Ecological site R102BY004SD
Wet Meadow

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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): 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 Wet Meadow ecological site typically occurs in a basin or closed depression and receives water directly from precipitation, surface overland flow, and groundwater discharge. Soils are poorly drained and formed in local alluvium. Permeability is very slow due to the clayey subsoil and the site ponds water 4 to 8 weeks in the spring of the year. Ponded water conditions and very slow permeability strongly influence the soil-water-plant relationship.

Vegetation in the Reference State is co-dominated by grass-likes, warm-season, and cool-season grasses including woolly sedge, reedgrasses, and prairie cordgrass, as well as switchgrass, fowl bluegrass, and a variety of other sedges and rushes. Key forbs include Rydberg's sunflower, Canada goldenrod, Indian hemp, and cinquefoil. Non-native species such as reed canarygrass and creeping meadow foxtail may invade with a change in the disturbance regime.

Associated sites

R102BY001SD	**Shallow Marsh** These sites occur in a basin or closed depression. Soils are very poorly drained and the site will pond water until early summer in most years. The central concept soil series is Worthing but other series are included.
R102BY003SD	**Subirrigated** These sites occur in drainageways. Soils are somewhat poorly drained and have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. The central concept soil series is Chancellor but other series are included.
R102BY020SD	**Loamy Overflow** These sites occur in upland swales. Soils are moderately well drained and have water flow into, over and through the site. The central concept soil series is Trent, but other series are included.
R102BY006SD	**Limy Subirrigated** These sites occur along the edges of drainageways. Soils are somewhat poorly drained and have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. Soils effervesce with acid at or near the surface. The central concept soil series are Davison and Wakonda but other series are included.

Similar sites

R102BY001SD	**Shallow Marsh** The Shallow Marsh site is in a similar landscape position, but the site ponds water until early summer in most years. The Shallow Marsh site has less prairie cordgrass and higher production than the Wet Meadow site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Carex pellita* (2) *Spartina pectinata*

Physiographic features

This site occurs on nearly level to concave depressions on uplands.

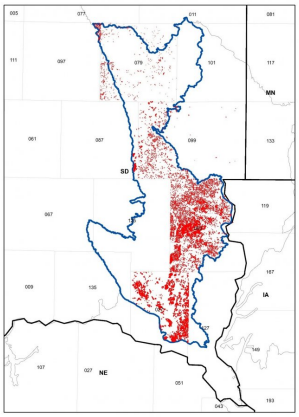


Figure 2. The Wet Meadow Ecological Site Distribution Map in MLRA 102B.

Table 2. Representative physiographic features

Landforms	(1) Pothole (2) Swale
Flooding frequency	None
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	1,100–1,900 ft
Slope	0–1%
Ponding depth	0–12 in
Water table depth	9–30 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) CANTON [USC00391392], Canton, SD
- (2) CENTERVILLE 6 SE [USC00391579], Beresford, SD
- (3) MADISON 2SE [USC00395090], Madison, SD
- (4) WENTWORTH 2.5 WNW [USC00399042], Wentworth, SD
- (5) MONTROSE 8N [USC00395738], Montrose, SD

Influencing water features

Wetland Description: Cowardin, et. al., 1979
System: Palustrine
Subsystem: N/A
Class: Emergent Wetland
Subclass: Persistent

Soil features

These are very deep, poorly drained, medium to fine textured soils. Permeability is slow and available water capacity is high. Salinity and sodicity levels typically are none to slight. Water tables on this site range from about 9 to 30 inches and ponding occurs frequently. The site normally receives additional water from surface runoff or underground seepage. The Wet Meadow site occurs in potholes, swales, and closed depressions. The slopes range from zero to one percent. This site should show no evidence of rills, wind-scoured areas, or pedestalled plants. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive to water movement and root penetration. Ponded water conditions and slow permeability strongly influence the soil-water-plant relationship.

The central concept soil series for this site is Tetonka.

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) Silt loam (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Very slow
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	7 in

Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	1–4%
Subsurface fragment volume >3" (Depth not specified)	0%

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 Wet Meadow site developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes 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 Woolly Sedge-Prairie Cordgrasss-Northern Reedgrass 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 to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered.

