USDA Natural Resources Conservation Service

Ecological site R055CY006SD
Limy Subirrigated

Last updated: 1/31/2024
Accessed: 05/21/2025

General information

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

Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 055C–Southern Black Glaciated Plains

The Southern Black Glaciated Plains (55C) is located within the Northern Great Plains Region. It is entirely within South Dakota encompassing about 10,835 square miles

(Figure 1). The elevation ranges from 1,310 to 1,970 square feet. The MLRA is on nearly level to undulating glacial till plains interrupted by steeper slopes adjacent to streams and moraines. The James River is an under-fit stream. Its valley was carved by floodwaters draining glacial Lake Dakota and is filled with glacial outwash and alluvial deposits. (USDA-NRCS, 2006).

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

Classification relationships

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

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

US EPA Level IV Ecoregion: Southern Missouri Coteau (42e); Southern Missouri Coteau Slope (42f); James River Lowland (46n) - (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 and have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. Soils will effervesce with acid at or near the surface. Slopes typically range from 0 to 3 percent. Vegetation in the Reference State is dominated by warm-season grasses such as little bluestem, big bluestem, and needlegrasses. Forbs include cudweed sagewort, goldenrods, and asters. Non-native species such as Kentucky bluegrass and smooth brome may invade this site due to a change in disturbance regime.

Associated sites

R055CY003SD	**Subirrigated** These sites occur in drainageways. Soils are somewhat poorly drained and have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. The central concept soil series is Crossplain, but other series are included.
R055CY004SD	**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.
R055CY020SD	**Loamy Overflow** These sites occur in upland swales. Soils are moderately well drained and have water flow into and over or through the site. The central concept soil series are Prosper and Bonilla, but other series are included.
R055CY002SD	**Linear Meadow** These sites occur in drainageways. Soils are poorly and very poorly drained and have a water table within 0 to 2 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 Lawet, but other series are included.

Similar sites

R055CY003SD	**Subirrigated** The Subirrigated site occurs 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 Subirrigated site will have more big bluestem, less little bluestem, and more production than the Limy Subirrigated site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Andropogon gerardii*

Physiographic features

This site occurs on nearly level lowlands or pothole rims.

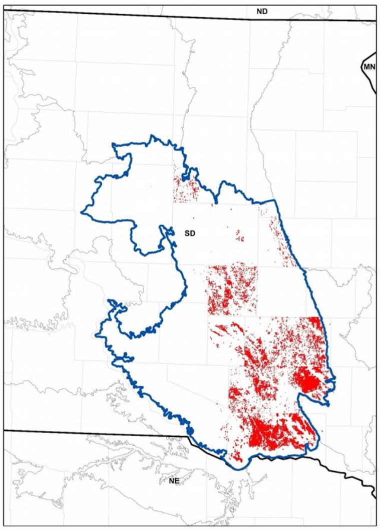


Figure 2. Distribution Map of Limy Subirrigated sites in MLRA 55C. In many cases, data is not spatially consistent across political boundaries due to the method with which soils were mapped; e. g. county subsets.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Pothole (3) Swale
Flooding frequency	None
Ponding frequency	None
Elevation	1,300–2,000 ft
Slope	1–2%
Water table depth	24–48 in
Aspect	Aspect is not a significant factor

Climatic features

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

Annual precipitation typically ranges from 19 to 25 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 15°F (Howard, South Dakota [SD]), to about 20°F (Wagner, SD). July is the warmest month with temperatures averaging from about 73°F (Howard, SD), to about 77°F (Wagner, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 12 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 11 mph during the summer. Daytime winds are generally stronger than nighttime, and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	120-129 days
Freeze-free period (characteristic range)	135-147 days
Precipitation total (characteristic range)	22-26 in
Frost-free period (actual range)	114-131 days
Freeze-free period (actual range)	132-154 days
Precipitation total (actual range)	21-27 in
Frost-free period (average)	124 days
Freeze-free period (average)	142 days
Precipitation total (average)	24 in

Climate stations used

- (1) REDFIELD [USC00397052], Redfield, SD
- (2) TYNDALL [USC00398472], Tyndall, SD
- (3) WAGNER [USC00398767], Wagner, SD
- (4) MARION [USC00395228], Marion, SD
- (5) CHAMBERLAIN MUNI AP [USW00094943], Chamberlain, SD
- (6) SALEM 5NE [USC00395360], Salem, SD
- (7) FORESTBURG 4 NNE [USC00393029], Artesian, SD
- (8) DE SMET [USC00392302], De Smet, SD
- (9) HURON RGNL AP [USW00014936], Huron, SD
- (10) MILLER [USC00395561], Miller, SD
- (11) FAULKTON 1 NW [USC00392927], Faulkton, SD

Influencing water features

This site has a persistent water table which strongly influences the production of the site but does not greatly influence the species composition. Most of the dominant species are typical upland plants.

