

Ecological site R055CY004SD 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.

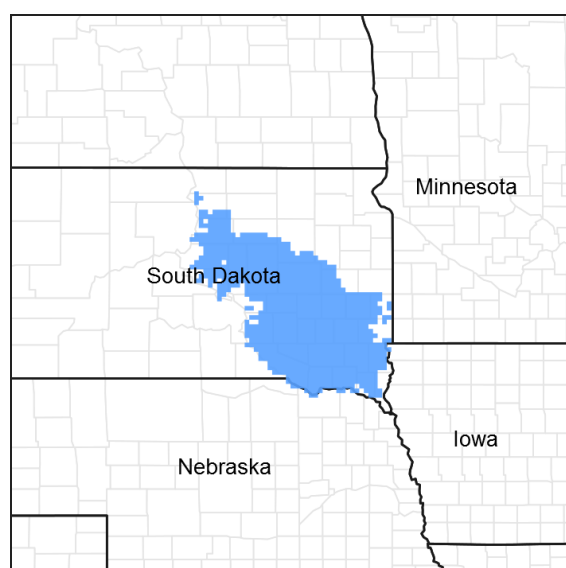


Figure 1. Mapped extent

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): 055C—Southern Black Glaciated Plains

The Southern Black Glaciated Plains (55C) is located within the Northern Great Plains Region. It is entirely within South Dakota encompassing about 10,835 square miles (Figure 1). The elevation ranges from 1,310 to 1,970 square feet. The MLRA is on nearly level to undulating glacial till plains interrupted by steeper slopes adjacent to streams and moraines. The James River is an under-fit stream. Its valley was carved by floodwaters draining glacial Lake Dakota and is filled with glacial outwash and alluvial deposits. (USDA-NRCS, 2006).

The dominant soil order in this MLRA is Mollisols. The soils in the area dominantly have a mesic soil temperature regime, an ustic soil moisture regime, and mixed or smectitic mineralogy. They generally are very deep, well drained to very poorly drained, and clayey or loamy. This area supports natural prairie vegetation characterized by western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Nassella viridula*), needle and thread (*Hesperostipa comata*), and porcupinegrass (*Hesperostipa spartea*) with Prairie cordgrass (*Spartina pectinata*), and reed canarygrass (*Phalaris arundinacea*) as the dominant vegetation on the poorly drained soils. (USDA-NRCS, 2006).

Classification relationships

Major Land Resource Area (MLRA): Southern Black Glaciated Plains (55C) (USDA-NRCS, 2006)

USFS Subregions: North Central Glaciated Plains Section (251B); Yankton Hills and Valleys Subsection (251Bf); Western Glaciated Plains Section (332B); James River Lowland Subsection (332Bb); North Central Great Plains Section (332D); Southern Missouri Coteau Slope Subsection (332Dd); Southern Missouri Coteau Subsection (332De) - (Cleland et al., 2007).

Level IV Ecoregions of the Conterminous United States: 42e – Southern Missouri Coteau, 42f – Southern Missouri Coteau Slope, 46n – James River Lowland.

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 will pond water 4 to 8 weeks in the spring of the year. Ponded water conditions and very slow permeability strongly influences 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, Kentucky bluegrass or quackgrass may invade due to change in disturbance regime.

Associated sites

R055CY001SD	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.
R055CY003SD	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 Crossplain but other series are included.
R055CY020SD	Loamy Overflow These sites occur in upland swales. Soils are moderately well drained which have water flow into and over or through the site. The central concept soil series are Bonilla and Prosper but other series are included.
R055CY006SD	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 will effervesce with acid at or near the surface. The central concept soil series is Davison but other series are included.

Similar sites

R055CY001SD	Shallow Marsh The Shallow Marsh site is in a similar landscape position but ponds water until early summer in most years. The Shallow Marsh site will have less prairie cordgrass and higher production than a Wet Meadow site.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Carex pellita</i> (2) <i>Spartina pectinata</i>

Physiographic features

This site occurs on concave shallow swales or depressions.