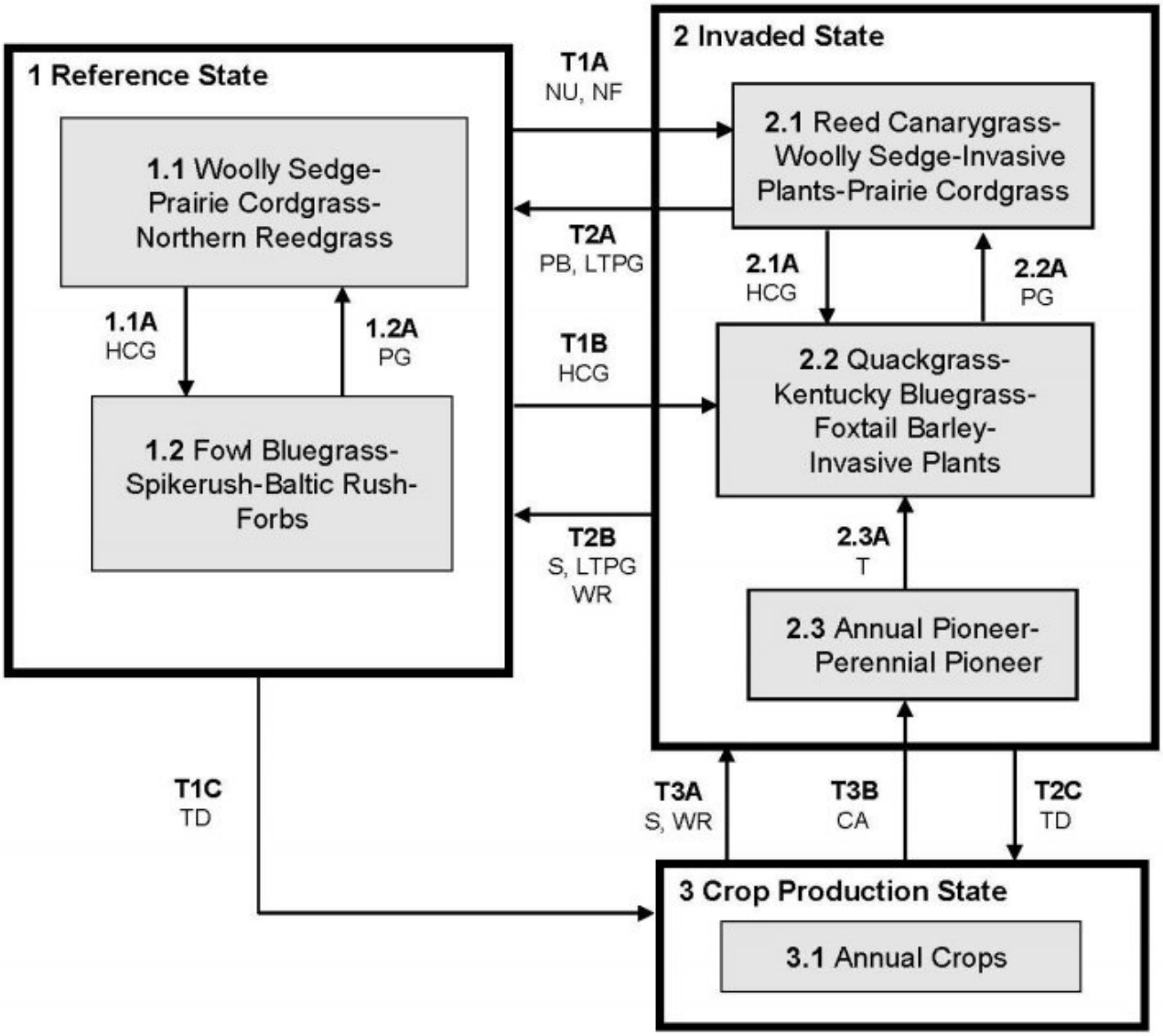
The introduction of domestic livestock and the use of fencing and reliable water sources have changed the disturbance regime of this site. Heavy, continuous grazing without adequate recovery periods causes the Wet Meadow ES to degrade from the Reference State. Species such as fowl bluegrass (*Poa palustris*), spikerush (Eleocharis), and Baltic rush (Juncus balticus) will initially increase. Prairie cordgrass and northern reedgrass will decrease in frequency and production. Continued heavy grazing eventually causes quackgrass (*Elymus repens*), foxtail barley (*Hordeum jubatum*), Kentucky bluegrass (*Poa pratensis*), spikerush, and unpalatable forbs such as curly dock (*Rumex crispus*) to increase and dominate.

