USDA Natural Resources Conservation Service

Ecological site R102BY003SD
Subirrigated

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 102B–Till Plains

The Till Plains (102B) is located within the Western Lake Section of the Central Lowland Province of the Interior Plains. It is entirely in South Dakota, encompassing 2,215 square

miles (Figure 1). The elevation ranges from 1,140 to 1,880 feet. The MLRA is characterized by glaciated, nearly level to hilly plains populated by stagnation and end moraines, glacial outwash terraces, and floodplains as the major landforms. The dominant parent materials are silty drift, glacial till, glacial outwash, and alluvium. (USDA-NRCS 2006)

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

Classification relationships

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

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

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

Ecological site concept

The Subirrigated ecological site typically occurs in drainageways which can receive moderate run off moisture from within the watershed. Soils are formed in alluvium and are somewhat poorly drained. These soils have a water table within 2 to 5 feet of the surface that persists longer than the wettest part of the growing season, typically until the month of August.

Vegetation in the Reference State is dominated by warm-season grasses including big bluestem, Indiangrass, and switchgrass. Grass-like species occurring on this site may include clustered field sedge. Forbs present may include goldenrod, cudweed sagewort, asters, and western yarrow. Non-native species such as Kentucky bluegrass and smooth brome may invade the site if there are major changes in disturbance regime.

Associated sites

R102BY004SD	**Wet Meadow** These sites occur in a basin or closed depression. Soils are poorly drained and the site ponds water for 4 to 8 weeks in the spring of the year or after a heavy rain. The central concept soil series is Tetonka, but other series are included.
R102BY006SD	**Limy Subirrigated** 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. The central concept soil series is Wakonda, but other series are included.
R102BY020SD	**Loamy Overflow** These sites occur in upland swales. Soils are moderately well drained which have water flow into and over and through the site. The central concept soil series is Trent, but other series are included.

Similar sites

R102BY006SD	**Limy Subirrigated** The Limy Subirrigated site occurs along the edges of drainageways. Soils are similar in drainage class and water table but will effervesce with acid at or near the surface. The Limy Subirrigated site has less big bluestem, more little bluestem, and lower production than a Subirrigated site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Sorghastrum nutans*

Physiographic features

This site occurs on nearly level flood plains or swales.

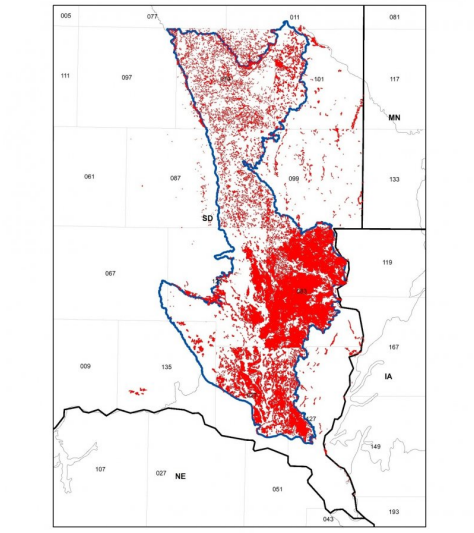


Figure 2. The Site Distribution Map for the Subirrigated Site in MLRA 102B.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Outwash plain
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	335–579 m
Slope	1–2%
Water table depth	46–203 cm
Aspect	Aspect is not a significant factor

Climatic features

Major Land Resource Area 102B is considered to have a continental climate with cold winters and relatively hot summers, low to moderate humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of the location of this MLRA near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 24 to 26 inches per year. The average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 14°F (Wentworth 2 WNW, South Dakota, to about 18°F (Canton 4 WNW, SD). July is the warmest month with temperatures averaging from about 72°F (Wentworth 2 WNW, SD), to about 73°F (Canton 4 WNW, SD). The range of normal

average monthly temperatures between the coldest and warmest months is about 57°F. This large annual range attests to the continental nature of the climate of this area. Hourly winds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Green-up of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	124-127 days
Freeze-free period (characteristic range)	138-140 days
Precipitation total (characteristic range)	660 mm
Frost-free period (actual range)	123-128 days
Freeze-free period (actual range)	137-141 days
Precipitation total (actual range)	660-686 mm
Frost-free period (average)	126 days
Freeze-free period (average)	139 days
Precipitation total (average)	660 mm

Climate stations used

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

Influencing water features

The Linear Meadow ecological site has a combination of physical and hydrological features that: 1) provide season-long ground water within two feet of the surface for most of the season 2) allows relatively free movement of water and air in the upper part of the soil, and 3) rarely to frequently flooded.
Wetland Description: Cowardin, et. al., 1979
System: Palustrine
Subsystem: N/A

Class: Emergent Wetland
Subclass: Persistent

Soil features

The soils in this site are poorly to somewhat poorly drained and formed in alluvium and beach sand. The loam to clay loam surface layer (occasionally loamy sand) is 9 to 27 inches thick and typically has a granular structure. Dark colors are very deep in these soils. The soils have a slow to moderately slow infiltration rate. This site should show no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer on this site can result in a shift in species composition and production.