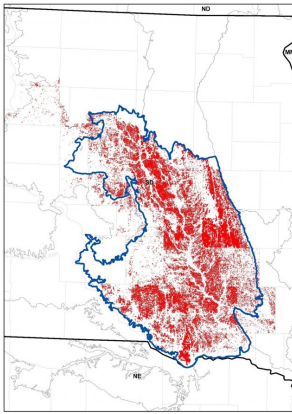


Figure 2. Site Distribution Map for the Wet Meadow site in MLRA 55C.

Table 2. Representative physiographic features

Landforms	(1) Pothole
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	396–610 m
Slope	0–1%
Ponding depth	0–30 cm
Water table depth	0–76 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 55C is considered to have a continental climate: Cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA’s location near the geographic center of North America. There are few natural barriers on the Northern Great Plains, and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 19 to 25 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 15°F (Howard, South Dakota [SD]), to about 20°F (Wagner, SD). July is the warmest month with temperatures averaging from about 73°F (Howard, SD), to about 77°F (Wagner, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 12 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 11 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)	123-130 days
Freeze-free period (characteristic range)	137-150 days
Precipitation total (characteristic range)	559-660 mm
Frost-free period (actual range)	114-131 days

Freeze-free period (actual range)	133-155 days
Precipitation total (actual range)	533-686 mm
Frost-free period (average)	126 days
Freeze-free period (average)	144 days
Precipitation total (average)	610 mm

Climate stations used

- (1) REDFIELD [USC00397052], Redfield, SD
- (2) MILLER [USC00395561], Miller, SD
- (3) HURON RGNL AP [USW00014936], Huron, SD
- (4) DE SMET [USC00392302], De Smet, SD
- (5) HOWARD [USC00394037], Howard, SD
- (6) FORESTBURG 4 NNE [USC00393029], Artesian, SD
- (7) CHAMBERLAIN MUNI AP [USW00094943], Chamberlain, SD
- (8) ACADEMY 2NE [USC00390043], Platte, SD
- (9) MITCHELL MUNI AP [USW00094950], Mitchell, SD
- (10) MITCHELL 2 N [USC00395671], Mitchell, SD
- (11) MITCHELL [USC00395669], Mitchell, SD
- (12) ALEXANDRIA [USC00390128], Alexandria, SD
- (13) SALEM 5NE [USC00395360], Salem, SD
- (14) BRIDGEWATER [USC00391032], Bridgewater, SD
- (15) MENNO [USC00395481], Menno, SD
- (16) ARMOUR [USC00390296], Armour, SD
- (17) WAGNER [USC00398767], Wagner, SD
- (18) TYNDALL [USC00398472], Tyndall, SD
- (19) FAULKTON 1 NW [USC00392927], Faulkton, SD

Influencing water features

Soils are poorly drained and formed in local alluvium. Permeability is very slow and the site will pond water 4 to 8 weeks in the spring of the year. Pondered water conditions and very slow permeability strongly influences the soil-water-plant relationship.

Soil features

These are very deep, poorly drained, medium to fine textured soils. Saturated hydraulic conductivity is slow to very slow and available water capacity is high. Salinity and sodicity are typically none to slight. Water tables on this site range from 1 foot above to near the surface several weeks during the growing season. The site normally receives additional water from surface runoff and underground seepage. This site occurs in potholes, depressions, and closed depressions. Slope ranges from 0 to 1 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. Pondered water conditions and slow permeability strongly influences the soil-water-plant relationship.

Soil series 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) Loam (2) Silt loam (3) Fine sandy loam
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Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Very slow to slow
Soil depth	203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	15.24–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–4%
Subsurface fragment volume >3" (Depth not specified)	0–2%

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 Prairie Cordgrass-Woolly Sedge-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 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 were introduced into the area. 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 following each grazing occurrence causes this site to depart 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.