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 following 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. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

The following diagram 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.

State and transition model

Wet Meadow – R102BY004SD



LEGEND
Wet Meadow – R102BY004SD

CA – Cropped and abandoned
HCG – Heavy, continuous grazing
LTPG – Long-term prescribed grazing
NU – Non-use
NF – No fire
PB – Prescribed burning
PG – Prescribed grazing
S – Seeding
T – Time w/wo disturbances
TD – Tillage, Artificial drainage
WR – Wetland restoration

Figure 9. The State-And-Transition Model and Legend for the Wet Meadow Site in MLRA 102B.

Code	Process
T1A	Non-use, no fire
T1B	Heavy, continuous grazing
T1C	Tillage, artificial drainage (surface and subsurface)
T2A	Long term prescribed grazing, prescribed burning
T2B	Long term prescribed grazing, seeding, wetland restoration
T2C	Tillage, artificial drainage (surface and subsurface)
T3A	Seeding, wetland restoration
T3B	Abandonment of cropping
1.1A	Heavy, continuous grazing
1.2A	Prescribed grazing with recovery periods
2.1A	Heavy, continuous grazing
2.2A	Prescribed grazing with recovery periods
2.3A	Time w/wo disturbances

Figure 10. The Matrix for the Wet Meadow Site in MLRA 102B.

State 1
Reference State

The Reference State represents the natural range of variability that influences the dynamics of this ES, and is typically dominated by cool-season grass and grass-like species. Before Europeans settled in North America, the primary disturbance mechanisms for this site Reference condition included periodic fire, grazing by large herding ungulates, and fluctuations in the water table. Frequent surface fires (every 3 to 5 years), grazing, and weather events drove the dynamics that influenced the natural range of variability. Today, the primary disturbances are lack of fire, concentrated livestock grazing, and weather fluctuations. Species that are desirable for livestock and wildlife can decline and a corresponding increase in less desirable species will occur.

Community 1.1
Woolly Sedge-Prairie Cordgrass- Northern Reedgrass

Figure 11. An example of the Woolly Sedge/Prairie Cordgrass Plant Community Phase of the Wet Meadow ecological site in South Dakota.

Interpretations are based primarily on the 1.1 Woolly Sedge-Prairie Cordgrass-Northern Reedgrass, Plant Community Phase. This Reference Community evolved with grazing by large herbivores, occasional prairie fires, and relatively frequent ponding events. It can be found on areas that are properly managed with grazing or prescribed burning, and sometimes on areas receiving occasional short periods of rest. The potential vegetation is about 50 percent grass-like species, 35 percent grasses, and 15 percent forbs by air-dry weight. Prairie cordgrass is the dominant tall warm-season grass occupying this plant community. Northern reedgrass is the dominant tall cool-season species. A variety of sedges and rushes occur throughout this community, as well as switchgrass (*Panicum virgatum*) and fowl bluegrass (*Poa palustris*). Key forbs include Rydberg's sunflower (*Helianthus nuttallii*), Canada goldenrod (Solidago canacensis), dogbane (Apocynum), and cinquefoil (Potentilla). This plant community phase is diverse, stable, and productive, and is well adapted to the Northern Great Plains. The high water table supplies much of the moisture for plant growth. Community dynamics, nutrient and water cycles, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for the variability of both the fluctuations of water table and reccurring ponding. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	4170	4779	5260
Forb	230	540	960
Shrub/Vine	0	81	180
Total	**4400**	**5400**	**6400**

Figure 13. Plant community growth curve (percent production by month). SD0218, Till Plains, lowland cool-season/warm-season codominant.. Cool-season, warm-season codominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Community 1.2
Fowl Bluegrass-Spikerush-Baltic Rush-Forbs

