Ecological site R102BY006SD
Limy 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 Limy Subirrigated ecological site typically occurs along the edges of drainageways or closed depressions. Soils are somewhat poorly drained which have a water table within two to five 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. Slopes typically range from zero to three percent.

Vegetation in the Reference State is dominated by warm-season grasses such as Indiangrass, big bluestem, and little bluestem. Forbs include goldenrods, cudweed sagewort, heath aster, scurfpea, and western yarrow. Non-native species such as Kentucky bluegrass, smooth brome, and quackgrass may invade this site due to a change in disturbance regime.

Associated sites

R102BY020SD	**Loamy Overflow** These sites occur in upland swales. Soils are moderately well drained and have water flow into and over the site. The central concept soil series is Trent, but other series are included.
R102BY003SD	**Subirrigated** These sites occur in drainageways. Soils are somewhat poorly drained and have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. The central concept soil series is Chancellor, but other series are included.
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.

Similar sites

R102BY003SD	**Subirrigated** The Subirrigated site occurs in drainageways. Soils are somewhat poorly drained and have a water table within two to five feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. A Subirrigated site has more big bluestem, less little bluestem and higher production than the Limy Subirrigated site.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on nearly level flood plains or swales.

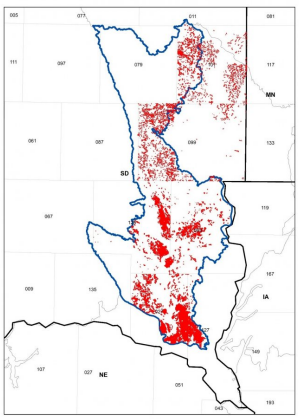


Figure 2. The Site Distribution Map for the Limy Subirrigated site in MLRA 102B.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Till plain (3) Rim
Flooding frequency	None
Ponding frequency	None
Elevation	1,100–1,900 ft
Slope	0–2%
Water table depth	24–48 in
Aspect	Aspect is not a significant factor

Climatic features

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

Annual precipitation typically ranges from 24 to 26 inches per year. The average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 14°F (Wentworth 2 WNW, South Dakota, to about 18°F (Canton 4 WNW, SD). July is the warmest month with temperatures averaging from about 72°F (Wentworth 2 WNW, SD), to about 73°F (Canton 4 WNW, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 57°F. This large annual range attests to the continental nature of the climate of this area. Hourly winds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	124-127 days
Freeze-free period (characteristic range)	138-140 days

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

Climate stations used

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

Influencing water features

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

Soil features

The soils in this site are moderately well drained and formed in alluvium, loamy till, or silty drift. The loam to clay loam surface layer is eight to 13 inches thick and typically has a granular structure. Dark colors are 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 are Davison and Wakonda, but other series are included.

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

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silty clay loam (3) Clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained
Permeability class	Slow to moderately slow
Soil depth	80 in
Surface fragment cover <=3"	0–4%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6–7 in
Calcium carbonate equivalent (0-40in)	0–20%

Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–27%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

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

The site which is located in the Till Plains Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions, the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Indiangrass-Big Bluestem-Little Bluestem 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.

