

## Ecological site R102DY004SD

### Wet Meadow

Last updated: 8/14/2024  
Accessed: 05/10/2025

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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.

#### MLRA notes

Major Land Resource Area (MLRA): 102D–Prairie Coteau

This area makes up about 7,867 square miles (20,375 square kilometers), consisting mostly of nearly level to undulating till plains with potholes and moraines. Elevation ranges from 1,150 to 2,130 feet (350 to 650 meters). The average annual precipitation is 22 to 29 inches (559 to 734 millimeters). The average annual temperature is 42 to 45 degrees F (6 to 7 degrees C). The dominant soil order in this MLRA is Mollisols. The soils in this area dominantly have a frigid temperature regime, and an aquic or udic moisture regime. They are generally very deep and loamy. Soils range from well drained to very poorly drained. Parent materials are dominantly fine-loamy till to clayey material, with smaller amounts of outwash, glaciofluvial deposits, eolian deposits, alluvium, and, to a lesser extent, loess and organic materials.

#### Classification relationships

\*Fenneman (1916) Physiographic Regions\*

Division - Interior Plains

East:

Province - Central Lowland

Section - Western Lake / Dissected Till Plains (12b/12e)

\*USFS (2007) Ecoregions\*

Domain - Humid Temperate

Division - Prairie

Province - Prairie Parkland (Temperate)

Section - North-Central Glaciated Plains (251B)

\*EPA Ecoregions (Omernik 1997)\*

I - Great Plains (9)

II - Temperate Prairies (9.2)

III - Aspen Parkland/Northern Glaciated Plains (9.2.1)

#### 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 codominated by grass-like, 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 due to change in disturbance

regime.

## Associated sites

|             |  |
|-------------|--|
| R102DY001SD | <b>Shallow Marsh</b><br>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.  |
| R102DY003SD | <b>Subirrigated</b><br>These sites occur in drainageways. Soils are somewhat poorly drained which 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.  |
| R102DY006SD | <b>Limy Subirrigated</b><br>These sites occur along the edges of drainageways. Soils are somewhat poorly drained which 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. |
| R102DY020SD | <b>Loamy Overflow</b><br>These sites occur in upland swales. Soils are moderately well drained which have water flow into and over/through the site.   |

## Similar sites

|             |  |
|-------------|--|
| R102DY001SD | <b>Shallow Marsh</b><br>The Shallow Marsh site is in a similar landscape position, but the site ponds water until early summer in most years. A Shallow marsh site will have less prairie cordgrass and higher production than a wet meadow. |
|-------------|--|

Table 1. Dominant plant species

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

## Physiographic features

This site typically occurs in potholes and closed depressions.

Table 2. Representative physiographic features

|                    |                                      |
|--------------------|--------------------------------------|
| Landforms          | (1) Pothole<br>(2) Closed depression |
| Runoff class       | Negligible                           |
| Flooding frequency | None                                 |
| Ponding duration   | Long (7 to 30 days)                  |
| Ponding frequency  | Frequent                             |
| Elevation          | 1,000–2,100 ft                       |
| Slope              | 0–1%                                 |
| Water table depth  | 0–20 in                              |
| Aspect             | Aspect is not a significant factor   |

## Climatic features

The average annual precipitation is 22 to 28 inches. Half or more of the precipitation falls during the growing season. Rainfall typically occurs during high-intensity, convective thunderstorms in summer. In the western part of

the MLRA, rainfall is less abundant and not always adequate for full maturation of crops. Precipitation in winter is typically snow. The average annual temperature is 42 to 45 degrees F. The freeze-free period averages 142 days and ranges from 131 to 150 days.

Table 3. Representative climatic features

|  |              |
|--|--------------|
| Frost-free period (characteristic range)   | 117-129 days |
| Freeze-free period (characteristic range)  | 137-150 days |
| Precipitation total (characteristic range) | 24-27 in     |
| Frost-free period (actual range)           | 110-131 days |
| Freeze-free period (actual range)          | 130-151 days |
| Precipitation total (actual range)         | 22-28 in     |
| Frost-free period (average)                | 122 days     |
| Freeze-free period (average)               | 143 days     |
| Precipitation total (average)              | 25 in        |