The central concept soil series for this site is Chancellor, though others are included as well.

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) Silty clay loam (2) Clay loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Slow to moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4

Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–34%
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 Subirrigated site developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes occur in the plant communities due to weather fluctuations and management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions, the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase. This community phase and the Reference State have been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered.

This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dynamics of this site. Several consecutive years of heavy, continuous grazing without adequate recovery periods causes this site to depart from the interpretive plant community. Species such as little bluestem and sedge (Carex) will initially increase. Warm-season grasses such as big bluestem, Indiangrass, and switchgrass will decrease in frequency and production. Heavy, continuous grazing causes Kentucky bluegrass (Poa pratentsis) to invade, and eventually develop into a sod condition. Extended periods of non-use and no fire will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass and smooth bromegrass (*Bromus inermis*). In time, shrubs such as western snowberry (*Symphoricarpos occidentalis*) will also increase.

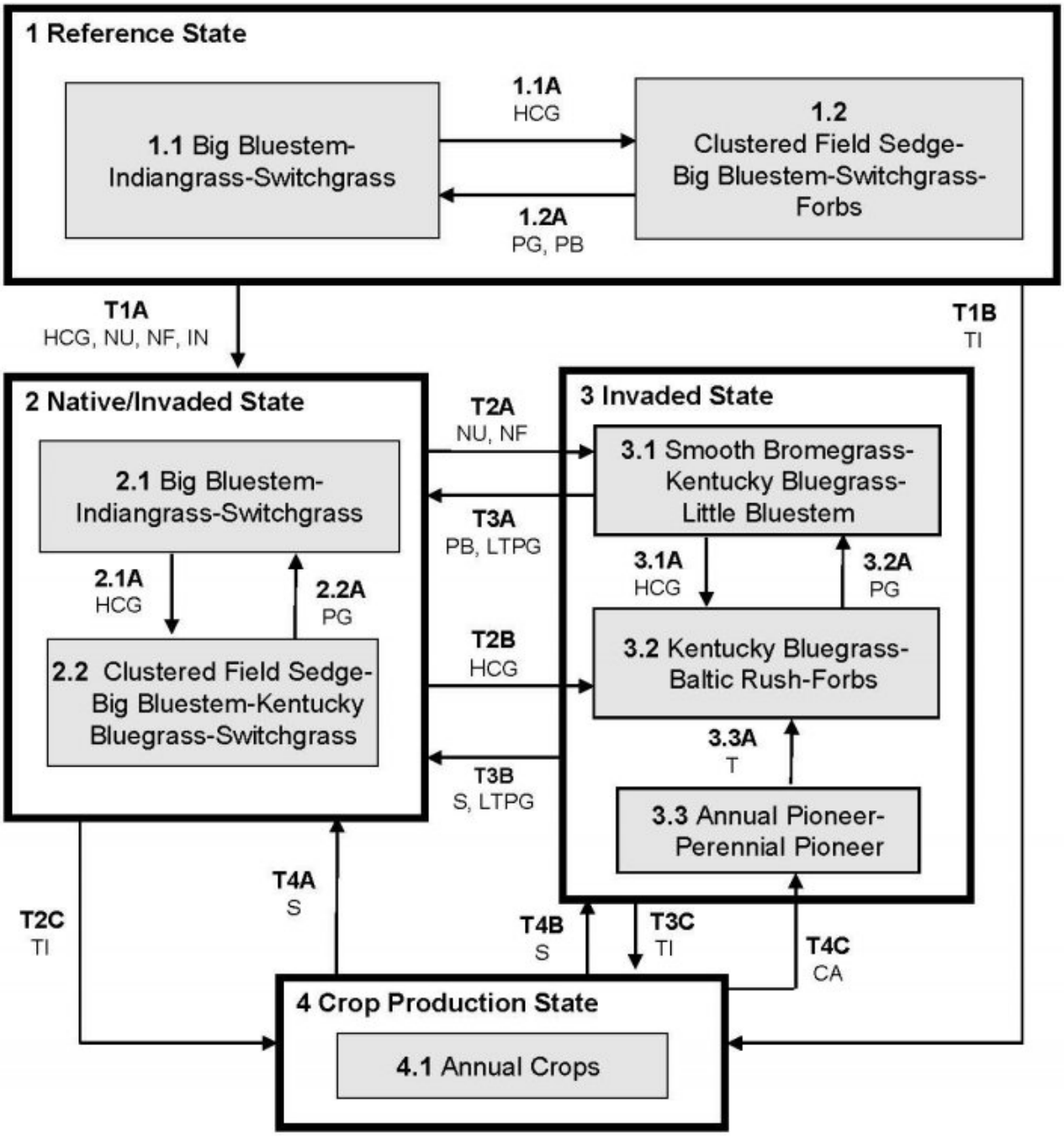
Following the state-and-transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states and community phases. The following plant composition