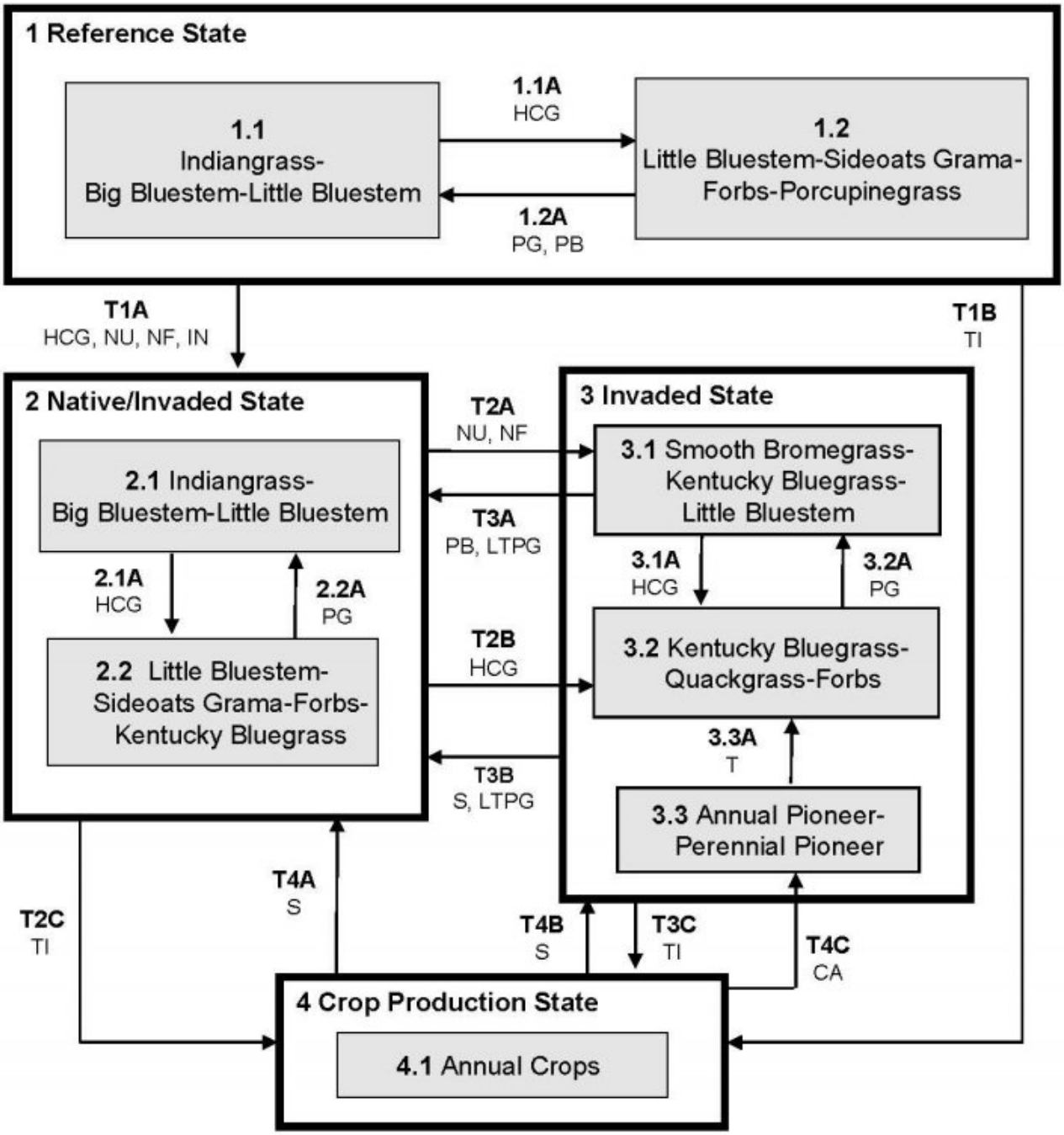
This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dynamics of this site. Heavy, continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the interpretive plant community. Species such as little bluestem, sideoats grama (*Bouteloua curtipendula*), and blue grama (*Bouteloua gracilis*) initially increase. Warm-season grasses such as big bluestem, Indiangrass, and switchgrass (*Panicum virgatum*) will decrease in frequency and production. Heavy, continuous grazing causes Kentucky bluegrass (*Poa pratensis*) to increase, 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 inermus). 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 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 states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

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

State and transition model

Limy Subirrigated – R102BY006SD



LEGEND
Limy Subirrigated– R102BY006SD

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 Limy 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
3.1A	Heavy, continuous grazing
3.2A	Prescribed grazing
3.3A	Time w/wo disturbances

Figure 10. Matrix for the Limy Subirrigated site in MLRA 102B.