Soil features

These are very deep, somewhat poorly to moderately well-drained, coarse to medium textured soils. These soils have a calcareous subsoil. Permeability is moderately slow and available water capacity is moderate to high. Salinity is none to slight. Soils on this site are somewhat susceptible to wind erosion. This site is on flats, potholes, and swales on outwash plains and flood plains. Slope ranges from 1 to 2 percent. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. No water flow paths are seen on this site. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive to water movement and root penetration.

Soil series is Davison.

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

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately slow
Soil depth	80 in
Surface fragment cover <=3"	0–4%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–7 in
Calcium carbonate equivalent (0-40in)	5–45%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	6.6–9
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 Southern Black Glaciated Plains Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Little Bluestem-Big Bluestem-Green Needlegrass Plant Community Phase. This community phase and the Reference State have been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered.

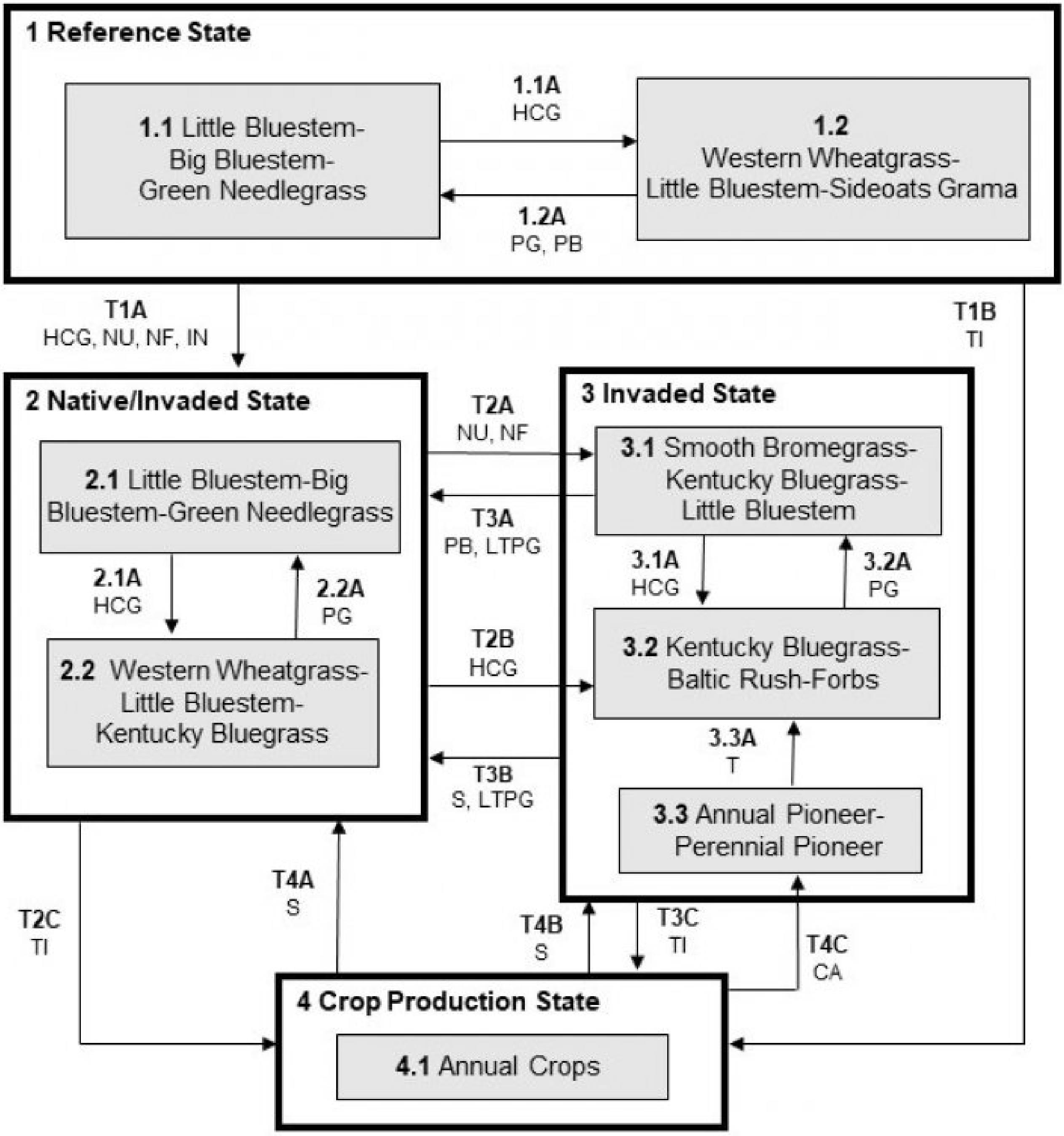
This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dynamics of this site. Heavy, continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the interpretive plant community. Species such as western wheatgrass, little bluestem and sideoats grama (*Bouteloua curtipendula*), will initially increase. Warm-season grasses such as Indiangrass (*Sorghastrum nutans*) and big bluestem will decrease in frequency and production. Heavy, continuous grazing causes Kentucky bluegrass (*Poa pratensis*) to increase and eventually develop into a sod-bound 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*).