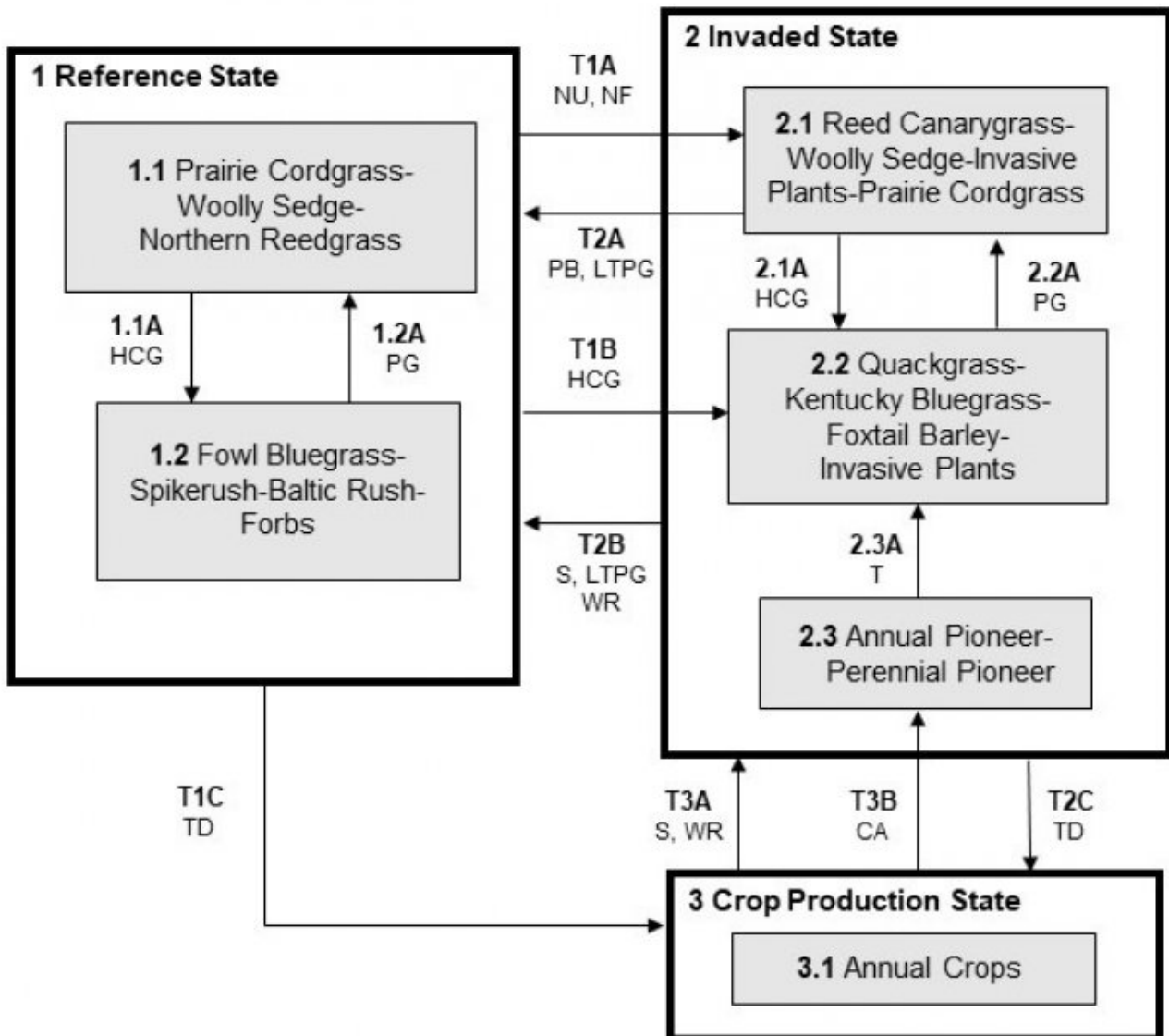
Following the state-and-transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states and community phases. The associated plant composition tables have been developed from the 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.

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.

State and transition model

Wet Meadow – R055CY004SD



LEGEND

Wet Meadow – R055CY004SD

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. State-And-Transition Model and Legend for the Wet Meadow site in MLRA 55C.

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. Matrix for the Wet Meadow site in MLRA 55C.