This community develops with periods of heavy-continuous grazing with lack of adequate recovery periods during the growing season following periods of below-normal precipitation. Lack of litter and reduced plant heights result in higher soil temperatures and reduced water infiltration rates. Recognition of this plant community will enable the land user to implement key management decisions before a significant ecological threshold is crossed. Prairie cordgrass has been reduced in this plant community but still persists. Fowl bluegrass, spikerush, other grass-likes, and forbs are the dominant species. Spikerush and Baltic rush, as well as other grass-likes have increased. Northern reedgrass has been significantly reduced. Switchgrass may be removed at this stage. Reed canarygrass (*Phalaris arundinacea*) may begin to increase significantly. Forb species would include asters (Asteraceae), goldenrod (Solidago) and cinquefoil, as well as a possible invasion of Canada thistle (*Cirsium arvense*). Plant production and frequency have been reduced. The water and nutrient cycles, and energy flow are slightly reduced but continue to function adequately.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3015	3935	4700
Forb	185	323	510
Shrub/Vine	0	43	90
Total	**3200**	**4301**	**5300**

Figure 15. Plant community growth curve (percent production by month). SD0217, Till Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	13	20	25	18	11	5	3	0	0

Pathway 1.1A
Community 1.1 to 1.2

Heavy-continuous grazing that 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 due to limited forage availability on adjacent upland sites will shift this community to the 1.2 Fowl Bluegrass-Spikerush-Baltic Rush-Forbs Plant Community Phase.

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 1.1 Woolly Sedge-Prairie Cordgrass- Northern Reedgrass Plant Community Phase. This pathway could also occur with a return to more normal levels and frequencies of precipitation.

Conservation practices

Prescribed Grazing

State 2
Invaded State

The Invaded state is characterized by the dominance of invasive or non-native species as a result of disturbance regimes outside the normal variability. Loss or reduction of native cool- and warm-season grasses and the forb component have negatively impacted energy flow and nutrient cycling. Infiltration is reduced and native plant

mortality is increased. As the disturbance level increases, native plant density decreases even more, giving way to annual species and invasive perennial species, as well as an increase in bare ground.

Community 2.1
Reed Canarygrass-Woolly Sedge-Invasive Plants-Prairie Cordgrass

This plant community phase develops with a long-term lack of grazing or fire. Eventually litter levels become high enough to reduce native grass vigor, diversity, and density. Years of accumulated litter will tend to make this community wetter. Sedges, Baltic rush, spikerush, and bulrush (Schoenoplectus) will increase. Hydrophytic forbs will also increase. Reed canarygrass often will increase to the point of dominance, while prairie cordgrass will diminish significantly. Other invasive plants such as creeping meadow foxtail (*Alopecurus arundinaceus*) may become prevalent if a seed source is present or nearby. Nutrient cycling will be greatly diminished, and the energy flow will shift significantly and also be reduced due to the increase in plant litter. Infiltration will be reduced somewhat compared to the Reference State. This plant community is somewhat resistant to change. The combination of both grazing and fire is most effective in moving this plant community towards the Reference State.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2630	3478	4265
Forb	70	222	435
Total	**2700**	**3700**	**4700**

Figure 17. Plant community growth curve (percent production by month). SD0216, Till Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Community 2.2
Quackgrass-Kentucky Bluegrass-Foxtail Barley-Invasive Plants

This plant community phase occurs after prolonged heavy disturbance such as previously described in the community pathway (i.e., heavy grazing pressure without adequate recovery). The prolonged nature of this disturbance will tend to increase soil temperatures and evaporation, causing this site to become drier than normal. This allows the increase or invasion of typically less hydrophytic vegetation such as quackgrass and Kentucky bluegrass. A significant amount of production and diversity has been lost when compared to the Reference State. Loss or reduction of native cool- and warm-season grasses and the native forb component have negatively impacted energy flow and nutrient cycling. It will take an extended period of time to restore this plant community back to the Reference State with improved management. Renovation typically is not practical but may be the only means to significantly restore the ecological processes on this site.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1580	2430	3120
Forb	120	270	480
Total	**1700**	**2700**	**3600**

Figure 19. Plant community growth curve (percent production by month). SD0216, Till Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Community 2.3
Annual Pioneer-Perennial Pioneer

This plant community develops under severe disturbance, typically abandonment after cropping. The dominant vegetation includes pioneer annual or perennial grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include inland saltgrass (*Distichlis spicata*), foxtail barley, barnyardgrass (Echinochloa), quackgrass, fowl bluegrass, Kentucky bluegrass, Baltic rush, and sedges. The dominant forbs include curlycup gumweed (*Grindelia squarrosa*), Canada thistle, and other early successional species. The community is susceptible to invasion of non-native species due to severe soil disturbances and relatively high percentage of bare ground. This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Significant economic inputs, management, and time would be required to move this plant community toward a higher successional stage. Secondary succession is highly variable, depending upon availability and diversity of a viable reproductive source of higher successional species. This plant community may be renovated to improve the production capability, but management changes would be needed to maintain the new plant community.