tables have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases or states may be revised or modified. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

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

State and transition model

Subirrigated – R102BY003SD



LEGEND
Subirrigated– R102BY003SD

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

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

Code	Process
T1A	Heavy, continuous grazing, non-use, no fire, invasion
T1B	Tillage
T2A	Non-use, no fire
T2B	Heavy, continuous grazing
T2C	Tillage
T3A	Long term prescribed grazing, prescribed burning
T3B	Long term prescribed grazing, seeding
T3C	Tillage
T4A	Seeding
T4B	Seeding
T4C	Abandonment of cropping
1.1A	Heavy, continuous grazing
1.2A	Prescribed grazing with recovery periods, prescribed burning
2.1A	Heavy, continuous grazing
2.2A	Prescribed grazing with recovery periods
3.1A	Heavy, continuous grazing
3.2A	Prescribed grazing with recovery periods
3.3A	Time w/wo disturbances

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

State 1

Reference State

The Reference State represents the natural range of variability of the dynamics of this ES. This state is typically dominated by warm-season grass and grass-like species. Before Europeans settled in North America, 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. Frequent surface fires (occurring every 3 to 5 years) and grazing, coupled with weather events dictated the natural range of variability. Today, the primary disturbance is from a lack of fire, concentrated livestock grazing, and weather fluctuations. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined and shorter statured grass and grass-likes would have increased. Today, a similar state, the Native/Invaded State (State 2) can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Big Bluestem-Indiangrass-Switchgrass

Figure 11. An example of the Reference Plant Community for the Subirrigated Site in MLRA 102B.

Interpretations are based primarily on the 1.1 Big Bluestem-Indiangrass-Switchgrass or Reference Plant Community Phase. This plant community evolved with grazing by large herbivores, frequent surface fires, and periodic flooding events, and is suited for grazing by domestic livestock. This plant community can be found on areas that are grazed and where the grazed plants receive adequate periods of rest during the growing season in order to recover. The potential vegetation was about 80 percent grasses or grass-like plants, 15 percent forbs, and five percent shrubs. The community was dominated by warm-season grasses. The major grasses included big bluestem, Indiangrass, and switchgrass. Other grass or grass-like species included little bluestem (*Schizachyrium scoparium*), prairie cordgrass, Canada wildrye (*Elymus canadensis*), sideoats grama (*Bouteloua curtipendula*), prairie dropseed (Sporobulus heterolepis), slender wheatgrass

(*Elymus trachycaulus*), and sedge. The Reference plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high tolerance to drought . This was a sustainable plant community in regards to site and 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	4775	5429	5963
Forb	269	628	1076
Shrub/Vine	112	220	359
Total	**5156**	**6277**	**7398**

Figure 13. Plant community growth curve (percent production by month). SD0220, Till Plains, lowland warm-season dominant.. Warm-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	8	15	21	26	15	8	5	0	0