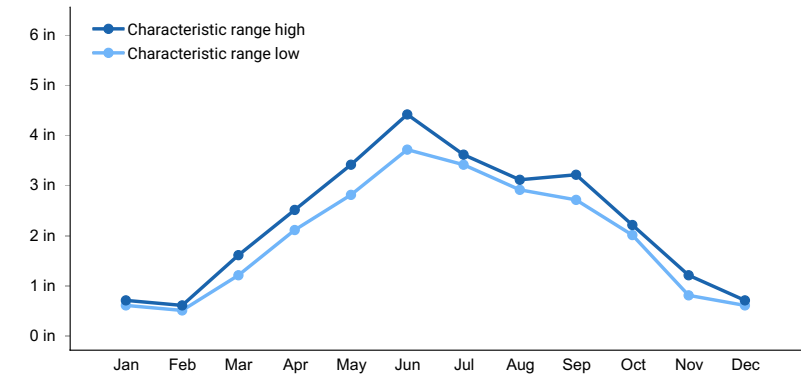


Figure 1. Monthly precipitation range

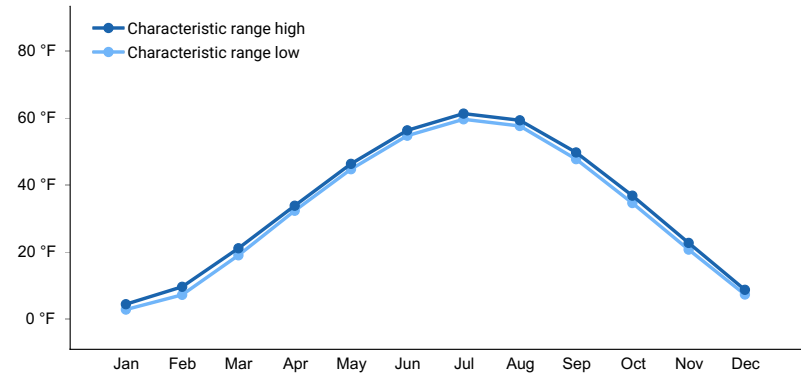
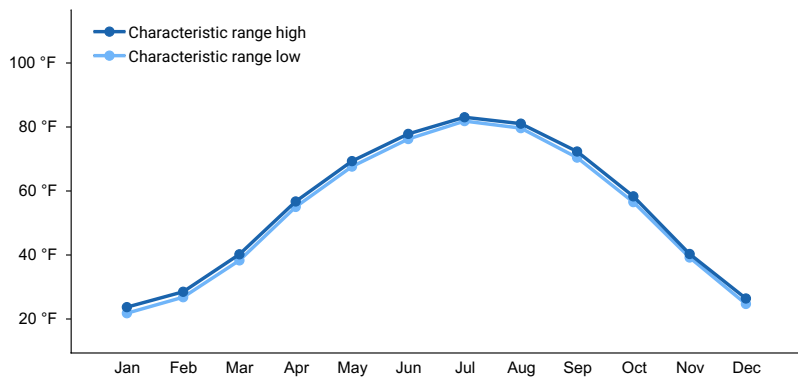
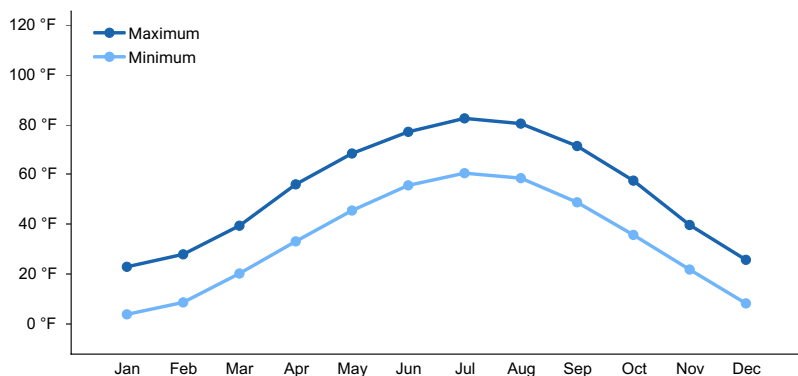


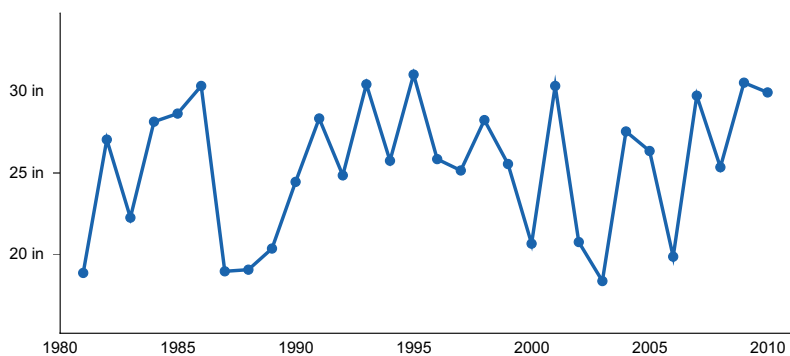
Figure 2. Monthly minimum temperature range



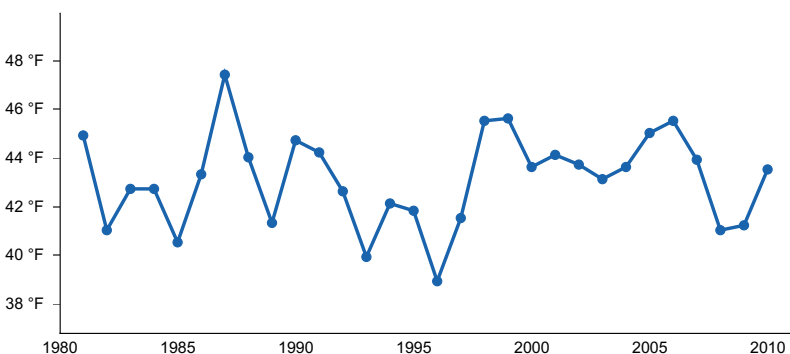
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) WAUBAY NWR [USC00398980], Waubay, SD
- (2) WEBSTER [USC00399004], Webster, SD
- (3) WATERTOWN RGRL AP [USW00014946], Watertown, SD

- (4) WATERTOWN 1W [USC00398930], Watertown, SD
- (5) CASTLEWOOD [USC00391519], Castlewood, SD
- (6) CLEAR LAKE [USC00391777], Clear Lake, SD
- (7) ASTORIA 4S [USC00390422], White, SD
- (8) TYLER [USC00218429], Tyler, MN
- (9) ARLINGTON 1 W [USC00390281], Arlington, SD

## Influencing water features

This site typically ponds for four to eight weeks in Spring. Ponded conditions and slow permeability drive vegetation dynamics.

## Soil features

Soils are typically formed in clayey alluvium or clayey alluvium over till. Soils of this site have silty clay loam surface textures.

**Table 4. Representative soil features**

|  |                     |
|--|---------------------|
| Parent material                          | (1) Alluvium        |
| Surface texture                          | (1) Silty clay loam |
| Drainage class                           | Poorly drained      |
| Permeability class                       | Slow                |
| Soil depth                               | 80 in               |
| Surface fragment cover <=3"              | 0%                  |
| Surface fragment cover >3"               | 0%                  |
| Available water capacity (0-40in)        | 7.1–7.7 in          |
| Soil reaction (1:1 water) (0-10in)       | 5.6–7.8             |
| Subsurface fragment volume <=3" (0-60in) | 1%                  |
| Subsurface fragment volume >3" (0-60in)  | 0–1%                |

## Ecological dynamics

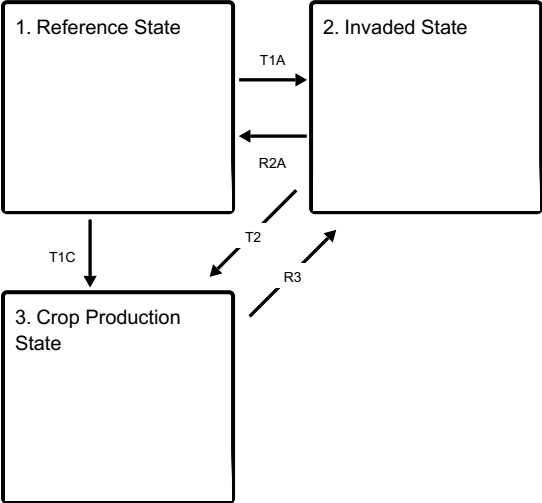
The site which is located in the Prairie Pothole Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse 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-Northern Reedgrass-Prairie Cordgrass 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 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/community phases. The plant composition tables shown below 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/or 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.