Pathway 2.1A
Community 2.1 to 2.2

Heavy-continuous grazing that 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 due to limited forage availability on adjacent upland sites will shift this community to the 2.2 Quackgrass-Kentucky Bluegrass-Foxtail Barley-Invasive Plants 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 Reed Canarygrass-Woolly Sedge-Invasive Plants-Prairie Cordgrass Plant Community Phase. This pathway could also occur with a return to more normal precipitation levels and frequencies.

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 Quackgrass-Kentucky Bluegrass-Foxtail Barley-Invasive Plants 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. Cropping on this site is enabled during years with drier than normal precipitation or with artificial drainage (surface or subsurface).

Community 3.1
Annual Crops

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

Transition T1A & T1B
State 1 to 2

T1A - Non-use and/or no surface fire for extended periods of time (typically for ten years or more) causing litter

levels to become high enough to reduce native grass vigor, diversity will eventually cause a shift over a threshold leading to the 2.1 Reed Canarygrass-Woolly Sedge-Invasive Plants-Prairie Cordgrass Plant Community Phase within the Invaded State (State 2). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling. T1B - Heavy-continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season and often at the same time of year each year) will eventually cause a shift over a threshold leading to the 2.2 Quackgrass-Kentucky Bluegrass-Foxtail Barley-Invasive Plants Plant Community Phase within the Invaded State (State 2). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

Transition T1C
State 1 to 3

Tillage, artificial drainage (surface and subsurface) 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 T2A & T2B
State 2 to 1

T2A – 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 2.1 Reed Canarygrass-Wooly Sedge-Invasive Plants-Prairie Cordgrass Plant Community Phase with the Invaded State (State 2) over a threshold to the Reference State (State 1). T2B – Seeding followed by 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 (State 1). Wetland restoration techniques may be necessary to restore biotic integrity and plant diversity and productivity.

Conservation practices

Prescribed Grazing

Transition T2C
State 2 to 3

Tillage, artificial drainage (surface and subsurface) 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 T3A & T3B
State 3 to 2

T3A – Wetland restoration along with seeding of perennial species adapted to the site may lead this plant community phase over a threshold to the Invaded State (State 2). T3B – Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 2) and more specifically to the 2.2 Annual Pioneer-Perennial Pioneer Plant Community Phase.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass-likes**			1080–2700	
	woolly sedge	CAPE42	*Carex pellita*	270–2160	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	108–810	–

	wheat sedge	CAAT2	*Carex atherodes*	108–810	–
	Bicknell's sedge	CABI3	*Carex bicknellii*	54–270	–
	shortbeak sedge	CABR10	*Carex brevior*	0–270	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	54–270	–
	water sedge	CAAQ	*Carex aquatilis*	0–270	–
	fox sedge	CAVU2	*Carex vulpinoidea*	54–270	–
	spikerush	ELEOC	*Eleocharis*	54–162	–
	rush	JUNCU	*Juncus*	54–162	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–54	–
	bulrush	SCHOE6	*Schoenoplectus*	0–54	–
2	**Warm-season Grasses**			540–1620	
	prairie cordgrass	SPPE	*Spartina pectinata*	270–1350	–
	switchgrass	PAVI2	*Panicum virgatum*	0–162	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	54–162	–
	Mexican muhly	MUME2	*Muhlenbergia mexicana*	0–108	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–54	–
3	**Cool-season Grasses**			540–1350	
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	270–1080	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	54–270	–
	fowl bluegrass	POPA2	*Poa palustris*	54–270	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	54–270	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	54–270	–
	prairie wedgescale	SPOB	*Sphenopholis obtusata*	0–162	–
Shrub/Vine					
5	**Shrubs**			270–810	
	willow	SALIX	*Salix*	0–162	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–108	–
Forb					
5	**Forbs**			270–810	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	54–216	–
	Indianhemp	APCA	*Apocynum cannabinum*	54–162	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–162	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	54–108	–
	swamp milkweed	ASIN	*Asclepias incarnata*	54–108	–
	Canadian anemone	ANCA8	*Anemone canadensis*	54–108	–
	mint	MENTH	*Mentha*	54–108	–
	swamp smartweed	POHY2	*Polygonum hydropiperoides*	54–108	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	54–108	–
	cinquefoil	POTEN	*Potentilla*	54–108	–
	Macoun's buttercup	RAMA2	*Ranunculus macounii*	54–108	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	54–108	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	54–108	–
	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	54–108	–

