrass (*Pascopyrum smithii*)]. 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.

Following the state-and-transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states and community phases. The associated plant composition tables have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition and community pathways between them. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Very Shallow – R102BY016SD



LEGEND
Very Shallow – R102BY016SD

CA – Cropped and abandoned
HCG – Heavy, continuous grazing
IN – Invasion
LTPG – Long-term prescribed grazing
NU – Non-use
NF – No fire
PB – Prescribed burning
PG – Prescribed grazing
S – Seeding
T – Time w/wo disturbances
TI – Tillage

Figure 9. State-and-Transition Model and Legend for the Very Shallow site in MLRA 102B.

Code	Process
T1A	Heavy, continuous grazing, inundation, non-use, no fire
T1B	Tillage
T2A	Long term prescribed grazing, prescribed burning
T2B	Tillage
T3A	Seeding
T3B	Abandonment of cropping
1.1A	Heavy, continuous grazing
1.2A	Prescribed grazing with recovery periods, prescribed burning
2.1A	Heavy, continuous grazing
2.2A	Prescribed grazing with recovery periods
2.3A	Time w/wo disturbance

Figure 10. Matrix for the Very Shallow site in MLRA 102B.

State 1
Reference State

The Reference State represents the natural range of variability that dominates the dynamics of this ecological site (ES). This state is dominated by cool-season grasses with warm-season grasses being subdominant. Prior to European settlement of North America, the primary disturbance mechanisms for this site in the Reference condition were grazing by large herding ungulates and fluctuations in levels of precipitation. Grazing, coupled with weather events, dictated the dynamics that occurred within the natural range of variability. Today this 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. The dominant tall and mid-grass species can decline and a corresponding increase in short-statured species will occur.

Community 1.1
Needle and Thread-Blue Grama-Threadleaf Sedge

Figure 11. Typical vegetation associated with the Reference Community of the Very Shallow site in MLRA 102B.

Interpretations are based primarily on the 1.1 Needle and Thread-Blue Grama-Threadleaf Sedge Plant Community Phase (this is also considered to be Reference). This plant community evolved with grazing by large herbivores, frequent surface fires, and periodic flooding events, and is suited for grazing by domestic livestock. It can be found on areas that are properly managed with prescribed grazing that allows for proper utilization, changes in season of use, and adequate recovery periods following each grazing event. The potential vegetation is about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. Cool-season grass and grass-like species dominate this plant community, with warm-season grasses being subdominant. The major grass or grass-like species include needle and thread, blue grama, threadleaf sedge, green needlegrass, porcupinegrass, hairy grama (*Bouteloua hirsuta*), sideoats grama (*Bouteloua curtipendula*), and needleleaf sedge (*Carex duriuscula*). Other grasses occurring on the site include threeawn (Aristida), plains muhly (*Muhlenbergia cuspidata*), little bluestem, and prairie Junegrass (*Koeleria macrantha*). The significant forbs include dotted gayfeather (*Liatris punctata*), hairy goldaster (*Heterotheca villosa*), purple coneflower (Echinacea), and prairie clover (Dalea). Significant shrubs are fringed sagewort (*Artemisia frigida*), leadplant (*Amorpha canescens*), rose (Rosa spp.), skunkbush sumac (*Rhus trilobata*), and snowberry (Symphoricarpos).

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1310	1732	2095
Forb	95	210	365
Shrub/Vine	95	158	240
Total	**1500**	**2100**	**2700**

Figure 13. Plant community growth curve (percent production by month). SD0212, Till 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
Threadleaf Sedge-Blue Grama-Needle and Thread