State 1
Reference State

The Reference State represents the natural range of variability that determines the dynamics of this ES. This state is typically dominated by warm-season grass. Before Europeans settled in North America, the primary disturbance mechanisms for the Reference condition included periodic fire, grazing by large herding ungulates, and fluctuations in the water table. Frequent surface fires (occurring 3 to 5 years), grazing, and weather events dictated the dynamics that occurred within the natural range of variability. Today, the primary disturbance is from a lack of fire, concentrated livestock grazing, and weather fluctuations. Species that are desirable for livestock and wildlife can decline and a corresponding increase in less desirable species will occur. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined and shorter warm-season grasses would have increased. Today, a similar state, the Native/Invaded State, can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Indiangrass-Big Bluestem-Little Bluestem

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

Interpretations are based primarily on the 1.1 Indiangrass-Big Bluestem-Little Bluestem 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 Indiangrass, big bluestem, and little bluestem. Other grass or grass-like species included sideoats grama, porcupine grass, slender wheatgrass (*Elymus trachycaulus*), and sedge (Carex). A variety of native forbs were present, but only in slight amounts. This 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3355	4002	4510
Forb	200	460	830
Shrub/Vine	45	138	260
Total	**3600**	**4600**	**5600**

Figure 13. Plant community growth curve (percent production by month). SD0215, Till Plains, warm-season dominant.. Warm-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	5	15	25	30	15	7	1	0	0

Community 1.2
Little Bluestem-Sideoats Grama-Forbs-Porcupinegrass

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 75 percent grasses and grass-like species, 20 percent forbs, and five percent shrubs. Dominant grasses and grass-likes included little bluestem, sideoats grama, and porcupinegrass. Grasses of secondary importance included Indiangrass, big bluestem, blue grama, green needlegrass (*Nassella viridula*), and slender wheatgrass. Forbs commonly found in this plant community included Canada goldenrod (Solidago Canadensis), cudweed sagewort (*Artemisia ludoviciana*), heath aster (*Symphyotrichum ericoides*), scurfpea (Psoralidium), stiff goldenrod (*Oligoneuron rigidum*), and western yarrow (*Achillea millefolium*). This plant community had similar plant composition to the 2.2 Little Bluestem-Blue Grama-Forbs-Kentucky Bluegrass Plant Community Phase. The main difference is that this plant community phase did not have the presence of non-native invasive species such as Kentucky bluegrass and smooth bromegrass. When compared to the 1.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase, sideoats grama and little bluestem increased. Production of all tall warm-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). SD0214, Till Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Pathway 1.1A
Community 1.1 to 1.2

Heavy, continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation will shift this community to the 1.2 Little Bluestem-Sideoats Grama-Forbs-Porcupine Grass Plant Community Phase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing, and/or prescribed burning occurring at relatively frequent intervals (every 3 to 5 years), 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 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase.

State 2
Native/Invaded State

This state is very similar to the Reference State and represents the more common range of variability that exists with higher levels of grazing management in the absence of periodic fire due. This state is dominated by warm-season grasses and can be found on areas that are properly managed with grazing and/or prescribed burning. Invasive cool-season sod-grasses are now present in all community phases of the state. Tall warm-season species can decline and a corresponding increase in short statured grass will occur.

Community 2.1
Indiangrass-Big Bluestem-Little Bluestem

This plant community phase is similar to the 1.1 Indiangrass-Big Bluestem-Little Bluestem 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 tall and mid warm-season grasses and cool-season grasses. The major grasses include Indiangrass, big bluestem, and little bluestem. Other grass or grass-like species include sideoats grama, porcupinegrass, green needlegrass, slender wheatgrass, and sedge. This is likely a naturally nitrogen deficient plant community, but perhaps less so than the Reference State. A change in the nutrient cycle and biological activity on the ES possibly due to the introduction of non-native species may be causative factor leading to the eventual dominance of cool-season introduced grasses in the Invaded State. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high tolerance to drought . This is a sustainable plant community in regards to site and soil stability, watershed function, and biologic integrity.