State 1
Reference State

The Reference State represents the natural range of variability that dominates the dynamics of this ES. This state is typically co-dominated by warm-season and cool-season grasses and grasslikes. Before European settlement of North America, the primary disturbance mechanisms for this site in the Reference condition included periodic fire, grazing by large herding ungulates, fluctuations in the water table, and ponding frequency and duration. Frequent surface fires (every 3 to 5 years), grazing, and weather events dictated the dynamics that occurred within the natural range of variability. Today, the primary disturbance is from a 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

Prairie Cordgrass-Woolly Sedge-Northern Reedgrass

Interpretations are based primarily on the 1.1 Prairie Cordgrass-Woolly Sedge-Northern Reedgrass Plant Community Phase (this is also considered to be the Reference Community). This community evolved with grazing by large herbivores, occasional prairie fires, and relatively frequent ponding events, and 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 potential vegetation is about 50 percent grass-like species, 40 percent grasses, and 10 percent forbs by air-dry weight. Prairie cordgrass is the dominant warm-season tallgrass 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 (*Arnica rydbergii*), Canada goldenrod (*Solidago canadensis*), 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, the 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 reoccurring 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3704	4539	5257
Forb	219	504	908
Total	3923	5043	6165

Figure 12. Plant community growth curve (percent production by month).
SD5508, Southern Black Glaciated 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-like, and forbs are the dominant species. Spikerush and Baltic rush, as well as, other grass-like 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2628	3629	4584
Forb	174	294	460
Total	2802	3923	5044

Figure 14. Plant community growth curve (percent production by month).
SD5507, Southern Black Glaciated 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 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 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 Prairie Cordgrass-Woolly Sedge-Northern Reedgrass Plant Community Phase. This pathway could also occur with a return to more normal precipitation levels and frequencies.

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, and 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 and/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 (*Scheuchzeria palustris*) 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 be reduced as well 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2729	3786	4825
Forb	73	137	219
Total	2802	3923	5044

Figure 16. Plant community growth curve (percent production by month).
SD5506, Southern Black Glaciated 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 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 of and invasion by typically less hydrophytic vegetation such as quackgrass (*Elymus repens*) and Kentucky bluegrass (*Poa pratensis*). 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 is typically 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1670	2522	3312
Forb	123	280	499
Total	1793	2802	3811

Figure 18. Plant community growth curve (percent production by month).
SD5506, Southern Black Glaciated 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 percent 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 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 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

The Crop Production 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 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

Non-use and/or no surface fire for extended periods of time (typically for 10 years or more) causing litter levels to become high enough to reduce native grass vigor and 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. 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

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), prescribed burning occurring at relatively frequent intervals (every 3 to 5 years), and a return to normal disturbance regime levels may lead this 2.1 Reed Canarygrass-Woolly Sedge-Invasive Plants-Prairie Cordgrass Plant Community Phase with the Invaded State (State 2) over a threshold to the Reference State (State 1). 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 Burning
Prescribed Grazing
Integrated Pest Management (IPM)

Transition T2C

State 2 to 3

Tillage and 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

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). 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 (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Grass-likes			1261–2018	
	woolly sedge	CAPE42	<i>Carex pellita</i>	101–757	–
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	101–504	–
	Sartwell's sedge	CASA8	<i>Carex sartwellii</i>	101–504	–
	shortbeak sedge	CABR10	<i>Carex brevior</i>	101–504	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	101–404	–
	green bulrush	SCAT2	<i>Scirpus atrovirens</i>	50–404	–
	spikerush	ELEOC	<i>Eleocharis</i>	101–252	–
	mountain rush	JUARL	<i>Juncus arcticus ssp. littoralis</i>	50–101	–
	flatsedge	CYPER	<i>Cyperus</i>	0–101	–
2	Tall Warm-Season Grasses			1009–1513	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	757–1513	–
	marsh bulrush	MURB	<i>Scirpus americanus</i>	404–504	–