Following the state-and-transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states and community phases. The associated plant composition tables have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

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

State and transition model

Limy Subirrigated – R055CY006SD



LEGEND
Limy Subirrigated– R055CY006SD

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. State-And-Transition Model and Legend for the Limy Subirrigated site in MLRA 55C.

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 55C.

State 1
Reference State

The Reference State represents the natural range of variability that dominates the dynamics of this ES. This state is typically dominated by warm-season grasses with a subdominant cool-season component. Before European settlement of North America, the primary disturbance mechanisms for this site in the Reference condition included periodic fire, grazing by large herding ungulates, fluctuations in the water table, and ponding frequency and duration. Frequent surface fires (every 3 to 5 years), grazing, and weather events dictated the dynamics that occurred within the natural range of variability. Today, the primary disturbance is from a lack of fire, concentrated livestock grazing, and weather fluctuations. Species that are desirable for livestock and wildlife can decline and a corresponding increase in less desirable species will occur.

Community 1.1
Little Bluestem-Big Bluestem-Green Needlegrass

Interpretations are based primarily on the 1.1 Little Bluestem/Big Bluestem/Needlegrass Plant Community Phase (this is also considered Reference). This community phase was the most dominant both temporally and spatially. The prevailing climate and weather patterns favored the development of this community phase dominated by tall and mid-warm-season and mid-cool-season grasses such as little bluestem, big bluestem, porcupinegrass, and green needlegrass. Other grass and grass-like species included switchgrass, Indiangrass, sideoats grama, western wheatgrass, slender wheatgrass, and sedge. A variety of native perennial forbs were present but only in slight amounts. The potential vegetation was about 85 percent grass and grass-like species, 10 percent forbs, and 5 percent shrubs by air-dry weight. This plant community phase was diverse, stable, and productive, and was well adapted to the Northern Great Plains. The water table supplied much of the moisture for plant growth. Community dynamics, the nutrient and water cycles, and energy flow were functioning properly. Plant litter was properly distributed with very little movement offsite and natural plant mortality was very low. This was a sustainable plant community in terms of soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2950	3560	4100
Forb	175	300	475
Shrub/Vine	75	140	225
Total	**3200**	**4000**	**4800**

Figure 12. Plant community growth curve (percent production by month). SD5509, Southern Black Glaciated 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