Figure 15. Plant community growth curve (percent production by month). SD0215, Till Plains, warm-season dominant.. Warm-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	5	15	25	30	15	7	1	0	0

Community 2.2
Little Bluestem-Sideoats Grama-Forbs-Kentucky Bluegrass

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 75 percent grasses and grass-like species, 20 percent forbs, and five percent shrubs. Non-native grasses, such as Kentucky bluegrass and smooth bromegrass tend to increase and may begin to dominate this community phase. Dominant grasses and grass-likes include little bluestem, sideoats grama, and Kentucky bluegrass. Grasses of secondary importance included Indiangrass, big bluestem, blue grama, porcupinegrass, and slender wheatgrass. Forbs commonly found in this plant community included Canada goldenrod, cudweed sagewort, heath aster, scurfpea, stiff goldenrod, and western yarrow. When compared to the 1.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase, sideoats grama and little bluestem increased. 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 are 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. This community phase is approaching the threshold which would readily lead to the Invaded State. If management is significantly altered, this community phase can still be reverted back to the 2.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2900	3211	3475
Forb	165	475	910
Shrub/Vine	35	114	215
Total	**3100**	**3800**	**4600**

Figure 17. Plant community growth curve (percent production by month). SD0214, Till Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	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, or during periods of below normal precipitation will shift this community to the 2.2 Little Bluestem-Sideoats Grama-Forbs-Kentucky Bluegrass 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 will convert this plant community to the 2.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase.

Conservation practices

Prescribed Grazing

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 that this threshold exists 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 sod-grass dominance. Production is limited to the sod forming species. As infiltration continues to decrease and runoff increases, the energy capture into the system is restricted to early season low producing species. Nutrient cycling is limited by root depth of the dominant species.

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. 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. This plant community is somewhat resistant to change without a combination of prescribed grazing and prescribed burning. The combination of both grazing and fire is most effective in moving this plant community towards the Native/Invaded State. Once this plant community is reached, time and external resources will be needed to see any immediate recovery in diversity.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3075	3741	4180
Forb	185	430	775
Shrub/Vine	40	129	245
Total	**3300**	**4300**	**5200**

Figure 19. Plant community growth curve (percent production by month). SD0211, Till Plains, cool-season dominant.. Cool-season dominant..

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

Community 3.2
Kentucky Bluegrass-Quackgrass-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 and quackgrass (*Elymus repens*). The longer this community phase exists the more resistant and resilient it becomes. The dominance 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 is limited to the sod forming species and 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 into this system is limited to one early growing species. Runoff increases and is the highest of any plant community phase on this ES. Biological activity in the soil is likely reduced significantly in this phase.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1485	2062	2660
Forb	215	375	600
Shrub/Vine	0	63	140
Total	**1700**	**2500**	**3400**

Figure 21. Plant community growth curve (percent production by month). SD0211, Till Plains, cool-season dominant.. Cool-season dominant..

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

Community 3.3
Annual Pioneer-Perennial Pioneer

This plant community developed under continuous, heavy grazing or other excessive disturbances. The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and 0 to five percent shrubs. The species present in this phase are highly variable, but often include nonnative invasive or early seral species. The dominant vegetation includes pioneer annual or perennial grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include foxtail barley (*Hordeum jubatum*), barnyardgrass (*Echinochloa crus-galli*), quackgrass, plains bluegrass (*Poa arida*), Kentucky bluegrass, Baltic rush, and sedges. The dominant forbs will likely include Cuman ragweed, 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 increases and infiltration decreases 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, or during periods of below normal precipitation, and no surface fire for extended periods of time (typically for 10 years or more) shifts this community to the 3.2 Kentucky Bluegrass-Quackgrass-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 converts this plant community to the 3.1 Smooth Bromegrass-Kentucky Bluegrass-Little Bluestem Plant Community Phase.