	marsn muniy	MURA	<i>Muhlenbergia racemosa</i>	101–504	–
	switchgrass	PAV12	<i>Panicum virgatum</i>	0–252	–
3	Tall Cool-Season Grasses			504–1261	
	northern reedgrass	CAST13	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	252–757	–
	slimstem reedgrass	CASTS5	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	101–504	–
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	101–504	–
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	0–252	–
4	Cool-Season Bunchgrasses			252–504	
	plains bluegrass	POAR3	<i>Poa arida</i>	50–404	–
	fowl bluegrass	POPA2	<i>Poa palustris</i>	101–404	–
	tufted hairgrass	DECE	<i>Deschampsia cespitosa</i>	0–151	–
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	0–101	–
5	Wheatgrass			50–252	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–252	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	50–252	–
6	Other Native Grasses			50–252	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–252	–
	mat muhly	MURI	<i>Muhlenbergia richardsonis</i>	0–151	–
Forb					
7	Forbs			252–757	
	Forb, native	2FN	<i>Forb, native</i>	50–202	–
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	50–151	–
	New England aster	SYNO2	<i>Symphytotrichum novae-angliae</i>	50–151	–
	mint	MENTH	<i>Mentha</i>	0–101	–
	giant goldenrod	SOGI	<i>Solidago gigantea</i>	0–101	–
	goldenrod	SOLID	<i>Solidago</i>	50–101	–
	white panicle aster	SYLA6	<i>Symphytotrichum lanceolatum</i>	50–101	–
	cinquefoil	POTEN	<i>Potentilla</i>	50–101	–
	western dock	RUAQ	<i>Rumex aquaticus</i>	50–101	–
	blackeyed Susan	RUHI2	<i>Rudbeckia hirta</i>	0–101	–
	Canadian anemone	ANCA8	<i>Anemone canadensis</i>	50–101	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–101	–
	Flodman's thistle	CIFL	<i>Cirsium flodmanii</i>	50–101	–
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	0–101	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–101	–
	blazing star	LIATR	<i>Liatris</i>	0–101	–
	wood lily	LIPH	<i>Lilium philadelphicum</i>	0–50	–
	Rydberg's sunflower	HENUR	<i>Helianthus nuttallii</i> ssp. <i>rydbergii</i>	0–50	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–50	–
	Virginia strawberry	FRVI	<i>Fragaria virginiana</i>	0–50	–
	blue-eyed grass	SISYR	<i>Sisyrinchium</i>	0–50	–
	Macoun's buttercup	RAMA2	<i>Ranunculus macounii</i>	0–50	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Grass-likes			1373–1765	
	spikerush	ELEOC	<i>Eleocharis</i>	392–785	–
	shortbeak sedge	CABR10	<i>Carex brevior</i>	196–588	–
	green bulrush	SCAT2	<i>Scirpus atrovirens</i>	39–471	–
	mountain rush	JUARL	<i>Juncus arcticus ssp. littoralis</i>	196–392	–
	flatsedge	CYPER	<i>Cyperus</i>	196–392	–
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	196–392	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	39–275	–
	Sartwell's sedge	CASA8	<i>Carex sartwellii</i>	39–196	–
	woolly sedge	CAPE42	<i>Carex pellita</i>	78–196	–
2	Tall Warm-Season Grasses			196–588	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	196–588	–
	spiked muhly	MUGL3	<i>Muhlenbergia glomerata</i>	0–196	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–78	–
3	Tall Cool-Season Grasses			78–588	
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	78–392	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta ssp. inexpansa</i>	0–196	–
	slimstem reedgrass	CASTS5	<i>Calamagrostis stricta ssp. stricta</i>	0–78	–
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	0–78	–
4	Cool-Season Bunchgrasses			196–588	
	fowl bluegrass	POPA2	<i>Poa palustris</i>	196–392	–
	plains bluegrass	POAR3	<i>Poa arida</i>	0–314	–
	tufted hairgrass	DECE	<i>Deschampsia cespitosa</i>	78–196	–
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	39–196	–
5	Wheatgrass			78–275	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	78–275	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–118	–
6	Other Native Grasses			78–314	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–196	–
	mat muhly	MURI	<i>Muhlenbergia richardsonis</i>	78–196	–
7	Non-Native Grasses			196–588	
	creeping meadow foxtail	ALAR	<i>Alopecurus arundinaceus</i>	0–392	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–392	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	78–392	–
Forb					
8	Forbs			196–392	
	giant goldenrod	SOGI	<i>Solidago gigantea</i>	0–118	–
	goldenrod	SOLID	<i>Solidago</i>	39–118	–
	white panicle aster	SYLA6	<i>Symphotrichum lanceolatum</i>	39–118	–