Community 1.2
Western Wheatgrass-Little Bluestem-Sideoats Grama

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 5 percent shrubs. Dominant grasses and grass-likes included western wheatgrass, little bluestem, sideoats grama, blue grama (*Bouteloua gracilis*), and sedges. Other grasses and grass-likes include big bluestem, tall dropseed (*Sporobolus compositus*), green needlegrass, porpupinegrass, rush (Juncus), witchgrass (*Panicum capillare*), switchgrass, Indiangrass, and Canada wildrye (*Elymus canadensis*). Forbs commonly found in this plant community included cudweed sagewort (*Artemisia ludoviciana*), goldenrod (Oligoneuron), and western yarrow (*Achillea millefolium*). This plant community had similar plant composition to the 2.2 Western Wheatgrass-Little Bluestem-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 Little Bluestem-Big Bluestem-Green Needlegrass Plant Community Phase, blue gramma, sideoats grama and western wheatgrass increased. Little Bluestem, big bluestem, and Indiangrass decreased, and production of all tall 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 13. Plant community growth curve (percent production by month). SD5509, Southern Black Glaciated 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, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites, will shift this community to the 1.2 Western Wheatgrass-Little Bluestem-Sideoats Grama 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, possibly including periodic rest, would have converted this plant community to the 1.1 Little Bluestem-Big Bluestem-Green Needlegrass Plant Community Phase.

State 2
Native/Invaded State

The Native/Invaded State is very similar to the Reference State and represents the more common range of variability that exists with higher levels of grazing management but in the absence of periodic fire due to fire suppression. This 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. Invasive cool-season sod-grasses are now present in all community phases of the state. Taller warm-season species can decline and a corresponding increase in short statured grass will occur.

Community 2.1
Little Bluestem-Big Bluestem-Green Needlegrass

This plant community phase is similar to the 1.1 Little Bluestem-Big Blustem-Green Needlegrass 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 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by tall and mid- warm-season and cool-season grasses. The major grasses include little bluestem, big bluestem, green needlegrass, and porcupinegrass. Other grass or grass-like species include switchgrass, Indiangrass, sideoats grama, western wheatgrass, slender wheatgrass, and sedges. A variety of native perennial forbs are present but only in minor amounts. 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 a 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 14. Plant community growth curve (percent production by month). SD5509, Southern Black Glaciated 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

Community 2.2
Western Wheatgrass-Little Bluestem-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 85 percent grasses and grass-like species, 10 percent forbs, and 5 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 western wheatgrass, little bluestem, sideoats grama, blue grama, Kentucky bluegrass, and sedges. Other grasses and grass-likes included big bluestem, tall dropseed, green needlegrass, porcupinegrass, rush, witchgrass, switchgrass, Indiangrass, and Canada wildrye. Forbs commonly found in this plant community included cudweed sagewort, goldenrod, and western yarrow. Western snowberry (*Symphoricarpos occidentalis*) and prairie rose (*Rosa arkansana*) are the principal shrubs. When compared to the 1.1 Little Bluestem-Big Bluestem-Green Needlegrass 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 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 if steps are not taken to reduce these species. 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 Little Bluestem-Big Bluestem Green Needlegrass Plant Community Phase.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1845	2523	3120
Forb	130	290	520
Shrub/Vine	25	87	160
Total	**2000**	**2900**	**3800**

Figure 16. Plant community growth curve (percent production by month). SD5508, Southern Black Glaciated Plains, lowland cool-season/warm-season codominant.. Cool-season, warm-season codominant, lowland..

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

Pathway 2.1A
Community 2.1 to 2.2

Heavy, continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites, will shift this community to the 2.2 Western Wheatgrass-Little Bluestem-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, possibly including periodic rest, will convert this plant community to the 2.1 Little Bluestem-Big Bluestem-Green Needlegrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 3
Invaded State

The Invaded State is the result of invasion and dominance of introduced species. This state is characterized by the dominance of Kentucky bluegrass and an increasing thatch layer that effectively blocks introduction of other plants into the system. Plant litter accumulation tends to favor the more shade tolerant introduced grass species. The nutrient cycle is also impaired and the result is typically a higher level of nitrogen which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns thereby shifting competitive advantage to shade tolerant introduced grass species. Studies indicate that soil biological activity is altered and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in sod-grass dominance. Preliminary studies would tend to 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. 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 the dominance of Kentucky bluegrass but due to the large amount of rhizomes in the soil there is no opportunity for the native species to 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 non-use 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. 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, as well as 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	2580	3115	3695
Forb	155	263	410
Shrub/Vine	65	122	195
Total	**2800**	**3500**	**4300**

Figure 18. Plant community growth curve (percent production by month). SD5506, Southern Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