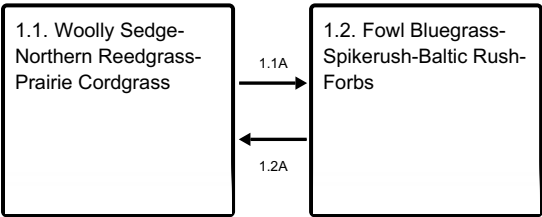
State and transition model

Ecosystem states



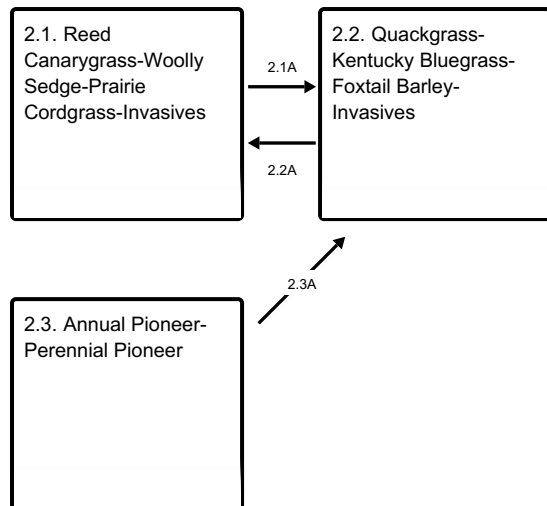
- T1A** - Non-use, no fire, heavy continuous grazing
- T1C** - Tillage, artificial drainage
- R2A** - Long term prescribed grazing, prescribed burning, seeding, wetland restoration
- T2** - Tillage, artificial drainage
- R3** - Seeding, wetland restoration, abandonment of cropping

State 1 submodel, plant communities



- 1.1A** - Heavy continuous grazing
- 1.2A** - Prescribed grazing with recovery periods

### State 2 submodel, plant communities

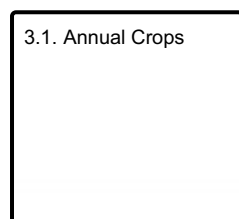


**2.1A** - Heavy continuous grazing

**2.2A** - Prescribed grazing with recovery periods

**2.3A** - Time without disturbances

### State 3 submodel, plant communities



## State 1

### Reference State

The Reference State represents the natural range of variability that dominates the dynamics of this ES. This state is typically dominated by cool-season grass and grass-like species. Before European settlement, the primary disturbance mechanisms for this site in the reference condition included periodic fire, grazing by large herding ungulates, and fluctuations in the water table and ponding frequency and duration. Frequent surface fires (3 to 5 years) and grazing coupled with 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.

### Dominant plant species

- willow (*Salix*), shrub
- woolly sedge (*Carex pellita*), grass
- wheat sedge (*Carex atherodes*), grass
- northern reedgrass (*Calamagrostis stricta* ssp. *inexpansa*), grass
- reed canarygrass (*Phalaris arundinacea*), grass
- prairie cordgrass (*Spartina pectinata*), grass
- switchgrass (*Panicum virgatum*), grass
- Indianhemp (*Apocynum cannabinum*), other herbaceous
- Flodman's thistle (*Cirsium flodmanii*), other herbaceous
- Illinois bundleflower (*Desmanthus illinoensis*), other herbaceous
- Canadian anemone (*Anemone canadensis*), other herbaceous
- goldenrod (*Solidago*), other herbaceous

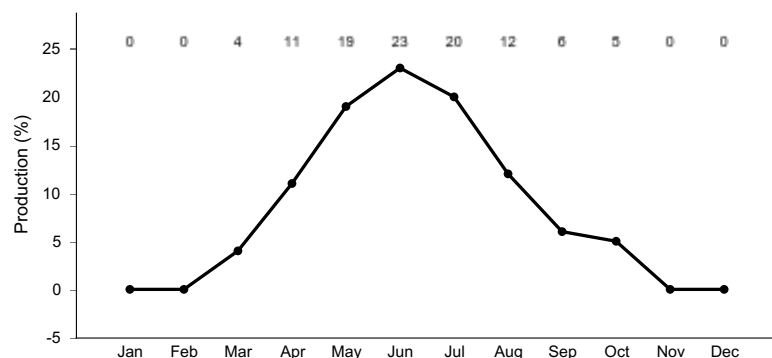
## Community 1.1

## Woolly Sedge-Northern Reedgrass-Prairie Cordgrass

Interpretations are based primarily on the 1.1 Woolly Sedge-Northern Reedgrass-Prairie Cordgrass Plant Community Phase (this is also considered to be climax). 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, 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 (*Arnica rydbergii*), Canada goldenrod (*Solidago canadensis*), Indian hemp (*Apocynum cannabinum*), 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 cycle, water cycle, 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<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 3785             | 4425                              | 4935              |
| Forb            | 215              | 500                               | 900               |
| Shrub/Vine      | 0                | 75                                | 165               |
| <b>Total</b>    | <b>4000</b>      | <b>5000</b>                       | <b>6000</b>       |



**Figure 8. Plant community growth curve (percent production by month).**  
SD0208, Rolling Till Prairie, lowland cool-season/warm-season codominant..  
Cool-season, warm-season codominant, lowland..

## Community 1.2

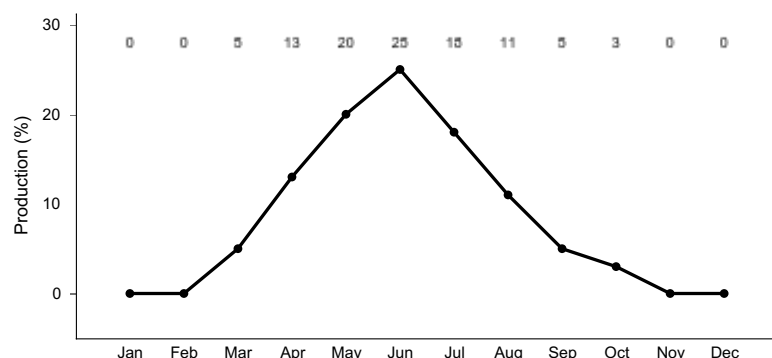
### Fowl Bluegrass-Spikerush-Baltic Rush-Forbs

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 (*Eleocharis*), other grass-like, and forbs are the dominant species. Spikerush and Baltic rush (*Juncus balticus*), 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 cycle, nutrient cycle, and energy flow are slightly reduced but continue to function adequately.