This plant community can develop from the adverse effects of heavy, continuous grazing in conjunction with extended periods of below average precipitation. Shortgrass and grass-like species increase to dominate the site and annual production decreases. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives blue grama and sedges a competitive advantage over cool- and warm-season mid-grasses. Threadleaf sedge, blue grama, and needle and thread are the dominant grass and grass-like species. Other grasses may include sideoats grama, needle and thread, prairie Junegrass, and threeawn. Significant forbs include green sagewort (*Artemisia campestris*), cutleaf ironplant (*Machaeranthera pinnatifida*), scurfpeas (Psoralidium), white prairie aster (*Symphyotrichum falcatum*), and woolly Indianwheat (*Plantago patagonica*). Common shrubs include fringed sagewort, cactus (Opuntia), and snowberry. Non-native species such as Kentucky bluegrass (*Poa pratensis*), cheatgrass (*Bromus tectorum*), and Japanese bromegrass (Bromus japonicas) may begin to invade this phase. This plant community is relatively stable. The competitive advantage of blue grama and threadleaf sedge prevents other species from establishing. This plant community is less productive than the 1.1 Needle and thread-Blue Grama-Threadleaf sedge Plant Community Phase. Runoff has increased and infiltration has decreased. Soil erosion does not increase substantially.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	770	1155	1505
Forb	65	140	240
Shrub/Vine	65	105	155
Total	**900**	**1400**	**1900**

Figure 15. Plant community growth curve (percent production by month). SD0212, Till 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

Pathway 1.1A
Community 1.1 to 1.2

Heavy, continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation will shift this community to the 1.2 Threadleaf Sedge-Blue Grama-Needle and Thread Plant Community Phase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing, and/or prescribed burning occurring at relatively frequent intervals (every 3 to 5 years) and a return to normal disturbance regime levels and frequencies, or periodic light to moderate grazing possibly including periodic rest would have converted this plant community to the 1.1 Needle and Thread-Blue Grama-Threadleaf Sedge Plant Community Phase.

State 2
Native/Invaded State

The Native/Invaded State represents the more common range of variability that exists with higher levels of grazing

management but in the absence of periodic fire due to fire suppression. This state is dominated by cool-season grasses. It 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. Taller cool-season species can decline and a corresponding increase in short-statured grass will occur. Non-native species such as cheatgrass or Japanese bromegrass can become dominant at times and influence the biotic and hydrologic ecological processes of the State.

Community 2.1
Needle and Thread-Blue Grama-Threadleaf Sedge

This plant community is the result of encroachment of non-native species, often as a result of fluctuations in precipitation cycles, typically extended periods of below average precipitation followed by a mild winter and a cool, wet spring. The potential vegetation is about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. Cool-season grass and grass-like species dominate this plant community, with warm-season grasses being subdominant. The major grass or grass-like species include needlegrasses (needle and thread, green needlegrass, and porcupinegrass), blue and hairy grama, sideoats grama, threadleaf sedge, and needleleaf sedge. Other grasses occurring on the site include threeawn, plains muhly, little bluestem, prairie Junegrass, and non-native species such as Kentucky bluegrass, cheatgrass, and Japanese bromegrass. The significant forbs include dotted gayfeather, purple coneflower, prairie clover, and hairy goldaster. Significant shrubs are fringed sagewort, leadplant, rose, and snowberry. This plant community is very similar to the 1.1 Needle and Thread-Blue Grama-Threadleaf Sedge Plant Community Phase. The main difference is that this plant community will have a minor amount on non-native grasses, up to about 10 to 15 percent by weight. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. This plant community is stable and protected from excessive erosion.

Figure 16. Plant community growth curve (percent production by month). SD0212, Till 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 2.2
Needle and Thread-Cheatgrass-Threadleaf Sedge

This plant community can develop from the adverse effects of heavy, continuous grazing in conjunction with extended periods of below average precipitation. It is further impacted by the invasion of non-native species such as cheatgrass, Japanese bromegrass, and Kentucky bluegrass. Needlegrasses will be evident on the aspect of this phase but will be reduced in vigor and production. Annual bromegrass and sedge will make up a bulk of the composition on this plant community phase. The dominant grass and grass-like species will include needlegrass (needle and thread, green needlegrass, porcupinegrass), cheatgrass, Japanese bromegrass, threadleaf sedge, and needleleaf sedge. Other grasses present include blue grama, threeawn, Kentucky bluegrass, hairy grama, and prairie Junegrass. Significant forbs include green sagewort, cutleaf ironplant, scurfpeas, white prairie aster, and woolly Indianwheat. Common shrubs include cactus, snowberry, and fringed sagewort. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives sedges and annual bromegrass a competitive advantage over cool-and warm-season mid-grasses. This plant community is relatively stable. The competitive advantage of blue grama and threadleaf sedge prevents other species from establishing. This plant community is less productive than the 1.1 Needle and Thread-Blue Grama-Threadleaf Sedge Plant Community Phase. Runoff has increased and infiltration has decreased. Soil erosion does not increase substantially.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	420	742	1055
Forb	40	90	150
Shrub/Vine	40	68	95
Total	**500**	**900**	**1300**