Conservation practices

Prescribed Grazing

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-Quackgrass-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. Cropping on this site occurs during years with drier than normal precipitation or with artificial drainage (surface or subsurface).

Community 4.1
Annual Crops

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).

Transition T1A
State 1 to 2

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

Transition T1b
State 1 to 3

Encroachment of non-native invasive and noxious species, abandonment of cropping, or seeding of introduced and 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 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-Quackgrass-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 (every 3 to 5 years), and a return to normal disturbance regime levels may lead this 3.1 Smooth Bromegrass-Kentucky Bluegrass-Little Bluestem 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).

Conservation practices

Prescribed Grazing

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 (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			920–2070	
	Indiangrass	SONU2	*Sorghastrum nutans*	460–1840	–
	big bluestem	ANGE	*Andropogon gerardii*	230–1610	–
	switchgrass	PAVI2	*Panicum virgatum*	0–230	–
2	**Mid Warm-season Grasses**			690–1380	
	little bluestem	SCSC	*Schizachyrium scoparium*	460–1380	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	92–690	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–230	–
3	**Cool-season Grasses**			230–1150	
	porcupinegrass	HESP11	*Hesperostipa spartea*	92–920	–
	green needlegrass	NAVI4	*Nassella viridula*	46–460	–
	Canada wildrye	ELCA4	*Elymus canadensis*	46–230	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	46–230	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–138	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–138	–
4	**Other Native Grasses**			46–230	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	46–184	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–184	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–46	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–46	–
5	**Grass-likes**			46–230	
	sedge	CAREX	*Carex*	46–230	–
	spikerush	ELEOC	*Eleocharis*	0–138	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–138	–
Forb					
6	**Forbs**			230–690	
	Forb, native	2FN	*Forb, native*	46–184	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	46–138	–
	goldenrod	SOLID	*Solidago*	46–138	–
	white heath aster	SYER	*Symphyotrichum ericoides*	46–92	–

	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–92	–
	western marbleseed	ONBEO	*Onosmodium bejariense var. occidentale*	46–92	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	46–92	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	0–92	–
	Indianhemp	APCA	*Apocynum cannabinum*	46–92	–
	meadow zizia	ZIAP	*Zizia aptera*	46–92	–
	tall blazing star	LIAS	*Liatris aspera*	46–92	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	46–92	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	46–92	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	46–92	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–92	–
	purple prairie clover	DAPU5	*Dalea purpurea*	46–92	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–46	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–46	–
	closed bottle gentian	GEAN	*Gentiana andrewsii*	0–46	–
	downy gentian	GEPU5	*Gentiana puberulenta*	0–46	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–46	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–46	–
	common goldstar	HYHI2	*Hypoxis hirsuta*	0–46	–
	palespike lobelia	LOSP	*Lobelia spicata*	0–46	–
	rough bugleweed	LYAS	*Lycopus asper*	0–46	–
	bluebell bellflower	CARO2	*Campanula rotundifolia*	0–46	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–46	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–46	–
	prairie violet	VIPE2	*Viola pedatifida*	0–46	–
Shrub/Vine					
7	**Shrubs**			46–230	
	leadplant	AMCA6	*Amorpha canescens*	46–184	–
	rose	ROSA5	*Rosa*	0–92	–
	willow	SALIX	*Salix*	0–92	–
	snowberry	SYMPH	*Symphoricarpos*	0–92	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–92	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			76–570	
	big bluestem	ANGE	*Andropogon gerardii*	0–380	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–380	–
	switchgrass	PAVI2	*Panicum virgatum*	0–114	–
2	**Mid Warm-season Grasses**			570–1520	
	little bluestem	SCSC	*Schizachyrium scoparium*	380–1330	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	190–684	–