**Table 6. Annual production by plant type**



| Plant Type      | Low<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 2825             | 3660                              | 4440              |
| Forb            | 175              | 300                               | 475               |
| Shrub/Vine      | 0                | 40                                | 85                |
| <b>Total</b>    | <b>3000</b>      | <b>4000</b>                       | <b>5000</b>       |



**Figure 10. Plant community growth curve (percent production by month).**  
SD0207, Rolling Till Prairie, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, lowland..

## 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 Woolly Sedge-Northern Reedgrass-Prairie Cordgrass 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

This state is characterized by the dominance of invasive and/or nonnative 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.

### Dominant plant species

- wheat sedge (*Carex atherodes*), grass
- spikerush (*Eleocharis*), grass
- rush (*Juncus*), grass
- woolly sedge (*Carex pellita*), grass

- reed canarygrass (*Phalaris arundinacea*), grass
- fowl bluegrass (*Poa palustris*), grass
- quackgrass (*Elymus repens*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- Pennsylvania smartweed (*Polygonum pensylvanicum*), other herbaceous
- cinquefoil (*Potentilla*), other herbaceous
- giant goldenrod (*Solidago gigantea*), other herbaceous
- Canada thistle (*Cirsium arvense*), other herbaceous

## Community 2.1

### Reed Canarygrass-Woolly Sedge-Prairie Cordgrass-Invasives

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<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 2435             | 3290                              | 4090              |
| Forb            | 65               | 210                               | 410               |
| <b>Total</b>    | <b>2500</b>      | <b>3500</b>                       | <b>4500</b>       |

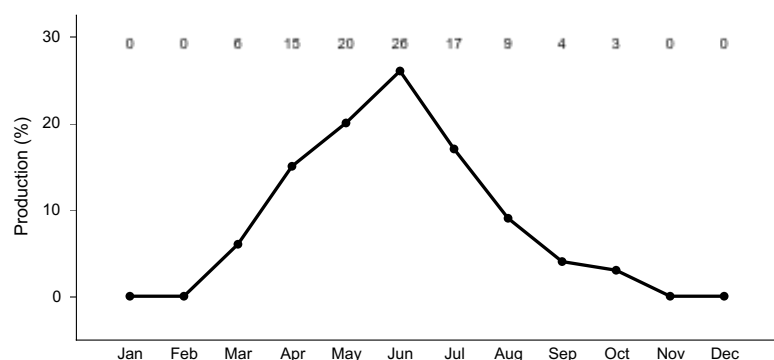


Figure 12. Plant community growth curve (percent production by month). SD0206, Rolling Till Prairie, lowland cool-season dominant.. Cool-season dominant, lowland..

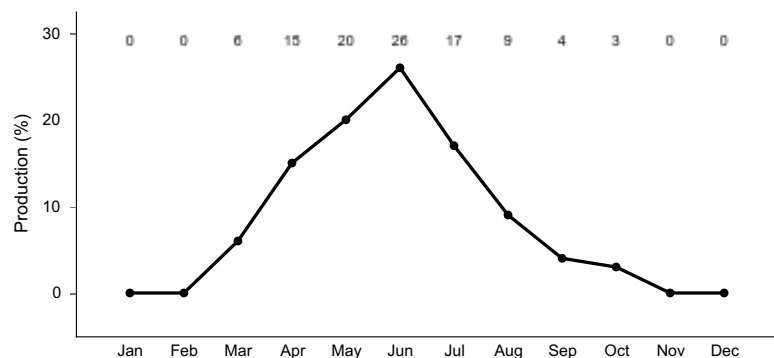
## Community 2.2

### Quackgrass-Kentucky Bluegrass-Foxtail Barley-Invasives

This plant community phase occurs after prolonged heavy disturbance such as described above 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/invasion of 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<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 1490             | 2250                              | 2955              |
| Forb            | 110              | 250                               | 445               |
| <b>Total</b>    | <b>1600</b>      | <b>2500</b>                       | <b>3400</b>       |



**Figure 14. Plant community growth curve (percent production by month). SD0206, Rolling Till Prairie, lowland cool-season dominant.. Cool-season dominant, lowland..**

## 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 (*Hordeum jubatum*), 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 nonnative 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**

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).

#### **Dominant plant species**

- corn (*Zea*), grass
- wheat (*Triticum*), grass
- soybean (*Glycine*), other herbaceous

### **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, sugar beet and a variety of other crops.

### **Transition T1A**

#### **State 1 to 2**

Non-use and/or no surface fire for extended periods of time (typically for 10 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. 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 R2A**

#### **State 2 to 1**

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) coupled with prescribed burning may lead this 2.1 Reed Canarygrass-Woolly Sedge-Invasive Plants-Prairie Cordgrass Plant Community Phase within 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.