Figure 18. Plant community growth curve (percent production by month). SD0211, Till Plains, cool-season dominant.. Cool-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

Community 2.3
Annual Pioneer-Perennial Pioneer

This plant community developed under continuous, heavy grazing or other excessive disturbances (e.g., heavy use areas, defoliation by rodents, etc.). The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and zero to five percent shrubs. The species present in this phase are highly variable, but often include non-native invasive and early seral species. Plant diversity is low (plant richness may be high but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites. This community can be renovated to improve the production capability; however, if management changes are not made the vegetation could revert back invasive or early seral species.

Pathway 2.1A
Community 2.1 to 2.2

Heavy, continuous grazing (which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods or during periods of below normal precipitation when grazing frequency and intensity increases on these sites), and no surface fire for extended periods of time (typically for 10 years or more), will shift this community to the 2.2 Needle and Thread-Cheatgrass-Threadleaf Sedge Plant Community Phase.

Pathway 2.2A
Community 2.2 to 2.1

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 2.1 Needle and Thread-Blue Grama-Threadleaf Sedge Plant Community Phase. This pathway could also occur with a return to more normal precipitation levels and frequencies.

Conservation practices

Prescribed Grazing

Pathway 2.3A
Community 2.3 to 2.2

This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again. This pathway will lead to the 2.2 Needle and Thread-Cheatgrass-Threadleaf Sedge Plant Community Phase.

State 3
Crop Production State

This state is characterized by the production of annual crops using a variety of tillage and cropping systems along with management practices.

Community 3.1
Annual Crops

This plant community developed with the use of a variety of tillage and cropping systems for the production of annual crops including corn, soybeans, wheat, and a variety of other crops.

Transition T1A
State 1 to 2

Non-use and/or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, and/or heavy continuous grazing or invasion of non-native plant species will likely lead this state over a threshold resulting in the Native/Invaded State (State 2).

Transition T1B
State 1 to 3

Tillage will cause a shift over a threshold leading to the 3.1 Annual Crops Plant Community Phase within the Crop Production State (State 3).

Transition T2A
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) coupled with prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels may lead this plant community phase over a threshold to the Reference State (State 1).

Transition T2B
State 2 to 3

Tillage will cause a shift over a threshold leading to the 3.1 Annual Crops Plant Community Phase within the Crop Production State (State 3).

Restoration pathway T3B
State 3 to 2

Cropping followed by abandonment may lead this plant community phase over a threshold to the Native/Invaded State (State 3) and more specifically to the 2.3 Annual Pioneer-Perennial Pioneer Plant Community Phase.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Needlegrass**			420–945	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	210–630	–

	porcupinegrass	HESP11	*Hesperostipa spartea*	105–420	–
	green needlegrass	NAVI4	*Nassella viridula*	0–168	–
2	**Short Warm-season Grasses**			210–525	
	blue grama	BOGR2	*Bouteloua gracilis*	105–420	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	42–210	–
	threeawn	ARIST	*Aristida*	21–63	–
3	**Mid Warm-season Grasses**			105–315	
	sideoats grama	BOCU	*Bouteloua curtipendula*	42–210	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	42–210	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–105	–
4	**Other Native Grasses**			21–105	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–84	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	21–63	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–42	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–42	–
5	**Grass-likes**			105–315	
	threadleaf sedge	CAFI	*Carex filifolia*	42–210	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–105	–
	needleleaf sedge	CADU6	*Carex duriuscula*	21–105	–
Forb					
6	**Forbs**			105–315	
	white sagebrush	ARLU	*Artemisia ludoviciana*	21–63	–
	Forb, native	2FN	*Forb, native*	21–63	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	21–63	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	21–63	–
	dotted blazing star	LIPU	*Liatris punctata*	21–42	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	21–42	–
	field sagewort	ARCA12	*Artemisia campestris*	21–42	–
	purple prairie clover	DAPU5	*Dalea purpurea*	21–42	–
	white heath aster	SYER	*Symphyotrichum ericoides*	21–42	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	21–42	–
	American vetch	VIAM	*Vicia americana*	21–42	–
	pussytoes	ANTEN	*Antennaria*	0–21	–
	milkvetch	ASTRA	*Astragalus*	0–21	–
	false boneset	BREU	*Brickellia eupatorioides*	0–21	–
	white prairie clover	DACA7	*Dalea candida*	0–21	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–21	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–21	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–21	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–21	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–21	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–21	–
Shrub/Vine					