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

Community 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 with lesser amounts of Baltic Rush and other grass likes. Some native and non-native forbs can increase in production and cover as well. The dominant grass is Kentucky bluegrass, with common forbs including cudweed sagewort, goldenrod, aster (Aster), Cuman ragweed (*Ambrosia psilostachya*), western yarrow, and a variety of introduced forbs. 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 evenually a thatch-mat layer may develop 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	1410	1837	2205
Forb	190	330	525
Shrub/Vine	0	33	70
Total	**1600**	**2200**	**2800**

Figure 20. Plant community growth curve (percent production by month). SD5506, Southern Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

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

Community 3.3
AnnualPioneer-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 5 percent shrubs. The species present in this phase are highly variable, but often include non-native 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 (*Elymus repens*), 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 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 or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites, and no surface fire for extended periods of time (typically for 10 years or more) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, 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, possibly including periodic rest, 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

The Crop Production State is characterized by the production of annual crops using a variety of tillage and cropping systems along with management practices. Cropping on this site is enabled during years with drier than normal precipitation or with artificial drainage (surface or subsurface).

Community 4.1
Annual Crops

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

Transition T1A
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, 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 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
State 2 to 3

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). 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
State 3 to 2

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest), prescribed burning occurring at relatively frequent intervals (every 3 to 5 years), and a return to normal disturbance regime levels may lead this 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). 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 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
State 4 to 3

Seeding may lead this Crop Production State (State 4) over a threshold to the Invaded State (State 3). 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	**Mid Warm-Season Grasses**			800–1600	
	little bluestem	SCSC	*Schizachyrium scoparium*	600–1600	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	80–400	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	40–200	–
2	**Tall Warm-Season Grasses**			400–1000	
	big bluestem	ANGE	*Andropogon gerardii*	200–800	–
	switchgrass	PAVI2	*Panicum virgatum*	40–400	–
	Indiangrass	SONU2	*Sorghastrum nutans*	80–400	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–200	–
3	**Cool-Season Bunchgrasses**			200–600	
	porcupinegrass	HESP11	*Hesperostipa spartea*	80–600	–
	green needlegrass	NAVI4	*Nassella viridula*	80–600	–
	Canada wildrye	ELCA4	*Elymus canadensis*	40–200	–
4	**Wheatgrass**			200–400	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	80–400	–

	western wheatgrass	PASM	*Pascopyrum smithii*	80–400	–
5	**Short Warm-Season Grasses**			80–320	
	blue grama	BOGR2	*Bouteloua gracilis*	40–200	–
	witchgrass	PACA6	*Panicum capillare*	40–120	–
	saltgrass	DISP	*Distichlis spicata*	0–80	–
6	**Other Native Grasses**			40–200	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–200	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	40–120	–
7	**Grass-likes**			80–400	
	sedge	CAREX	*Carex*	80–320	–
	rush	JUNCU	*Juncus*	0–80	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–80	–
Forb					
8	**Forbs**			200–400	
	Forb, native	2FN	*Forb, native*	40–120	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	40–80	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	40–80	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	40–80	–
	aster	ASTER	*Aster*	40–80	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	40–80	–
	sunflower	HELIA3	*Helianthus*	0–80	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	40–80	–
	dotted blazing star	LIPU	*Liatris punctata*	40–80	–
	soft-hair marbleseed	ONBEB	*Onosmodium bejariense var. bejariense*	0–80	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	40–80	–
	cinquefoil	POTEN	*Potentilla*	40–80	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	40–80	–
	goldenrod	SOLID	*Solidago*	40–80	–
	white heath aster	SYER	*Symphyotrichum ericoides*	40–80	–

	Nuttall's violet	VINU2	*Viola nuttallii*	0–40	–
	meadow zizia	ZIAP	*Zizia aptera*	0–40	–
	ragwort	SENEC	*Senecio*	0–40	–
	blue lettuce	LATA	*Lactuca tatarica*	0–40	–
	tall blazing star	LIAS	*Liatris aspera*	0–40	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–40	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–40	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–40	–
Shrub/Vine					
9	**Shrubs**			80–200	
	false indigo bush	AMFR	*Amorpha fruticosa*	0–120	–
	snowberry	SYMPH	*Symphoricarpos*	40–120	–
	rose	ROSA5	*Rosa*	40–80	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–80	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid Warm-Season Grasses**			435–725	
	little bluestem	SCSC	*Schizachyrium scoparium*	290–580	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	145–435	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–29	–
2	**Tall Warm-Season Grasses**			145–435	
	big bluestem	ANGE	*Andropogon gerardii*	58–290	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	29–203	–
	switchgrass	PAVI2	*Panicum virgatum*	0–87	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–87	–
3	**Cool-Season Bunchgrasses**			0–145	
	green needlegrass	NAVI4	*Nassella viridula*	0–145	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–116	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–58	–
4	**Wheatgrass**			290–580	
	western wheatgrass	PASM	*Pascopyrum smithii*	290–580	–