### **Transition T2**

#### **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 R3 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 (Lb/Acre) | Foliar Cover (%) |
|------------------------|---|--------|--|-----------------------------|------------------|
| <b>Grass/Grasslike</b> |   |        |  |                             |                  |
| 1                      | <b>Grass-likes</b>                          |        |  | 1000–2500                   |                  |
|                        | woolly sedge                                | CAPE42 | <i>Carex pellita</i>                               | 250–2000                    | –                |
|                        | wheat sedge                                 | CAAT2  | <i>Carex atherodes</i>                             | 250–1250                    | –                |
|                        | Sartwell's sedge                            | CASA8  | <i>Carex sartwellii</i>                            | 100–750                     | –                |
|                        | fox sedge                                   | CAVU2  | <i>Carex vulpinoidea</i>                           | 50–250                      | –                |
|                        | Bicknell's sedge                            | CABI3  | <i>Carex bicknellii</i>                            | 50–250                      | –                |
|                        | shortbeak sedge                             | CABR10 | <i>Carex brevior</i>                               | 0–250                       | –                |
|                        | Grass-like (not a true grass)               | 2GL    | <i>Grass-like (not a true grass)</i>               | 50–250                      | –                |
|                        | water sedge                                 | CAAQ   | <i>Carex aquatilis</i>                             | 0–250                       | –                |
|                        | spikerush                                   | ELEOC  | <i>Eleocharis</i>                                  | 50–150                      | –                |
|                        | rush  | JUNCU  | <i>Juncus</i>                                      | 50–150                      | –                |
|                        | green bulrush                               | SCAT2  | <i>Scirpus atrovirens</i>                          | 0–50                        | –                |
|                        | bulrush                                     | SCHOE6 | <i>Schoenoplectus</i>                              | 0–50                        | –                |
| 2                      | <b>Cool-season Grasses</b>                  |        |  | 500–1750                    |                  |
|                        | northern reedgrass                          | CASTI3 | <i>Calamagrostis stricta</i> ssp. <i>inexpansa</i> | 250–1500                    | –                |
|                        | reed canarygrass                            | PHAR3  | <i>Phalaris arundinacea</i>                        | 50–250                      | –                |
|                        | fowl bluegrass                              | POPA2  | <i>Poa palustris</i>                               | 50–250                      | –                |
|                        | Graminoid (grass or grass-like)             | 2GRAM  | <i>Graminoid (grass or grass-like)</i>             | 50–250                      | –                |
|                        | American sloughgrass                        | BESY   | <i>Beckmannia syzigachne</i>                       | 50–250                      | –                |
|                        | prairie wedgescale                          | SPOB   | <i>Sphenopholis obtusata</i>                       | 0–150                       | –                |
| 3                      | <b>Warm-season Grasses</b>                  |        |  | 100–500                     |                  |
|                        | prairie cordgrass                           | SPPE   | <i>Spartina pectinata</i>                          | 50–250                      | –                |
|                        | switchgrass                                 | PAVI2  | <i>Panicum virgatum</i>                            | 0–150                       | –                |
|                        | spiked muhly                                | MUGL3  | <i>Muhlenbergia glomerata</i>                      | 50–150                      | –                |
|                        | Mexican muhly                               | MUME2  | <i>Muhlenbergia mexicana</i>                       | 0–100                       | –                |
|                        | mat muhly                                   | MURI   | <i>Muhlenbergia richardsonis</i>                   | 0–50                        | –                |
| <b>Forb</b>            |   |        |  |                             |                  |
| 4                      | <b>Forbs</b>                                |        |  | 250–750                     |                  |
|                        | Forb (herbaceous, not grass nor grass-like) | 2FORB  | <i>Forb (herbaceous, not grass nor grass-like)</i> | 50–150                      | –                |

|                   |                          |        |   |        |   |
|-------------------|--------------------------|--------|---|--------|---|
|                   | Indianhemp               | APCA   | <i>Apocynum cannabinum</i>                        | 50–150 | – |
|                   | Flodman's thistle        | CIFL   | <i>Cirsium flodmanii</i>                          | 0–100  | – |
|                   | Illinois bundleflower    | DEIL   | <i>Desmanthus illinoensis</i>                     | 50–100 | – |
|                   | swamp milkweed           | ASIN   | <i>Asclepias incarnata</i>                        | 50–100 | – |
|                   | Canadian anemone         | ANCA8  | <i>Anemone canadensis</i>                         | 50–100 | – |
|                   | mint                     | MENTH  | <i>Mentha</i>                                     | 50–100 | – |
|                   | swamp smartweed          | POHY2  | <i>Polygonum hydropiperoides</i>                  | 50–100 | – |
|                   | Pennsylvania smartweed   | POPE2  | <i>Polygonum pensylvanicum</i>                    | 50–100 | – |
|                   | cinquefoil               | POTEN  | <i>Potentilla</i>                                 | 50–100 | – |
|                   | Macoun's buttercup       | RAMA2  | <i>Ranunculus macounii</i>                        | 50–100 | – |
|                   | western dock             | RUAQ   | <i>Rumex aquaticus</i>                            | 0–100  | – |
|                   | blackeyed Susan          | RUHI2  | <i>Rudbeckia hirta</i>                            | 50–100 | – |
|                   | American licorice        | GLLE3  | <i>Glycyrrhiza lepidota</i>                       | 50–100 | – |
|                   | Rydberg's sunflower      | HENUR  | <i>Helianthus nuttallii</i> ssp. <i>rydbergii</i> | 50–100 | – |
|                   | blazing star             | LIATR  | <i>Liatris</i>                                    | 0–100  | – |
|                   | giant goldenrod          | SOGI   | <i>Solidago gigantea</i>                          | 50–100 | – |
|                   | goldenrod                | SOLID  | <i>Solidago</i>                                   | 50–100 | – |
|                   | white panicle aster      | SYLA6  | <i>Symphyotrichum lanceolatum</i>                 | 50–100 | – |
|                   | New England aster        | SYNO2  | <i>Symphyotrichum novae-angliae</i>               | 50–100 | – |
|                   | Canada germander         | TECA3  | <i>Teucrium canadense</i>                         | 0–50   | – |
|                   | broadleaf cattail        | TYLA   | <i>Typha latifolia</i>                            | 50     | – |
|                   | northern bog violet      | VINE   | <i>Viola nephrophylla</i>                         | 0–50   | – |
|                   | wood lily                | LIPH   | <i>Lilium philadelphicum</i>                      | 0–50   | – |
|                   | American water horehound | LYAM   | <i>Lycopus americanus</i>                         | 0–50   | – |
|                   | golden dock              | RUMA4  | <i>Rumex maritimus</i>                            | 0–50   | – |
|                   | blue-eyed grass          | SISYR  | <i>Sisyrinchium</i>                               | 0–50   | – |
|                   | white doll's daisy       | BOAS   | <i>Boltonia asteroides</i>                        | 0–50   | – |
|                   | smooth horsetail         | EQLA   | <i>Equisetum laevigatum</i>                       | 0–50   | – |
|                   | Virginia strawberry      | FRVI   | <i>Fragaria virginiana</i>                        | 0–50   | – |
| <b>Shrub/Vine</b> |                          |        |   |        |   |
| 5                 | <b>Shrubs</b>            |        |   | 0–150  |   |
|                   | willow                   | SALIX  | <i>Salix</i>                                      | 0–150  | – |
|                   | Shrub (>.5m)             | 2SHRUB | <i>Shrub (&gt;.5m)</i>                            | 0–100  | – |