Community 1.2
Clustered Field Sedge-Big Bluestem-Switchgrass-Forbs

This plant community evolved under heavy, continuous grazing or from over-utilization during extended drought periods. The potential plant community was made up of approximately 80 percent grasses and grass-like species, 15 percent forbs, and five percent shrubs. Dominant grass and grass-like species included clustered field sedge (*Carex praegracilis*), big bluestem, and switchgrass. Grass and grass-like species of secondary importance included Indiangrass, slender wheatgrass, plains bluegrass (*Poa arida*), little bluestem, rushes (Juncus), and Canada wildrye. Forbs commonly found in this plant community included goldenrod (Solidago), cudweed sagewort (*Artemisia ludoviciana*), heath aster (*Symphyotrichum ericoides*), Indian hemp (*Apocynum cannabinum*), and western yarrow (*Achillea millefolium*). This plant community had similar plant composition to the 2.2 Clustered Field Sedge-Big Bluestem-Kentucky Bluegrass-Switchgrass Plant Community Phase. The main difference is that this plant community phase did not have the presence of non-native invasive grass species such as Kentucky Bluegrass and Smooth Bromegrass. When compared to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, sedge, plains bluegrass, and grass-like species increased. Big bluestem and Indiangrass decreased, and production of tall warm-season grasses was reduced. This plant community was moderately resistant to change. The herbaceous species present were well adapted to grazing; however, species composition could be altered through long-term overgrazing. If the herbaceous component was intact, it tended to be resilient if the disturbance was not long-term. Most of the components of the ecological processes would have been functioning at optimum levels.

However, the vigor and reproductive capability of the tall warm-season grasses would have been reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allowed for an increase in shorter-statured (and shallower rooted) species.

Figure 14. Plant community growth curve (percent production by month). SD0219, Till Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	16	22	23	14	7	5	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 and periods of below normal precipitation will shift this community to the 1.2 Clusterd Field Sedge-Big Bluestem-Switchgrass-Forbs Plant Community Phase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing, and/or prescribed burning occurring at relatively frequent intervals (occurring 3 to 5 years), a return to normal disturbance regime levels and frequencies, or periodic light to moderate grazing would have converted this plant community to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase.

State 2
Native/Invaded State

This state represents the more common range of variability that exists with higher levels of grazing management in the absence of periodic fire. The Native/Invaded State is dominated by warm-season grasses. It can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. Taller warm-season species can decline and a corresponding increase in short statured grass will occur.

Community 2.1
Big Bluestem-Indiangrass-Switchgrass

This plant community phase is similar to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, but it also contains minor amounts of non-native invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 10 percent by air-dry weight). The potential vegetation is about 80 percent grasses or grass-like plants,

15 percent forbs, and five percent shrubs. The community is dominated by warm-season grasses. The major grasses include big bluestem, Indiangrass, and switchgrass. Other grass or grass-like species include little bluestem, prairie cordgrass, Canada wildrye, sideoats grama, prairie dropseed, slender wheatgrass, and sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regard to site and soil stability, watershed function, and biologic integrity.

Figure 15. Plant community growth curve (percent production by month). SD0220, Till Plains, lowland warm-season dominant.. Warm-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	8	15	21	26	15	8	5	0	0

Community 2.2
Clustered Field Sedge-Big Bluestem-Kentucky Bluegrass-Switchgrass

This plant community is a result of heavy, continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 15 percent forbs, and 5 percent shrubs. Dominant grass and grass-like species include clustered field sedge, big bluestem, Kentucky bluegrass, switchgrass and sedge. Grass and grass-like species of secondary importance include Indiangrass, slender wheatgrass, plains bluegrass, little bluestem, Kentucky bluegrass, rush, and Canada wildrye. Forbs commonly found in this plant community included goldenrod, cudweed sagewort, heath aster, Indian hemp, and western yarrow. When compared to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, sedge, plains bluegrass, and grass-like species increase. Kentucky bluegrass has also invaded. Production of tall warm-season grasses was reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. Most of the components of the ecological processes are functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses are reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allows for an increase in shorter-statured (and shallower rooted) species. The introduction of non-native invasive species such as Kentucky bluegrass and smooth bromegrass results in alterations to the soil profile. Organic matter levels tend to decrease and begin to be concentrated more in the surface layers, and the structure will begin to be modified. These changes favor the shallow rooted species and hasten their eventual dominance.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3660	4388	4971
Forb	219	504	908
Shrub/Vine	45	151	286
Total	**3924**	**5043**	**6165**

Figure 17. Plant community growth curve (percent production by month). SD0219, Till Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	16	22	23	14	7	5	0	0

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, periods of below normal precipitation, and no surface fire for extended periods of time (typically for 10 years or more) will shift this community to the 2.2 Clustered Field Sedge-Big Bluestem-Kentucky Bluegrass-Switchgrass 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 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase.