	western wheatgrass	PASM	*Pascopyrum smithii*	[illegible]	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–145	–
5	**Short Warm-Season Grasses**			145–435	
	blue grama	BOGR2	*Bouteloua gracilis*	87–348	–
	witchgrass	PACA6	*Panicum capillare*	29–145	–
	saltgrass	DISP	*Distichlis spicata*	0–87	–
6	**Other Native Grasses**			29–145	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–145	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	29–58	–
7	**Grass-likes**			145–290	
	sedge	CAREX	*Carex*	87–290	–
	rush	JUNCU	*Juncus*	29–145	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–87	–
8	**Non-Native Grasses**			145–435	
	Kentucky bluegrass	POPR	*Poa pratensis*	58–435	–
	quackgrass	ELRE4	*Elymus repens*	0–290	–
	smooth brome	BRIN2	*Bromus inermis*	0–87	–
Forb					
9	**Forbs**			145–435	
	goldenrod	SOLID	*Solidago*	29–174	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	29–116	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	29–116	–
	Forb, introduced	2FI	*Forb, introduced*	29–116	–
	Forb, native	2FN	*Forb, native*	0–87	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	29–87	–
	white heath aster	SYER	*Symphyotrichum ericoides*	29–87	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	29–87	–
	cinquefoil	POTEN	*Potentilla*	29–58	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–58	–
	dotted blazing star	LIPU	*Liatris punctata*	0–58	–
	aster	ASTER	*Aster*	0–58	–

	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–58	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–58	–
	sunflower	HELIA3	*Helianthus*	0–58	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–29	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–29	–
	soft-hair marbleseed	ONBEB	*Onosmodium bejariense var. bejariense*	0–29	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–29	–
	ragwort	SENEC	*Senecio*	0–29	–
Shrub/Vine					
10	**Shrubs**			29–145	
	snowberry	SYMPH	*Symphoricarpos*	29–87	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–58	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–58	–
	rose	ROSA5	*Rosa*	0–58	–

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid Warm-Season Grasses**			0–525	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–525	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–175	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–70	–
2	**Tall Warm-Season Grasses**			0–350	
	big bluestem	ANGE	*Andropogon gerardii*	0–245	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–175	–
	switchgrass	PAVI2	*Panicum virgatum*	0–70	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–70	–
3	**Cool-Season Bunchgrasses**			0–350	
	green needlegrass	NAVI4	*Nassella viridula*	0–280	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–105	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–70	–

4	**Wheatgrass**			0–175	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–175	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–175	–
5	**Short Warm-Season Grasses**			0–245	
	blue grama	BOGR2	*Bouteloua gracilis*	0–105	–
	witchgrass	PACA6	*Panicum capillare*	0–105	–
	saltgrass	DISP	*Distichlis spicata*	0–70	–
6	**Other Native Grasses**			35–175	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	35–175	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–70	–
7	**Grass-likes**			70–280	
	sedge	CAREX	*Carex*	35–175	–
	rush	JUNCU	*Juncus*	35–175	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–70	–
8	**Non-Native Grasses**			875–1750	
	Kentucky bluegrass	POPR	*Poa pratensis*	700–1400	–
	smooth brome	BRIN2	*Bromus inermis*	175–700	–
	quackgrass	ELRE4	*Elymus repens*	0–175	–
Forb					
9	**Forbs**			175–350	
	goldenrod	SOLID	*Solidago*	35–140	–
	aster	ASTER	*Aster*	35–140	–
	Forb, introduced	2FI	*Forb, introduced*	35–105	–
	Forb, native	2FN	*Forb, native*	0–105	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	35–105	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	35–105	–
	white heath aster	SYER	*Symphyotrichum ericoides*	35–105	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	35–105	–
	meadow zizia	ZIAP	*Zizia aptera*	0–70	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	35–70	–
	cinquefoil	POTEN	*Potentilla*	0–70	–