Table 10. Community 1.2 plant community composition

| Group                  | Common Name                   | Symbol | Scientific Name               | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|-------------------------------|--------|-------------------------------|-----------------------------|------------------|
| <b>Grass/Grasslike</b> |                               |        |                               |                             |                  |
| 1                      | <b>Grass-likes</b>            |        |                               | 1400–1800                   |                  |
|                        | spikerush                     | ELEOC  | <i>Eleocharis</i>             | 400–800                     | –                |
|                        | green bulrush                 | SCAT2  | <i>Scirpus atrovirens</i>     | 40–480                      | –                |
|                        | bulrush                       | SCHOE6 | <i>Schoenoplectus</i>         | 40–480                      | –                |
|                        | rush                          | JUNCU  | <i>Juncus</i>                 | 200–400                     | –                |
|                        | wheat sedge                   | CAAT2  | <i>Carex atherodes</i>        | 80–400                      | –                |
|                        | Grass-like (not a true grass) | 2GCL   | Grass-like (not a true grass) | 40–200                      |                  |

|             |                                 |        |  |          |   |
|-------------|---------------------------------|--------|--|----------|---|
|             | Grass-like (not a true grass)   | ZGL    | Grass-like (not a true grass)                      | 40–280   | – |
|             | woolly sedge                    | CAPE42 | <i>Carex pellita</i>                               | 80–200   | – |
|             | Sartwell's sedge                | CASA8  | <i>Carex sartwellii</i>                            | 40–200   | – |
|             | fox sedge                       | CAVU2  | <i>Carex vulpinoidea</i>                           | 0–160    | – |
|             | shortbeak sedge                 | CABR10 | <i>Carex brevior</i>                               | 0–160    | – |
|             | water sedge                     | CAAQ   | <i>Carex aquatilis</i>                             | 0–120    | – |
|             | Bicknell's sedge                | CABI3  | <i>Carex bicknellii</i>                            | 0–40     | – |
| 2           | <b>Cool-season Grasses</b>      |        |  | 200–1000 |   |
|             | fowl bluegrass                  | POPA2  | <i>Poa palustris</i>                               | 200–1000 | – |
|             | reed canarygrass                | PHAR3  | <i>Phalaris arundinacea</i>                        | 80–400   | – |
|             | Graminoid (grass or grass-like) | 2GRAM  | Graminoid (grass or grass-like)                    | 0–200    | – |
|             | northern reedgrass              | CASTI3 | <i>Calamagrostis stricta</i> ssp. <i>inexpansa</i> | 0–200    | – |
|             | American mannagrass             | GLGR   | <i>Glyceria grandis</i>                            | 0–160    | – |
|             | foxtail barley                  | HOJU   | <i>Hordeum jubatum</i>                             | 0–160    | – |
| 3           | <b>Warm-season Grasses</b>      |        |  | 80–600   |   |
|             | prairie cordgrass               | SPPE   | <i>Spartina pectinata</i>                          | 200–600  | – |
|             | spiked muhly                    | MUGL3  | <i>Muhlenbergia glomerata</i>                      | 0–200    | – |
|             | mat muhly                       | MURI   | <i>Muhlenbergia richardsonis</i>                   | 80–200   | – |
|             | switchgrass                     | PAVI2  | <i>Panicum virgatum</i>                            | 0–80     | – |
| 4           | <b>Non-Native Grasses</b>       |        |  | 200–600  |   |
|             | creeping meadow foxtail         | ALAR   | <i>Alopecurus arundinaceus</i>                     | 0–400    | – |
|             | quackgrass                      | ELRE4  | <i>Elymus repens</i>                               | 0–400    | – |
|             | Kentucky bluegrass              | POPR   | <i>Poa pratensis</i>                               | 80–400   | – |
| <b>Forb</b> |                                 |        |  |          |   |
| 5           | <b>Forbs</b>                    |        |  | 200–400  |   |
|             | giant goldenrod                 | SOGI   | <i>Solidago gigantea</i>                           | 0–120    | – |
|             | goldenrod                       | SOLID  | <i>Solidago</i>                                    | 40–120   | – |
|             | white panicle aster             | SYLA6  | <i>Symphyotrichum lanceolatum</i>                  | 40–120   | – |
|             | Forb, native                    | 2FN    | Forb, native                                       | 40–120   | – |
|             | American licorice               | GLLE3  | <i>Glycyrrhiza lepidota</i>                        | 0–120    | – |
|             | Flodman's thistle               | CIFL   | <i>Cirsium flodmanii</i>                           | 40–120   | – |
|             | cinquefoil                      | POTEN  | <i>Potentilla</i>                                  | 40–120   | – |
|             | Forb, introduced                | 2FI    | Forb, introduced                                   | 0–80     | – |
|             | Pennsylvania smartweed          | POPE2  | <i>Polygonum pennsylvanicum</i>                    | 40–80    | – |
|             | mint                            | MENTH  | <i>Mentha</i>                                      | 0–80     | – |
|             | Indianhemp                      | APCA   | <i>Apocynum cannabinum</i>                         | 0–80     | – |
|             | swamp milkweed                  | ASIN   | <i>Asclepias incarnata</i>                         | 0–80     | – |
|             | New England aster               | SYNO2  | <i>Symphyotrichum novae-angliae</i>                | 40–80    | – |
|             | broadleaf cattail               | TYLA   | <i>Typha latifolia</i>                             | 0–80     | – |
|             | western dock                    | RUAQ   | <i>Rumex aquaticus</i>                             | 0–80     | – |
|             | blackeyed Susan                 | RUHI2  | <i>Rudbeckia hirta</i>                             | 0–40     | – |
|             | golden dock                     | RUMA4  | <i>Rumex maritimus</i>                             | 0–40     | – |
|             | blue-eyed grass                 | SISYR  | <i>Sisyrinchium</i>                                | 0–40     | – |

|                   |                       |        |   |          |   |
|-------------------|-----------------------|--------|---|----------|---|
|                   | Canadian anemone      | ANCA8  | <i>Anemone canadensis</i>                         | 0–40     | – |
|                   | Rydberg's sunflower   | HENUR  | <i>Helianthus nuttallii</i> ssp. <i>rydbergii</i> | 0–40     | – |
|                   | blazing star          | LIATR  | <i>Liatris</i>                                    | 0–40     | – |
|                   | wood lily             | LIPH   | <i>Lilium philadelphicum</i>                      | 0–40     | – |
|                   | swamp smartweed       | POHY2  | <i>Polygonum hydropiperoides</i>                  | 0–40     | – |
|                   | Illinois bundleflower | DEIL   | <i>Desmanthus illinoensis</i>                     | 0–40     | – |
|                   | smooth horsetail      | EQLA   | <i>Equisetum laevigatum</i>                       | 0–40     | – |
|                   | Macoun's buttercup    | RAMA2  | <i>Ranunculus macounii</i>                        | 0–40     | – |
| <b>Shrub/Vine</b> |                       |        |   |          |   |
| 6                 | <b>Shrubs</b>         |        |   | 700–1400 |   |
|                   | Shrub (>.5m)          | 2SHRUB | <i>Shrub (&gt;.5m)</i>                            | 0–80     | – |
|                   | willow                | SALIX  | <i>Salix</i>                                      | 0–40     | – |