State 3
Invaded State

This state is a result of encroachment mainly by invasive introduced cool-season grasses. The ecological processes are not functioning, especially the biotic processes and the hydrologic functions. The introduced cool-season grasses cause reduced infiltration and increased runoff. Preliminary studies indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community, and native grasses represent less than 40 percent of the plant community composition. The opportunity for high intensity spring burns is severely reduced by early green-up, and increased moisture and humidity at the soil surface. Grazing pressure cannot cause a reduction in sodgrass dominance. Production is limited to the sod-forming species. As infiltration decreases and runoff increases, the amount of energy captured into the system is restricted to early season, low

producing species. Nutrient cycling is limited by root depth of the dominant species. Once the state is well established, even drastic events such as high intensity fires driven by high fuel loads of litter and thatch will not result in more than a very short-term reduction of Kentucky bluegrass. These events may reduce it's dominance, but due to the large amount of rhizomes in the soil, there is no opportunity for the native species to re-establish before Kentucky bluegrass rebounds.

Community 3.1
Smooth Bromegrass-Kentucky Bluegrass-Little Bluestem

This plant community phase is a result of extended periods of nonuse and no fire, or occasionally light levels of grazing over several years. It is characterized by dominance of smooth bromegrass and Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface and eventually a thatch-mat layer may develop at the surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. When dominated by smooth bromegrass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short as these cool-season species mature rapidly. Energy capture is also reduced. The dominance of these introduced species has been shown to alter the biotic component of the soil, organic matter levels, and eventually the soil structure. These alterations perpetuate the dominance of Kentucky bluegrass and smooth bromegrass and tend to make establishment of native species extremely difficult.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	4293	5116	5828
Forb	247	429	684
Shrub/Vine	56	171	325
Total	**4596**	**5716**	**6837**

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

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

Community 3.2

Kentucky Bluegrass-Baltic Rush-Forbs

This plant community phase is a result of heavy, continuous seasonal grazing or heavy, continuous season-long grazing. It is characterized by a dominance of Kentucky bluegrass, grass-like species, and forbs. The dominance of Kentucky bluegrass is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface and a thatch-mat layer often develops at the surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2528	3103	3547
Forb	163	448	863
Shrub/Vine	–	36	73
Total	**2691**	**3587**	**4483**

Figure 21. Plant community growth curve (percent production by month). SD0216, Till Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

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

Community 3.3
Annual Pioneer-Perennial Pioneer

This plant community developed under continuous, heavy grazing or other excessive disturbances, typically abandonment after cropping. The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and zero to five percent shrubs. The species present in this phase are highly variable, but often include non-native invasive or early seral species. Grasses may include foxtail barley, barnyard grass (Echinochia crus-galli), and quackgrass (*Elymus repens*). Dominant forbs include curlycup gumweed (*Grindelia squarrosa*), Canada thistle (*Cirsium arvense*), and other early successional species. Plant diversity is low (plant richness may be high but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will

decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community and the plant communities on adjacent sites.

Pathway 3.1A
Community 3.1 to 3.2

Heavy, continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, periods of below normal precipitation, and no surface fire for extended periods of time (typically for 10 years or more) will shift this community to the 3.2 Kentucky Bluegrass-Baltic Rush-Forbs Plant Community Phase.

Pathway 3.2A
Community 3.2 to 3.1

Prescribed grazing (alternating season of use and providing adequate recovery periods), or periodic light to moderate grazing may convert this plant community to the 3.1 Smooth Bromegrass-Kentucky Bluegrass-Little Bluestem Plant Community Phase.

Pathway 3.3A
Community 3.3 to 3.2

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 3.2 Kentucky Bluegrass-Baltic Rush-Forbs Plant Community Phase.

State 4
Crop production State

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

Community 4.1
Annual Crops

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

Transition T1A
State 1 to 2

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

Transition T1c
State 1 to 3

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer, Non-native Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group (FSG) description for adapted species and expected production (production estimates in the FSG description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T1B
State 1 to 4

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Plant Community Phase within the Crop Production State (State 4).

Transition T2A & T2B
State 2 to 3

T2A – Non-use and/or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, will likely lead this state over a threshold leading to the 3.1 Smooth Bromegrass-Kentucky Bluegrass-Little Bluestem Plant Community Phase within the Invaded State (State 3). T2B – 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 likely lead this state over a threshold leading to the 3.2 Kentucky Bluegrass-Baltic Rush-Forbs Plant Community Phase within the Invaded State (State 3). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

Transition T2C
State 2 to 4

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Plant Community Phase within the Crop Production State (State 4).

Restoration pathway T3A & T3B
State 3 to 2

T3A – Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) coupled with prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels may lead this 3.1 Smooth Bromegrass-Kentucky Bluegrass Plant Community Phase within the Invaded State (State 3) over a threshold to the Native/Invaded State (State 2). T3B – 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 Invaded State (State 3) over a threshold to the Native/Invaded State (State 2).