	Forb, native	2FN	<i>Forb, native</i>	39–118	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–118	–
	Flodman's thistle	CIFL	<i>Cirsium flodmanii</i>	39–118	–
	cinquefoil	POTEN	<i>Potentilla</i>	39–118	–
	western dock	RUAQ	<i>Rumex aquaticus</i>	0–78	–
	mint	MENTH	<i>Mentha</i>	0–78	–
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	39–78	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	0–78	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–78	–
	New England aster	SYNO2	<i>Symphotrichum novae-angliae</i>	39–78	–
	Canadian anemone	ANCA8	<i>Anemone canadensis</i>	0–39	–
	Rydberg's sunflower	HENUR	<i>Helianthus nuttallii</i> ssp. <i>rydbergii</i>	0–39	–
	blazing star	LIATR	<i>Liatris</i>	0–39	–
	wood lily	LIPH	<i>Lilium philadelphicum</i>	0–39	–
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	0–39	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–39	–
	blackeyed Susan	RUHI2	<i>Rudbeckia hirta</i>	0–39	–
	blue-eyed grass	SISYR	<i>Sisyrinchium</i>	0–39	–
	Macoun's buttercup	RAMA2	<i>Ranunculus macounii</i>	0–39	–

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Grass-likes			785–1177	
	woolly sedge	CAPE42	<i>Carex pellita</i>	78–392	–
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	78–392	–
	Sartwell's sedge	CASA8	<i>Carex sartwellii</i>	78–392	–
	spikerush	ELEOC	<i>Eleocharis</i>	78–392	–
	mountain rush	JUARL	<i>Juncus arcticus</i> ssp. <i>littoralis</i>	39–196	–
	green bulrush	SCAT2	<i>Scirpus atrovirens</i>	0–196	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	39–196	–
	shortbeak sedge	CABR10	<i>Carex brevior</i>	39–196	–
	flatsedge	CYPER	<i>Cyperus</i>	39–196	–
2	Tall Warm-Season Grasses			78–392	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	78–392	–
3	Tall Cool-Season Grasses			588–1177	
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	588–1177	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	39–196	–
	slimstem reedgrass	CASTS5	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	0–39	–
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	0–39	–
4	Cool-Season Bunchgrasses			196–588	
	fowl bluegrass	POPA2	<i>Poa palustris</i>	78–588	–
	foxtail barley	HQ.III	<i>Hordeum jubatum</i>	39–196	–

	plains bluegrass	POAR3	<i>Poa arida</i>	0–196	–
	tufted hairgrass	DECE	<i>Deschampsia cespitosa</i>	0–78	–
5	Wheatgrass			78–392	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	78–392	–
6	Other Native Grasses			0–196	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–196	–
	mat muhly	MURI	<i>Muhlenbergia richardsonis</i>	0–78	–
7	Non-Native Grasses			392–1373	
	quackgrass	ELRE4	<i>Elymus repens</i>	0–1177	–
	creeping meadow foxtail	ALAR	<i>Alopecurus arundinaceus</i>	0–981	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	78–588	–
Forb					
8	Forbs			78–196	
	giant goldenrod	SOGI	<i>Solidago gigantea</i>	0–78	–
	goldenrod	SOLID	<i>Solidago</i>	0–78	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	0–78	–
	Forb, native	2FN	<i>Forb, native</i>	0–78	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–78	–
	Flodman's thistle	CIFL	<i>Cirsium flodmanii</i>	0–78	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–78	–
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	0–78	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–78	–
	western dock	RUAQ	<i>Rumex aquaticus</i>	0–39	–
	mint	MENTH	<i>Mentha</i>	0–39	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–39	–
	white panicle aster	SYLA6	<i>Symphotrichum lanceolatum</i>	0–39	–
	New England aster	SYNO2	<i>Symphotrichum novae-angliae</i>	0–39	–