Shrub/Vine					
7	**Shrubs**			105–210	
	leadplant	AMCA6	*Amorpha canescens*	21–63	–
	prairie sagewort	ARFR4	*Artemisia frigida*	21–63	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–42	–
	rose	ROSA5	*Rosa*	21–42	–
	snowberry	SYMPH	*Symphoricarpos*	21–42	–
	pricklypear	OPUNT	*Opuntia*	0–21	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–21	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Needlegrass**			70–210	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–210	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–210	–
	green needlegrass	NAVI4	*Nassella viridula*	0–210	–
2	**Short Warm-season Grasses**			210–420	
	blue grama	BOGR2	*Bouteloua gracilis*	140–350	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	42–210	–
	threeawn	ARIST	*Aristida*	28–112	–
3	**Mid Warm-season Grasses**			14–140	
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	14–140	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–70	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–28	–
4	**Other Native Grasses**			14–56	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–42	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	14–28	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–14	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–14	–
5	**Grass-likes**			210–420	
	threadleaf sedge	CAFI	*Carex filifolia*	140–280	–
	needleleaf sedge	CADU6	*Carex duriuscula*	70–210	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–140	–
6	**Non-Native Grasses**			0–140	
	field brome	BRAR5	*Bromus arvensis*	0–140	–
	cheatgrass	BRTE	*Bromus tectorum*	0–140	–
	bluegrass	POA	*Poa*	0–140	–
	smooth brome	BRIN2	*Bromus inermis*	0–70	–
Forb					
7	**Forbs**			70–210	
	white sagebrush	ARLU	*Artemisia ludoviciana*	14–70	–
	Forb, introduced	2FI	*Forb, introduced*	0–56	–

	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	14–56	–
	field sagewort	ARCA12	*Artemisia campestris*	14–56	–
	Forb, native	2FN	*Forb, native*	14–42	–
	white heath aster	SYER	*Symphyotrichum ericoides*	14–42	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–28	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	14–28	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–14	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–14	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–14	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–14	–
	dotted blazing star	LIPU	*Liatris punctata*	0–14	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–14	–
	pussytoes	ANTEN	*Antennaria*	0–14	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–14	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–14	–
	American vetch	VIAM	*Vicia americana*	0–14	–
Shrub/Vine					
8	**Shrubs**			70–140	
	prairie sagewort	ARFR4	*Artemisia frigida*	14–70	–
	pricklypear	OPUNT	*Opuntia*	0–28	–
	snowberry	SYMPH	*Symphoricarpos*	0–28	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–28	–
	leadplant	AMCA6	*Amorpha canescens*	0–14	–
	rose	ROSA5	*Rosa*	0–14	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Needlegrass**			45–180	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–180	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–180	–
	green needlegrass	NAVI4	*Nassella viridula*	0–180	–
2	**Short Warm-season Grasses**			45–135	
	threeawn	ARIST	*Aristida*	18–108	–
	blue grama	BOGR2	*Bouteloua gracilis*	18–90	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–63	–
3	**Mid Warm-season Grasses**			0–27	
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–27	–
4	**Other Native Grasses**			0–27	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–27	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–18	–
5	**Grass-likes**			135–270	