Transition T3C
State 3 to 4

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Plant Community Phase within the Crop Production State (State 4).

Restoration pathway T4A
State 4 to 2

Seeding may lead this Crop Production State (State 4) over a threshold to the Native/Invaded State (State 2).

Restoration pathway T4B & T4C
State 4 to 3

T4B – Seeding may lead this Crop Production State (State 4) over a threshold to the Invaded State (State 3). T4C – Cropping followed by abandonment may lead this plant community phase over a threshold to the 3.3 Annual Pioneer- Perennial Pioneer Plant Community Phase within the Invaded State (State 3).

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			1569–3766	

	big bluestem	ANGE	*Andropogon gerardii*	628–2825	–
	Indiangrass	SONU2	*Sorghastrum nutans*	628–2825	–
	switchgrass	PAVI2	*Panicum virgatum*	126–1255	–
	prairie cordgrass	SPPE	*Spartina pectinata*	63–628	–
2	**Cool-season Grasses**			314–942	
	Canada wildrye	ELCA4	*Elymus canadensis*	63–628	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	63–314	–
	plains bluegrass	POAR3	*Poa arida*	63–188	–
	common rivergrass	SCFE	*Scolochloa festucacea*	63–188	–
	prairie wedgescale	SPOB	*Sphenopholis obtusata*	0–188	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	63–188	–
3	**Mid Warm-season Grasses**			314–942	
	little bluestem	SCSC	*Schizachyrium scoparium*	314–942	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	63–314	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	63–314	–
4	**Grass-likes**			314–942	
	clustered field sedge	CAPR5	*Carex praegracilis*	63–628	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	63–628	–
	manyhead sedge	CASY	*Carex sychnocephala*	63–628	–
	rush	JUNCU	*Juncus*	63–314	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–188	–
5	**Other Native Grasses**			63–314	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–314	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–63	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–63	–
Forb					
6	**Forbs**			314–942	
	Forb, native	2FN	*Forb, native*	63–188	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	63–188	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	63–126	–

	tall blazing star	LIAS	*Liatris aspera*	63–126	–
	Canadian anemone	ANCA8	*Anemone canadensis*	63–126	–
	Indianhemp	APCA	*Apocynum cannabinum*	63–126	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	63–126	–
	purple prairie clover	DAPU5	*Dalea purpurea*	63–126	–
	goldenrod	SOLID	*Solidago*	63–126	–
	white heath aster	SYER	*Symphyotrichum ericoides*	63–126	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	63–126	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–126	–
	prairie violet	VIPE2	*Viola pedatifida*	0–63	–
	meadow zizia	ZIAP	*Zizia aptera*	0–63	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–63	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–63	–
	closed bottle gentian	GEAN	*Gentiana andrewsii*	0–63	–
	downy gentian	GEPU5	*Gentiana puberulenta*	0–63	–
	milkweed	ASCLE	*Asclepias*	0–63	–
	bluebell bellflower	CARO2	*Campanula rotundifolia*	0–63	–
	palespike lobelia	LOSP	*Lobelia spicata*	0–63	–
	rough bugleweed	LYAS	*Lycopus asper*	0–63	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	0–63	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–63	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	0–63	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–63	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–63	–
	common goldstar	HYHI2	*Hypoxis hirsuta*	0–63	–
Shrub/Vine					
7	**Shrubs**			126–314	
	leadplant	AMCA6	*Amorpha canescens*	63–188	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–126	–
	rose	ROSA5	*Rosa*	63–126	–

	willow	SALIX	*Salix*	0–126	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–126	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			504–1513	
	big bluestem	ANGE	*Andropogon gerardii*	252–1261	–
	switchgrass	PAVI2	*Panicum virgatum*	252–1009	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–504	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–252	–
2	**Cool-season Grasses**			101–504	
	plains bluegrass	POAR3	*Poa arida*	101–404	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–353	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–252	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–50	–
3	**Mid Warm-season Grasses**			0–504	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–504	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–151	–
4	**Grass-likes**			252–1513	
	clustered field sedge	CAPR5	*Carex praegracilis*	50–1009	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	50–1009	–
	manyhead sedge	CASY	*Carex sychnocephala*	50–1009	–
	rush	JUNCU	*Juncus*	50–404	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–151	–
5	**Other Native Grasses**			0–252	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–252	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–50	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–50	–
6	**Non-Native Grasses**			504–1261	