Table 12. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Grass-like			701–981	
	spikerush	ELEOC	<i>Eleocharis</i>	140–701	–
	mountain rush	JUARL	<i>Juncus arcticus ssp. littoralis</i>	280–560	–
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	56–280	–
	flatsedge	CYPER	<i>Cyperus</i>	56–280	–
	shortbeak sedge	CABR10	<i>Carex brevior</i>	28–224	–
	woolly sedge	CAPE42	<i>Carex pellita</i>	0–56	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–56	–
	green bulrush	SCAT2	<i>Scirpus atrovirens</i>	0–56	–
	Sartwell's sedge	CASA8	<i>Carex sartwellii</i>	28–56	–
2	Tall Warm-Season Grasses			0–140	

	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	0–140	–
3	Tall Cool-Season Grasses			0–280	
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	0–280	–
4	Cool-Season Bunchgrasses			280–841	
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	140–841	–
	fowl bluegrass	POPA2	<i>Poa palustris</i>	140–420	–
	plains bluegrass	POAR3	<i>Poa arida</i>	0–84	–
	tufted hairgrass	DECE	<i>Deschampsia cespitosa</i>	0–56	–
5	Wheatgrass			0–140	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–140	–
6	Other Native Grasses			28–280	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–196	–
	mat muhly	MURI	<i>Muhlenbergia richardsonis</i>	28–140	–
7	Non-Native Grasses			420–1261	
	creeping meadow foxtail	ALAR	<i>Alopecurus arundinaceus</i>	0–981	–
	quackgrass	ELRE4	<i>Elymus repens</i>	140–981	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	140–701	–
Forb					
8	Forbs			140–420	
	Forb, introduced	2FI	<i>Forb, introduced</i>	28–224	–
	Forb, native	2FN	<i>Forb, native</i>	28–112	–
	Pennsylvania smartweed	POPE2	<i>Polygonum pennsylvanicum</i>	28–112	–
	goldenrod	SOLID	<i>Solidago</i>	28–112	–
	white panicle aster	SYLA6	<i>Symphyotrichum lanceolatum</i>	28–84	–
	New England aster	SYNO2	<i>Symphyotrichum novae-angliae</i>	28–84	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–84	–
	Flodman's thistle	CIFL	<i>Cirsium flodmanii</i>	28–84	–
	giant goldenrod	SOGI	<i>Solidago gigantea</i>	0–84	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–56	–
	western dock	RUAQ	<i>Rumex aquaticus</i>	0–28	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–28	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–28	–

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. Following 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.

Prairie Cordgrass/Sedge/Northern Reedgrass (1.1)
Average Annual Production (lbs./acre, air-dry): 4,500
Stocking Rate* (AUM/acre): 1.23

Fowl Bluegrass/Spikerush/Baltic Rush/Forbs (1.2)
Average Annual Production (lbs./acre, air-dry): 3,500
Stocking Rate* (AUM/acre): 0.96

Reed Canarygrass/Sedge/Invasive Plants/Prairie Cordgrass (2.1)
Average Annual Production (lbs./acre, air-dry): 3,500
Stocking Rate* (AUM/acre): 0.96

Quackgrass/Kentucky Bluegrass/Foxtail Barley/Invasive Plants (2.2)
Average Annual Production (lbs./acre, air-dry): 2,500
Stocking Rate* (AUM/acre): 0.69

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 is very slow and runoff potential for this site is negligible. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower 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 varieties of plants that bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Ecological Site Correlation Issues and Questions:

- 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
SCS-Range-417 (0557246059) 9/20/1972 SD Hand
SCS-Range-417 (0017346059) 11/17/1973 SD Hand
SCS-Range-417 (0027446059) 9/11/1974 SD Hand
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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. Officially approved for publication by David Kraft as of 11/12/2020.

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Rangeland health reference sheet

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

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Date	12/07/2004
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class 6. Typically high root content, and organic matter. Soil surface is very resistant to erosion.

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.

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.

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.

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 grass-like >>

Sub-dominant: Tall warm-season rhizomatous grass > tall cool-season rhizomatous grass >

Other: Mid cool-season rhizomatous grass > forb

Additional:

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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):** 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):** 3,500–5,500 lbs./acre air-dry weight, average 4,500 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.
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