	threadleaf sedge	CAFI	*Carex filifolia*	90–180	–
	needleleaf sedge	CADU6	*Carex duriuscula*	45–135	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–90	–
6	**Non-Native Grasses**			90–270	
	field brome	BRAR5	*Bromus arvensis*	45–180	–
	cheatgrass	BRTE	*Bromus tectorum*	45–180	–
	bluegrass	POA	*Poa*	0–90	–
	smooth brome	BRIN2	*Bromus inermis*	0–45	–
Forb					
7	**Forbs**			45–135	
	Forb, introduced	2FI	*Forb, introduced*	9–72	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	9–63	–
	field sagewort	ARCA12	*Artemisia campestris*	9–54	–
	white heath aster	SYER	*Symphyotrichum ericoides*	9–36	–
	Forb, native	2FN	*Forb, native*	0–18	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	9–18	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–9	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–9	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–9	–
	pussytoes	ANTEN	*Antennaria*	0–9	–
Shrub/Vine					
8	**Shrub**			45–90	
	prairie sagewort	ARFR4	*Artemisia frigida*	18–72	–
	pricklypear	OPUNT	*Opuntia*	0–36	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	snowberry	SYMPH	*Symphoricarpos*	0–9	–

Animal community

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 ES description). Because of this, 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. Stocking rates are calculated using Animal-Unit-Month (AUM), which is the amount of air-dry forage required to feed a cow, with or without calf, for one month.

Needlegrass/Grama/Sedge (1.1 & 2.1)
Average Annual Production (lbs./acre, air-dry): 2,100
Stocking Rate* (AUM/acre): 0.58

Sedge/Grama/Needlegrass (1.2)
Average Annual Production (lbs./acre, air-dry): 1,400
Stocking Rate* (AUM/acre): 0.38

Needlegrass/Annual Bromegrass/Sedge (2.2)
Average Annual Production (lbs./acre, air-dry): 900
Stocking Rate* (AUM/acre): 0.25

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), National Range and Pasture Handbook).

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. This site is dominated by soils in hydrologic group A. 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. Dominance by blue grama, bluegrass, or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent 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 opportunities. The wide variety 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

Ecological Site Correlation Issues and Questions:

• SD125 Turner County, SD did not use the (DkB) Delmont and Talmo soils, 2 to 9 percent slopes (national symbol fzjv) as used in the adjoining SD083 Lincoln County, SD.
• SD135 Yankton County, SD did not use the (TaE) Talmo-Thurman complex, 15 to 40 percent slopes (national symbol gypk) as used in the adjoining SD027 Clay County. In SD135 Yankton County, SD (TaE) Talmo-Thurman complex, 15 to 40 percent slopes (national symbol g129) was used, but only exists in the MLRA 55C overlap table and will need to be split correlated to match SD027 Clay County, SD.
• Reference and alternative states within the state and transition model are may not be fully documented and may require additional field sampling for refinement.

Inventory data references

There is no NRCS clipping data and other inventory currently available for this site. Information presented here has been derived using field observations from range-trained personnel. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; and Bruce Kunze, Soil Scientist, NRCS.

Data Source Sample Period State County
NONE

Other references

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This Provisional Ecological Site concept has passed both Quality Control and Quality Assurance processes. It was officially approved for publication by David Kraft as of 11/12/2020.

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)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	
Date	12/07/2004
Approved by	Suzanne Mayne-Kinney
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:** Typically not observable.

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3. **Number and height of erosional pedestals or terracettes:** None.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not**

bare ground): Bare ground 20-40%.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class usually 4-6. Moderately high root content. Soil surface is resistant to erosion, in large part due to high rock/gravel content.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, native grasses enhance infiltration and reduce runoff.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be evident.

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

    Dominant: Mid and tall cool-season bunchgrasses >>

    Sub-dominant: Short warm-season grasses >

    Other: Mid warm-season grasses = short grass-like species = forbs > shrubs > short cool-season grasses

    Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth bromegrass do not fit into reference plant community F/S groups.

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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.

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14. **Average percent litter cover (%) and depth (in):** 20-40%, less than 0.5 inch thick. Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 1,500-2,700 lbs./acre (air-dry weight). Reference value production is 2,100 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:** Refer to State and Local Noxious Weed List

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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