	Kentucky bluegrass	POPR	*Poa pratensis*	252–1009	–
	smooth brome	BRIN2	*Bromus inermis*	50–504	–
	timothy	PHPR3	*Phleum pratense*	0–404	–
	creeping bentgrass	AGST2	*Agrostis stolonifera*	0–404	–
Forb					
7	**Forbs**			252–757	
	Forb, introduced	2FI	*Forb, introduced*	0–252	–
	Indianhemp	APCA	*Apocynum cannabinum*	50–202	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	50–202	–
	goldenrod	SOLID	*Solidago*	50–202	–
	white heath aster	SYER	*Symphyotrichum ericoides*	50–202	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	50–151	–
	Forb, native	2FN	*Forb, native*	50–151	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	50–151	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	50–151	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–151	–
	tall blazing star	LIAS	*Liatris aspera*	0–101	–
	milkweed	ASCLE	*Asclepias*	0–101	–
	purple prairie clover	DAPU5	*Dalea purpurea*	50–101	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–101	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–50	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	0–50	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–50	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–50	–
Shrub/Vine					
8	**Shrubs**			50–252	
	rose	ROSA5	*Rosa*	50–101	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–101	–
	leadplant	AMCA6	*Amorpha canescens*	0–101	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–50	–

	willow	SALIX	*Salix*	0–50	–

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			0–572	
	big bluestem	ANGE	*Andropogon gerardii*	0–572	–
	switchgrass	PAVI2	*Panicum virgatum*	0–286	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–286	–
2	**Cool-season Grasses**			57–857	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–572	–
	plains bluegrass	POAR3	*Poa arida*	57–572	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–114	–
3	**Mid Warm-season Grasses**			0–572	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–457	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–171	–
4	**Grass-likes**			286–1143	
	clustered field sedge	CAPR5	*Carex praegracilis*	0–857	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	0–857	–
	manyhead sedge	CASY	*Carex sychnocephala*	0–857	–
	rush	JUNCU	*Juncus*	0–400	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–286	–
5	**Other Native Grasses**			0–286	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–286	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–57	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–57	–
6	**Non-Native Grasses**			1143–3144	
	smooth brome	BRIN2	*Bromus inermis*	857–2858	–
	Kentucky bluegrass	POPR	*Poa pratensis*	286–1429	–
	creeping bentgrass	AGST2	*Agrostis stolonifera*	0–572	–
	timothy	PHPR3	*Phleum pratense*	0–572	–

Forb					
7	**Forbs**			286–572	
	Forb, introduced	2FI	*Forb, introduced*	57–229	–
	Forb, native	2FN	*Forb, native*	0–171	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	57–171	–
	Indianhemp	APCA	*Apocynum cannabinum*	57–171	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	57–171	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–171	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	57–114	–
	goldenrod	SOLID	*Solidago*	57–114	–
	white heath aster	SYER	*Symphyotrichum ericoides*	57–114	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	57–114	–
	tall blazing star	LIAS	*Liatris aspera*	0–57	–
	rough bugleweed	LYAS	*Lycopus asper*	0–57	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–57	–
	milkweed	ASCLE	*Asclepias*	0–57	–
	bluebell bellflower	CARO2	*Campanula rotundifolia*	0–57	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–57	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–57	–
Shrub/Vine					
8	**Shrubs**			57–286	
	willow	SALIX	*Salix*	0–171	–
	rose	ROSA5	*Rosa*	0–114	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–114	–
	leadplant	AMCA6	*Amorpha canescens*	0–57	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–57	–

Table 12. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm season Grasses**			0–103	

1	**Tall Warm-season Grasses**			0–108	
	big bluestem	ANGE	*Andropogon gerardii*	0–108	–
	switchgrass	PAVI2	*Panicum virgatum*	0–108	–
2	**Cool-season Grasses**			0–251	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–179	–
	plains bluegrass	POAR3	*Poa arida*	0–179	–
3	**Mid Warm-season Grasses**			0–108	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–108	–
4	**Grass-likes**			179–717	
	rush	JUNCU	*Juncus*	72–538	–
	clustered field sedge	CAPR5	*Carex praegracilis*	0–179	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	0–179	–
	manyhead sedge	CASY	*Carex sychnocephala*	0–179	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–108	–
5	**Other Native Grasses**			0–179	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–179	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–36	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–36	–
6	**Non-Native Grasses**			717–2511	
	Kentucky bluegrass	POPR	*Poa pratensis*	359–2152	–
	timothy	PHPR3	*Phleum pratense*	0–538	–
	creeping bentgrass	AGST2	*Agrostis stolonifera*	0–538	–
	smooth brome	BRIN2	*Bromus inermis*	0–287	–
Forb					
7	**Forbs**			179–717	
	Forb, introduced	2FI	*Forb, introduced*	36–359	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	36–287	–
	goldenrod	SOLID	*Solidago*	36–287	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	36–251	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	36–251	–
	white heath aster	SYER	*Symphyotrichum ericoides*	36–179	–