3	**Cool-season Grasses**			38–380	
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–190	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–152	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–114	–
	green needlegrass	NAVI4	*Nassella viridula*	0–114	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–76	–
4	**Other Native Grasses**			76–380	
	blue grama	BOGR2	*Bouteloua gracilis*	38–266	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	38–152	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–76	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–38	–
5	**Grass-likes**			38–190	
	sedge	CAREX	*Carex*	38–190	–
	spikerush	ELEOC	*Eleocharis*	0–152	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–76	–
6	**Non-Native Grasses**			190–570	
	Kentucky bluegrass	POPR	*Poa pratensis*	190–570	–
	smooth brome	BRIN2	*Bromus inermis*	0–266	–
	quackgrass	ELRE4	*Elymus repens*	0–190	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–190	–
Forb					
7	**Forbs**			190–760	
	goldenrod	SOLID	*Solidago*	38–228	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	38–190	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	38–152	–
	Indianhemp	APCA	*Apocynum cannabinum*	38–114	–
	Forb, introduced	2FI	*Forb, introduced*	38–114	–
	Forb, native	2FN	*Forb, native*	0–114	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	38–114	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	38–114	–
	white heath aster	SYER	*Symphyotrichum ericoides*	38–114	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–114	–
	western marbleseed	ONBEO	*Onosmodium bejariense var. occidentale*	0–114	–
	tall blazing star	LIAS	*Liatris aspera*	0–76	–
	rough bugleweed	LYAS	*Lycopus asper*	0–38	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	0–38	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	0–38	–
	meadow zizia	ZIAP	*Zizia aptera*	0–38	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–38	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–38	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–38	–

	smooth horsetail	EQLA	*Equisetum laevigatum*	0–38	–
Shrub/Vine					
8	**Shrubs**			38–190	
	snowberry	SYMPH	*Symphoricarpos*	38–152	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–76	–
	leadplant	AMCA6	*Amorpha canescens*	0–76	–
	rose	ROSA5	*Rosa*	0–76	–
	willow	SALIX	*Salix*	0–38	–

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			0–215	
	big bluestem	ANGE	*Andropogon gerardii*	0–129	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–129	–
	switchgrass	PAVI2	*Panicum virgatum*	0–86	–
2	**Mid Warm-season Grasses**			0–860	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–860	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–258	–
3	**Cool-season Grasses**			0–430	
	green needlegrass	NAVI4	*Nassella viridula*	0–344	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–215	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–129	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–43	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–43	–
4	**Other Native Grasses**			0–215	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–172	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–129	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–43	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–43	–
5	**Grass-likes**			43–215	
	sedge	CAREX	*Carex*	43–215	–
	spikerush	ELEOC	*Eleocharis*	0–172	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–86	–
6	**Non-Native Grasses**			1075–2580	
	smooth brome	BRIN2	*Bromus inermis*	645–2365	–
	Kentucky bluegrass	POPR	*Poa pratensis*	430–1505	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–645	–
	quackgrass	ELRE4	*Elymus repens*	0–129	–
Forb					
7	**Forbs**			215–645	

	white sagebrush	ARLU	*Artemisia ludoviciana*	43–215	–
	goldenrod	SOLID	*Solidago*	43–215	–
	Forb, introduced	2FI	*Forb, introduced*	43–172	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–172	–
	Forb, native	2FN	*Forb, native*	0–129	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	43–129	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	43–129	–
	white heath aster	SYER	*Symphyotrichum ericoides*	43–129	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–86	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–86	–
	tall blazing star	LIAS	*Liatris aspera*	0–43	–
	rough bugleweed	LYAS	*Lycopus asper*	0–43	–
	western marbleseed	ONBEO	*Onosmodium bejariense var. occidentale*	0–43	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	0–43	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–43	–
Shrub/Vine					
8	**Shrubs**			43–215	
	snowberry	SYMPH	*Symphoricarpos*	43–215	–
	rose	ROSA5	*Rosa*	0–86	–
	willow	SALIX	*Salix*	0–86	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–86	–
	leadplant	AMCA6	*Amorpha canescens*	0–43	–