**Table 11. Community 2.1 plant community composition**

| Group                  | Common Name                     | Symbol | Scientific Name                                    | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|---------------------------------|--------|--|-----------------------------|------------------|
| <b>Grass/Grasslike</b> |                                 |        |  |                             |                  |
| 1                      | <b>Grass-likes</b>              |        |  | 700–1400                    |                  |
|                        | wheat sedge                     | CAAT2  | <i>Carex atherodes</i>                             | 70–350                      | –                |
|                        | spikerush                       | ELEOC  | <i>Eleocharis</i>                                  | 70–350                      | –                |
|                        | woolly sedge                    | CAPE42 | <i>Carex pellita</i>                               | 70–350                      | –                |
|                        | Sartwell's sedge                | CASA8  | <i>Carex sartwellii</i>                            | 70–350                      | –                |
|                        | Grass-like (not a true grass)   | 2GL    | <i>Grass-like (not a true grass)</i>               | 35–175                      | –                |
|                        | shortbeak sedge                 | CABR10 | <i>Carex brevior</i>                               | 35–175                      | –                |
|                        | rush                            | JUNCU  | <i>Juncus</i>                                      | 35–175                      | –                |
|                        | green bulrush                   | SCAT2  | <i>Scirpus atrovirens</i>                          | 0–175                       | –                |
|                        | bulrush                         | SCHOE6 | <i>Schoenoplectus</i>                              | 0–175                       | –                |
|                        | fox sedge                       | CAVU2  | <i>Carex vulpinoidea</i>                           | 0–140                       | –                |
|                        | Bicknell's sedge                | CABI3  | <i>Carex bicknellii</i>                            | 0–35                        | –                |
| 2                      | <b>Cool-season Grasses</b>      |        |  | 525–1225                    |                  |
|                        | reed canarygrass                | PHAR3  | <i>Phalaris arundinacea</i>                        | 525–1050                    | –                |
|                        | fowl bluegrass                  | POPA2  | <i>Poa palustris</i>                               | 70–525                      | –                |
|                        | foxtail barley                  | HOJU   | <i>Hordeum jubatum</i>                             | 0–210                       | –                |
|                        | Graminoid (grass or grass-like) | 2GRAM  | <i>Graminoid (grass or grass-like)</i>             | 0–175                       | –                |
|                        | northern reedgrass              | CASTI3 | <i>Calamagrostis stricta</i> ssp. <i>inexpansa</i> | 35–175                      | –                |
|                        | American mannagrass             | GLGR   | <i>Glyceria grandis</i>                            | 0–105                       | –                |
| 3                      | <b>Warm-season Grasses</b>      |        |  | 70–350                      |                  |
|                        | prairie cordgrass               | SPPE   | <i>Spartina pectinata</i>                          | 70–350                      | –                |
|                        | mat muhly                       | MURI   | <i>Muhlenbergia richardsonis</i>                   | 0–140                       | –                |
| 4                      | <b>Non-Native Grasses</b>       |        |  | 350–1225                    |                  |
|                        | quackgrass                      | ELRE4  | <i>Elymus repens</i>                               | 0–1050                      | –                |
|                        | creeping meadow foxtail         | ALAR   | <i>Alopecurus arundinaceus</i>                     | 0–875                       | –                |
|                        | Kentucky bluegrass              | POPR   | <i>Poa pratensis</i>                               | 70–525                      | –                |



| Forb |                        |       |                                     |        |   |
|------|------------------------|-------|-------------------------------------|--------|---|
| 5    | Forbs                  |       |                                     | 70–350 |   |
|      | Pennsylvania smartweed | POPE2 | <i>Polygonum pensylvanicum</i>      | 0–70   | – |
|      | cinquefoil             | POTEN | <i>Potentilla</i>                   | 0–70   | – |
|      | giant goldenrod        | SOGI  | <i>Solidago gigantea</i>            | 0–70   | – |
|      | goldenrod              | SOLID | <i>Solidago</i>                     | 0–70   | – |
|      | Forb, introduced       | 2FI   | <i>Forb, introduced</i>             | 0–70   | – |
|      | Forb, native           | 2FN   | <i>Forb, native</i>                 | 0–70   | – |
|      | Indianhemp             | APCA  | <i>Apocynum cannabinum</i>          | 0–70   | – |
|      | Flodman's thistle      | CIFL  | <i>Cirsium flodmanii</i>            | 0–70   | – |
|      | American licorice      | GLLE3 | <i>Glycyrrhiza lepidota</i>         | 0–70   | – |
|      | mint                   | MENTH | <i>Mentha</i>                       | 0–35   | – |
|      | smooth horsetail       | EQLA  | <i>Equisetum laevigatum</i>         | 0–35   | – |
|      | swamp milkweed         | ASIN  | <i>Asclepias incarnata</i>          | 0–35   | – |
|      | white panicle aster    | SYLA6 | <i>Symphyotrichum lanceolatum</i>   | 0–35   | – |
|      | New England aster      | SYNO2 | <i>Symphyotrichum novae-angliae</i> | 0–35   | – |
|      | broadleaf cattail      | TYLA  | <i>Typha latifolia</i>              | 0–35   | – |
|      | western dock           | RUAQ  | <i>Rumex aquaticus</i>              | 0–35   | – |