	New England aster	SYNO2	*Symphyotrichum novae-angliae*	36–179	–
	Forb, native	2FN	*Forb, native*	0–72	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–36	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–36	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–36	–
Shrub/Vine					
8	**Shrubs**			0–72	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–72	–
	rose	ROSA5	*Rosa*	0–72	–

Animal community

Animal Community – Grazing Interpretations
The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ES description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity. Stocking rates are calculated using Animal-Unit-Month (AUM), which is the amount of air-dry forage required to feed a cow, with or without calf, for one month.

Big Bluestem/Indiangrass/Switchgrass (1.1 & 2.1)
Average Annual Production (lbs./acre, air-dry): 5,600
Stocking Rate* (AUM/acre): 1.48

Sedge/Bluestem/Kentucky Bluegrass/Switchgrass (2.2)
Average Annual Production (lbs./acre, air-dry): 4,500
Stocking Rate* (AUM/acre): 1.15

Smooth Bromegrass/Kentucky Bluegrass/Bluestem (3.1)
Average Annual Production (lbs./acre, air-dry): 5,100
Stocking Rate* (AUM/acre): 1.32

Kentucky Bluegrass/Rush/Forbs (3.2)
Average Annual Production (lbs./acre, air-dry): 3,200
Stocking Rate* (AUM/acre): 0.82

Annual/Pioneer, Non-Native Perennial (3.3)
Average Annual Production (lbs./acre, air-dry): 1,600
Stocking Rate* (AUM/acre): 0.44

*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 B, with some soils in hydrologic group A, C, and D. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by bluegrass, or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Ecological Site Correlation Issues and Questions:

• SD027 Clay County, SD did not use the (Wa) Wakonda-Worthing-Chancellor complex (national symbol h749) as used in the adjoining SD127 Union County, SD.

• SD027 Clay County, SD did not use the (Wh) Whitewood silty clay loam (national symbol h74f) as used in the adjoining SD127 Union County, SD.

• SD027 Clay County, SD did not use the (Ws) Worthing-Chancellor silty clay loams (national symbol h74h) as used in the adjoining SD127 Union County, SD.

• SD079 Lake County, SD did not use the (WcA) Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes (national symbol g1bc) as used in the adjoining SD101 Moody County, SD.

• SD101 Moody County, SD did not use the (Wh) Whitewood silty clay loam (national symbol fzf6) as used in the adjoining SD079 Lake County, SD.

• SD127 Union County, SD did not use the (WhA) Wentworth-Chancellor silty clay loams (national symbol fzks) as used in the adjoining SD083 Lincoln County, SD.

• SD127 Union County, SD did not use the (EaA) Eagan-Chancellor-Davison complex, 0 to 3 percent slopes (national symbol gymj) as used in the adjoining SD027 Clay County, SD.

• SD127 Union County, SD did not use the (EbA) Eagan-Clarno-Chancellor complex, 0 to 3 percent slopes (national symbol gymk) as used in the adjoining SD027 Clay County, SD.

• SD127 Union County, SD did not use the (Wc) Wakonda-Wentworth-Whitewood complex, 0 to 2 percent slopes (national symbol gypx) as used in the adjoining SD027 Clay County, SD.

• Reference and alternative states within the state and transition model are may not be fully documented and may require additional field sampling for refinement.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; and Bruce Kunze, Soil Scientist, NRCS.

Data Source Sample Period State County
None

Other references

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

Rangeland health reference sheet

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

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Date	12/07/2004
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 5% and less than 2 inches in diameter.

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

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

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 usually 6. Typically high root content, organic matter, and granular structure. 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: Tall warm-season rhizomatous grass >>

    Sub-dominant: Mid and tall cool-season grasses = mid warm-season grasses = grass-like species >>

    Other: Short cool-season grasses = shrubs

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

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

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14. **Average percent litter cover (%) and depth (in):** 85-90%, roughly 0.5 inch thick or less. Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 4,600-6,600 lbs./acre (air-dry weight). Reference value production is 5,600 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 Kentucky bluegrass, smooth bromegrass

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