	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	54–108	
	blazing star	LIATR	*Liatris*	0–108	–
	giant goldenrod	SOGI	*Solidago gigantea*	54–108	–
	goldenrod	SOLID	*Solidago*	54–108	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	54–108	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	54–108	–
	Canada germander	TECA3	*Teucrium canadense*	0–54	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–54	–
	northern bog violet	VINE	*Viola nephrophylla*	0–54	–
	wood lily	LIPH	*Lilium philadelphicum*	0–54	–
	American water horehound	LYAM	*Lycopus americanus*	0–54	–
	golden dock	RUMA4	*Rumex maritimus*	0–54	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–54	–
	white doll's daisy	BOAS	*Boltonia asteroides*	0–54	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–54	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–54	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass-likes**			1505–1935	
	spikerush	ELEOC	*Eleocharis*	430–860	–
	green bulrush	SCAT2	*Scirpus atrovirens*	43–516	–
	bulrush	SCHOE6	*Schoenoplectus*	43–516	–
	rush	JUNCU	*Juncus*	215–430	–
	wheat sedge	CAAT2	*Carex atherodes*	86–430	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	43–301	–
	woolly sedge	CAPE42	*Carex pellita*	86–215	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	43–215	–
	fox sedge	CAVU2	*Carex vulpinoidea*	0–172	–
	shortbeak sedge	CABR10	*Carex brevior*	0–172	–
	water sedge	CAAQ	*Carex aquatilis*	0–129	–
	Bicknell's sedge	CABI3	*Carex bicknellii*	0–43	–
2	**Warm-season Grasses**			86–645	
	prairie cordgrass	SPPE	*Spartina pectinata*	86–645	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	0–215	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	86–215	–
	switchgrass	PAVI2	*Panicum virgatum*	0–86	–
3	**Cool-season Grasses**			215–1290	
	fowl bluegrass	POPA2	*Poa palustris*	215–1075	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	86–430	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–215	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–215	–

	American mannagrass	GLGR	*Glyceria grandis*	0–172	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–172	–
4	**Non-Native Grasses**			215–645	
	creeping meadow foxtail	ALAR	*Alopecurus arundinaceus*	0–430	–
	quackgrass	ELRE4	*Elymus repens*	0–430	–
	Kentucky bluegrass	POPR	*Poa pratensis*	86–430	–
Forb					
5	**Forbs**			215–430	
	cinquefoil	POTEN	*Potentilla*	43–129	–
	giant goldenrod	SOGI	*Solidago gigantea*	0–129	–
	goldenrod	SOLID	*Solidago*	43–129	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	43–129	–
	Forb, native	2FN	*Forb, native*	43–129	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–129	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	43–129	–
	mint	MENTH	*Mentha*	0–86	–
	western dock	RUAQ	*Rumex aquaticus*	0–86	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–86	–
	swamp milkweed	ASIN	*Asclepias incarnata*	0–86	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–86	–
	Forb, introduced	2FI	*Forb, introduced*	0–86	–
	Macoun's buttercup	RAMA2	*Ranunculus macounii*	0–43	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–43	–
	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	0–43	–
	blazing star	LIATR	*Liatris*	0–43	–
	wood lily	LIPH	*Lilium philadelphicum*	0–43	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	0–43	–
	golden dock	RUMA4	*Rumex maritimus*	0–43	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–43	–
	swamp smartweed	POHY2	*Polygonum hydropiperoides*	0–43	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–43	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–43	–
Shrub/Vine					
6	**Shrubs**			0–86	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–86	–
	willow	SALIX	*Salix*	0–43	–

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass-likes**			740–1480	
	wheat sedge	CAAT2	*Carex atherodes*	74–370	–
	woolly sedge	CAPE42	*Carex pellita*	74–370	–