Table 12. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			0–50	
	big bluestem	ANGE	*Andropogon gerardii*	0–50	–
	switchgrass	PAVI2	*Panicum virgatum*	0–25	–
2	**Mid Warm-season Grasses**			0–125	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–125	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–75	–
3	**Cool-season Grasses**			0–75	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–75	–
	green needlegrass	NAVI4	*Nassella viridula*	0–50	–
4	**Other Native Grasses**			0–175	
	blue grama	BOGR2	*Bouteloua gracilis*	0–150	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–75	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–25	–
5	**Grass-likes**			25–200	
	sedge	CAREX	*Carex*	25–175	–
	spikerush	ELEOC	*Eleocharis*	0–125	–

	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–50	–
6	**Non-Native Grasses**			750–1750	
	Kentucky bluegrass	POPR	*Poa pratensis*	500–1500	–
	quackgrass	ELRE4	*Elymus repens*	25–250	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–125	–
	smooth brome	BRIN2	*Bromus inermis*	0–125	–
Forb					
7	**Forbs**			250–500	
	goldenrod	SOLID	*Solidago*	25–200	–
	Forb, introduced	2FI	*Forb, introduced*	25–175	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	25–175	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	25–125	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	25–100	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–100	–
	white heath aster	SYER	*Symphyotrichum ericoides*	25–75	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–75	–
	Forb, native	2FN	*Forb, native*	0–50	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–50	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	0–25	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–25	–
Shrub/Vine					
8	**Shrubs**			0–125	
	snowberry	SYMPH	*Symphoricarpos*	0–125	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–50	–
	rose	ROSA5	*Rosa*	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. 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.

Indiangrass/Big Bluestem/Little Bluestem (1.1 & 2.1)
Average Annual Production (lbs./acre, air-dry): 4,600
Stocking Rate* (AUM/acre): 1.26

Little Bluestem/Grama/Forbs/Kentucky Bluegrass (2.2)
Average Annual Production (lbs./acre, air-dry): 3,800
Stocking Rate* (AUM/acre): 1.04

Smooth Bromegrass/Kentucky Bluegrass/Little Bluestem (3.1)
Average Annual Production (lbs./acre, air-dry): 4,300
Stocking Rate* (AUM/acre): 1.18

Kentucky Bluegrass/Quackgrass/Forbs (3.2)
Average Annual Production (lbs./acre, air-dry): 2,500
Stocking Rate* (AUM/acre): 0.69

Annual/Pioneer, Non-Native Perennial (3.3)
Average Annual Production (lbs./acre, air-dry): 1,200
Stocking Rate* (AUM/acre): 0.33

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

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland, in this area, may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C. 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:

• 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.
• SD079 Lake County, SD did not use the (Wa) Wakonda-Chancellor complex, 0 to 2 percent slopes (national symbol 2vwcm) as used in the adjoining SD099 Minnehaha County, SD.
• SD083 Lincoln County, SD did not use the (WcA) Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes (national symbol gz5w) as used in the adjoining SD099 Minnehaha County, SD.
• SD083 Lincoln County, SD did not use the (WcA) Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes (national symbol g16r) as used in the adjoining SD125 Turner County, SD.

• SD083 Lincoln County, SD did not use the (EaA) Egan-Chancellor-Davison complex, 0 to 3 percent slopes (national symbol gymj) as used in the adjoining SD027 Clay County, SD.
• SD101 Moody County, SD did not use the (Wa) Wakonda-Chancellor complex, 0 to 2 percent slopes (national symbol 2vwcm) as used in the adjoining SD099 Minnehaha 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.

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

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

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

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class 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 grasses > mid warm-season grasses >

    Sub-dominant: Mid and tall cool-season grasses > forbs >

    Other: Grass-like species = shrubs > short warm-season grasses > short cool-season grasses

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

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

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14. **Average percent litter cover (%) and depth (in):** 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 3,600-5,600 lbs./acre (air-dry weight). Reference value production is 4,600 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

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