Table 12. Community 2.2 plant community composition

| Group                  | Common Name                     | Symbol | Scientific Name                        | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|---------------------------------|--------|--|-----------------------------|------------------|
| <b>Grass/Grasslike</b> |                                 |        |  |                             |                  |
| 1                      | <b>Grass-likes</b>              |        |  | 625–875                     |                  |
|                        | spikerush                       | ELEOC  | <i>Eleocharis</i>                      | 125–625                     | –                |
|                        | rush                            | JUNCU  | <i>Juncus</i>                          | 250–500                     | –                |
|                        | shortbeak sedge                 | CABR10 | <i>Carex brevior</i>                   | 25–125                      | –                |
|                        | fox sedge                       | CAVU2  | <i>Carex vulpinoidea</i>               | 0–75                        | –                |
|                        | woolly sedge                    | CAPE42 | <i>Carex pellita</i>                   | 0–50                        | –                |
|                        | Sartwell's sedge                | CASA8  | <i>Carex sartwellii</i>                | 0–50                        | –                |
|                        | Grass-like (not a true grass)   | 2GL    | <i>Grass-like (not a true grass)</i>   | 0–50                        | –                |
|                        | green bulrush                   | SCAT2  | <i>Scirpus atrovirens</i>              | 0–50                        | –                |
|                        | bulrush                         | SCHOE6 | <i>Schoenoplectus</i>                  | 0–50                        | –                |
| 2                      | <b>Cool-season Grasses</b>      |        |  | 125–500                     |                  |
|                        | foxtail barley                  | HOJU   | <i>Hordeum jubatum</i>                 | 125–375                     | –                |
|                        | reed canarygrass                | PHAR3  | <i>Phalaris arundinacea</i>            | 0–250                       | –                |
|                        | fowl bluegrass                  | POPA2  | <i>Poa palustris</i>                   | 0–125                       | –                |
|                        | Graminoid (grass or grass-like) | 2GRAM  | <i>Graminoid (grass or grass-like)</i> | 0–125                       | –                |
| 3                      | <b>Warm-season Grasses</b>      |        |  | 25–125                      |                  |
|                        | mat muhly                       | MURI   | <i>Muhlenbergia richardsonis</i>       | 25–125                      | –                |
|                        | prairie cordgrass               | SPPE   | <i>Spartina pectinata</i>              | 0–125                       | –                |
| 4                      | <b>Non-Native Grasses</b>       |        |  | 375–1125                    |                  |
|                        | creeping meadow foxtail         | ALAR   | <i>Alopecurus arundinaceus</i>         | 0–875                       | –                |
|                        | quackgrass                      | ELRE4  | <i>Elymus repens</i>                   | 125–875                     | –                |
|                        | Kentucky bluegrass              | POPR   | <i>Poa pratensis</i>                   | 125–625                     | –                |
| <b>Forb</b>            |                                 |        |  |                             |                  |
| 5                      | <b>Forbs</b>                    |        |  | 125–375                     |                  |
|                        | Forb, introduced                | 2FI    | <i>Forb, introduced</i>                | 25–200                      | –                |
|                        | Forb, native                    | 2FN    | <i>Forb, native</i>                    | 25–100                      | –                |
|                        | Pennsylvania smartweed          | POPE2  | <i>Polygonum pensylvanicum</i>         | 25–100                      | –                |
|                        | goldenrod                       | SOLID  | <i>Solidago</i>                        | 25–100                      | –                |
|                        | white panicle aster             | SYLA6  | <i>Symphyotrichum lanceolatum</i>      | 25–75                       | –                |
|                        | New England aster               | SYNO2  | <i>Symphyotrichum novae-angliae</i>    | 25–75                       | –                |
|                        | Indianhemp                      | APCA   | <i>Apocynum cannabinum</i>             | 0–75                        | –                |
|                        | Flodman's thistle               | CIFL   | <i>Cirsium flodmanii</i>               | 25–75                       | –                |
|                        | giant goldenrod                 | SOGI   | <i>Solidago gigantea</i>               | 0–75                        | –                |
|                        | cinquefoil                      | POTEN  | <i>Potentilla</i>                      | 0–50                        | –                |
|                        | western dock                    | RUAQ   | <i>Rumex aquaticus</i>                 | 0–25                        | –                |
|                        | smooth horsetail                | EQLA   | <i>Equisetum laevigatum</i>            | 0–25                        | –                |
|                        | American licorice               | GLLE3  | <i>Glycyrrhiza lepidota</i>            | 0–25                        | –                |

## 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.

### Prairie Cordgrass/Sedge/Northern Reedgrass (1.1)

Average Annual Production (lbs./acre, air-dry): 5000

Stocking Rate\* (AUM/acre): 1.37

### Fowl Bluegrass/Spikerush/Baltic Rush/Forbs (1.2)

Average Annual Production (lbs./acre, air-dry): 4000

Stocking Rate\* (AUM/acre): 1.10

### Reed Canarygrass/Sedge/Invasive Plants/Prairie Cordgrass (2.1)

Average Annual Production (lbs./acre, air-dry): 3500

Stocking Rate\* (AUM/acre): 0.96

### Quackgrass/Kentucky Bluegrass/Foxtail Barley/Invasive Plants (2.2)

Average Annual Production (lbs./acre, air-dry): 2500

Stocking Rate\* (AUM/acre): 0.69

### Annual/Pioneer, Non-Native Perennial (2.3)

Average Annual Production (lbs./acre, air-dry): 1200

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 groups C and D. Infiltration is typically slow to very slow and runoff potential for this site is negligible due to the concave shape of the landform this site occupies.

## 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 esthetic 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.

## **Inventory data references**

MLRA 102D was created in 2022 with Agricultural Handbook 296 updated. This area was MLRA 102A prior to this time . Information was copied from MLRA 102A ESDs to create the MLRA 102D ESDs.

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 (0020746039) 1985 SD Clark  
NP-ESC-1 (0020746039) 2007 SD Deuel  
NP-ESC-1 (0110746039) 2007 SD Deuel  
NP-ESC-1 (0020846039) 2008 SD Deuel

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## **Contributors**

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Acknowledgments

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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.

|   |  |
|---|--|
| Author(s)/participant(s)                    | David Schmidt, Tim Nordquist, Stan Boltz |
| Contact for lead author                     |  |
| Date  | 12/04/2007                               |
| 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.
- 
2. **Presence of water flow patterns:** Barely observable.
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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 5% and less than 2 inches in diameter.
- 
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.
- 
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 & tall cool-season grass-like >> tall warm-season rhizomatous grass
- Sub-dominant: > tall cool-season rhizomatous grass > mid cool-season rhizomatous grass > forb
- Other:
- Additional:
- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality.
- 
14. **Average percent litter cover (%) and depth ( in):** 85-90%, roughly 1-2 inches. Litter cover is in contact with soil surface.
- 
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 4000 – 5200 lbs./acre air-dry weight, average 4,600 lbs./acre air-dry weight
- 
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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