	Sartwell's sedge	CASA8	*Carex sartwellii*	74–370	–
	spikerush	ELEOC	*Eleocharis*	74–370	–
	rush	JUNCU	*Juncus*	37–185	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–185	–
	bulrush	SCHOE6	*Schoenoplectus*	0–185	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	37–185	–
	shortbeak sedge	CABR10	*Carex brevior*	37–185	–
	fox sedge	CAVU2	*Carex vulpinoidea*	0–148	–
	Bicknell's sedge	CABI3	*Carex bicknellii*	0–37	–
2	**Warm-season Grasses**			74–370	
	prairie cordgrass	SPPE	*Spartina pectinata*	74–370	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–148	–
3	**Cool-season Grasses**			555–1295	
	reed canarygrass	PHAR3	*Phalaris arundinacea*	555–1110	–
	fowl bluegrass	POPA2	*Poa palustris*	74–555	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–222	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–185	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	37–185	–
	American mannagrass	GLGR	*Glyceria grandis*	0–111	–
4	**Non-Native Grasses**			370–1295	
	quackgrass	ELRE4	*Elymus repens*	0–1110	–
	creeping meadow foxtail	ALAR	*Alopecurus arundinaceus*	0–925	–
	Kentucky bluegrass	POPR	*Poa pratensis*	74–555	–
Forb					
5	**Forbs**			74–370	
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–74	–
	cinquefoil	POTEN	*Potentilla*	0–74	–
	giant goldenrod	SOGI	*Solidago gigantea*	0–74	–
	goldenrod	SOLID	*Solidago*	0–74	–
	Forb, introduced	2FI	*Forb, introduced*	0–74	–
	Forb, native	2FN	*Forb, native*	0–74	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–74	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–74	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–74	–
	mint	MENTH	*Mentha*	0–37	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–37	–
	swamp milkweed	ASIN	*Asclepias incarnata*	0–37	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	0–37	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–37	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–37	–
	western dock	RUAQ	*Rumex aquaticus*	0–37	–

Table 12. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass-likes**			675–945	
	spikerush	ELEOC	*Eleocharis*	135–675	–
	rush	JUNCU	*Juncus*	270–540	–
	shortbeak sedge	CABR10	*Carex brevior*	27–135	–
	fox sedge	CAVU2	*Carex vulpinoidea*	0–81	–
	woolly sedge	CAPE42	*Carex pellita*	0–54	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	0–54	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–54	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–54	–
	bulrush	SCHOE6	*Schoenoplectus*	0–54	–
2	**Warm-season Grasses**			27–135	
	mat muhly	MURI	*Muhlenbergia richardsonis*	27–135	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–135	–
3	**Cool-season Grasses**			135–540	
	foxtail barley	HOJU	*Hordeum jubatum*	135–405	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–270	–
	fowl bluegrass	POPA2	*Poa palustris*	0–135	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–135	–
4	**Non-Native Grasses**			405–1215	
	creeping meadow foxtail	ALAR	*Alopecurus arundinaceus*	0–945	–
	quackgrass	ELRE4	*Elymus repens*	135–945	–
	Kentucky bluegrass	POPR	*Poa pratensis*	135–675	–
Forb					
5	**Forbs**			135–405	
	Forb, introduced	2FI	*Forb, introduced*	27–216	–
	Forb, native	2FN	*Forb, native*	27–108	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	27–108	–
	goldenrod	SOLID	*Solidago*	27–108	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	27–81	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	27–81	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–81	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	27–81	–
	giant goldenrod	SOGI	*Solidago gigantea*	0–81	–
	cinquefoil	POTEN	*Potentilla*	0–54	–
	western dock	RUAQ	*Rumex aquaticus*	0–27	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–27	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–27	–

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.

Woolly Sedge/Prairie Cordgrass (1.1)
Average Annual Production (lbs./acre, air-dry): 5,400
Stocking Rate* (AUM/acre): 1.48

Fowl Bluegrass/Spikerush/Baltic Rush/Forbs (1.2)
Average Annual Production (lbs./acre, air-dry): 4,300
Stocking Rate* (AUM/acre): 1.18

Reed Canarygrass/Sedge/Invasive Plants/Prairie Cordgrass (2.1)
Average Annual Production (lbs./acre, air-dry): 3,700
Stocking Rate* (AUM/acre): 1.01

Quackgrass/Kentucky Bluegrass/Foxtail Barley/Invasive Plants (2.2)
Average Annual Production (lbs./acre, air-dry): 2,700
Stocking Rate* (AUM/acre): 0.74

Annual/Pioneer, Non-Native Perennial (2.3)
Average Annual Production (lbs./acre, air-dry): 1,200
Stocking Rate* (AUM/acre): 0.33

*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 C and D. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be an area where shortgrasses form a strong sod and dominate the site. Dominance by 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 opportunities for hunting, hiking, photography, bird watching and other activities. 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:

• SD079 Lake County, SD did not use the (Ca) Chancellor-Tetonka complex, 0 to 2 percent slopes (national symbol 2vwch) as used in the adjoining SD097 Miner County, SD.
• SD087 McCook County, SD did not use the (Te) Tetonka silt loam, 0 to 2 percent slopes, frequently ponded (national symbol 2vwbq) (R102BY004SD ESD) as used in the adjoining SD099 Minnehaha County, SD. SD087 McCook County, SD (Tb) Tetonka silt loam, 0 to 1 percent slopes (national symbol 2tlcd) (R55CBY004SD ESD) will need to be split correlated between MLRA55C and MLRA102B to match SD099 Minnehaha County, SD ESD.
• SD125 Turner County, SD did not use the (Te) Tetonka silt loam, 0 to 2 percent slopes, frequently ponded (national symbol 2vwbq) (R102BY004SD ESD) as used in the adjoining SD099 Minnehaha County, SD. SD125 Turner County, SD (Te) Tetonka silt loam, 0 to 1 percent slopes (national symbol 2tlcd) (R55CBY004SD ESD) will need to be split correlated between MLRA55C and MLRA102B to match SD099 Minnehaha County, SD ESD.
• SD125 Turner County, SD did not use the (Te) Tetonka silt loam, 0 to 2 percent slopes, frequently ponded (national symbol 2vwbq) (R102BY004SD ESD) as used in the adjoining SD083 Lincoln County, SD. SD125 Turner County, SD (Te) Tetonka silt loam, 0 to 1 percent slopes (national symbol 2tlcd) (R55CBY004SD ESD) will need to be split correlated between MLRA55C and MLRA102B to match SD083 Lincoln County, SD ESD.
• SD125 Turner County, SD did not use the (Ca) Chancellor-Tetonka complex, 0 to 2 percent slopes (national symbol 2vwch) as used in the adjoining SD083 Lincoln County, SD.
• SD125 Turner County, SD did not use the (Ch) Chancellor-Wakonda-Tetonka complex (national symbol fzjm) as used in the adjoining SD083 Lincoln County, SD.
• SD127 Union County, SD did not use the (EcA) Egan-Clarno-Tetonka complex, 0 to 2 percent slopes (national symbol gyml) as used in the adjoining SD027 Clay County, SD.
• SD127 Union County, SD did not use the (EcA) Egan-Clarno-Tetonka complex, 0 to 2 percent slopes (national symbol gyml) as used in the adjoining SD027 Clay County, SD.
• SD127 Union County, SD did not use the (EfB) Egan-Ethan-Tetonka complex, 0 to 6 percent slopes (national symbol gymq) as used in the adjoining SD027 Clay County, SD.
• SD127 Union County, SD did not use the (DkA) Davison-Tetonka-Egan complex, 0 to 3 percent slopes (national symbol gymd) as used in the adjoining SD027 Clay County, SD.
• SD127 Union County, SD did not use the (TtA) Davison-Tetonka-Egan complex, 0 to 3 percent slopes (national symbol gypr) as used in the adjoining 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

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: 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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Approval

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Additional Information Acknowledgment: Jason Hermann (Jason.Hermann@usda.gov), Area Rangeland Management Specialist, USDA-NRCS, Redfield, SD.

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	david.schmidt@sd.usda.gov 605-352-1236
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:** Barely observable.

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3. **Number and height of erosional pedestals or terracettes:** Essentially, non-existent.

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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 less than 5% and less than 2 inches in diameter.

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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. Plant litter remains in place and is not moved by erosional forces.

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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 6. Typically high root content, and organic matter. Soil surface is very resistant to erosion.

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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, deep rooted 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 grass-like species >

    Sub-dominant: Tall warm-season grasses > mid and tall cool-season grasses >

    Other: Forbs > shrubs

    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):** 85-90%, roughly 1-2 inches. 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 4,400-6,400 lbs./acre (air-dry weight). Reference value production is 5,400 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, also reed canarygrass.

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