	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–35	–
	ragwort	SENEC	*Senecio*	0–35	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–35	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–35	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–35	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–35	–
	sunflower	HELIA3	*Helianthus*	0–35	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–35	–
	blue lettuce	LATA	*Lactuca tatarica*	0–35	–
	tall blazing star	LIAS	*Liatris aspera*	0–35	–
	dotted blazing star	LIPU	*Liatris punctata*	0–35	–
Shrub/Vine					
10	**Shrubs**			70–175	
	snowberry	SYMPH	*Symphoricarpos*	35–105	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–70	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–70	–
	rose	ROSA5	*Rosa*	35–70	–

Table 12. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid Warm-Season Grasses**			0–110	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–110	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–66	–
2	**Tall Warm-Season Grasses**			0–110	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–110	–
	switchgrass	PAVI2	*Panicum virgatum*	0–22	–
3	**Short Warm-Season Grasses**			0–220	
	blue grama	BOGR2	*Bouteloua gracilis*	0–154	–
	witchgrass	PACA6	*Panicum capillare*	0–110	–
	saltgrass	DISP	*Distichlis spicata*	0–66	–
4	**Other Native Grasses**			22–110	

4	**Other Native Grasses**			22–110	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–110	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	22–44	–
5	**Grass-likes**			22–440	
	rush	JUNCU	*Juncus*	22–330	–
	sedge	CAREX	*Carex*	0–110	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–44	–
6	**Non-Native Grasses**			770–1320	
	Kentucky bluegrass	POPR	*Poa pratensis*	550–1100	–
	quackgrass	ELRE4	*Elymus repens*	110–440	–
	smooth brome	BRIN2	*Bromus inermis*	0–176	–
Forb					
7	**Forbs**			220–440	
	goldenrod	SOLID	*Solidago*	22–220	–
	Forb, introduced	2FI	*Forb, introduced*	44–220	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	22–154	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	22–132	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	22–132	–
	white heath aster	SYER	*Symphyotrichum ericoides*	22–110	–
	Forb, native	2FN	*Forb, native*	0–110	–
	aster	ASTER	*Aster*	0–88	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	22–66	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–44	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–22	–
	cinquefoil	POTEN	*Potentilla*	0–22	–
	ragwort	SENEC	*Senecio*	0–22	–
Shrub/Vine					
8	**Shrubs**			0–66	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–44	–
	snowberry	SYMPH	*Symphoricarpos*	0–44	–
	rose	ROSA5	*Rosa*	0–22	–

Animal community

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. After 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.

Little Bluestem/Big Bluestem/Needlegrass (1.1 & 2.1)
Average Annual Production (lbs./acre, air-dry): 4,400
Stocking Rate* (AUM/acre): 1.20

Wheatgrass/Little Bluestem/Grama/Kentucky Bluegrass (2.2)
Average Annual Production (lbs./acre, air-dry): 2,900
Stocking Rate* (AUM/acre): 0.79

Kentucky Bluegrass/Smooth Bromegrass/Decadent Bluestem (3.1)
Average Annual Production (lbs./acre, air-dry): 3,500
Stocking Rate* (AUM/acre): 0.96

Kentucky Bluegrass/Baltic Rush/Forbs (3.2)
Average Annual Production (lbs./acre, air-dry): 2,200
Stocking Rate* (AUM/acre): 0.60

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 contains soils in hydrologic group B. Infiltration is moderately slow and runoff potential for this site is negligible to medium. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Ecological Site Correlation Issues and Questions:

• SD043 Bon Homme County, SD did not use the (CeB) Clarno-Davison loams, 2 to 4 percent slopes (national symbol g0x4) as used in the adjoining SD602 Hanson and Hutchinson Counties, SD.
• SD023 Charles Mix County, SD did not use the (DcB) Davison-Onita complex, 2 to 6 percent slopes (national symbol g0xc) as used in the adjoining SD602 Hanson and Hutchinson Counties, SD.
• SD003 Aurora County, SD did not use the (TcA) Tetonka-Davison-Clarno complex, 0 to 2 percent slopes (national symbol cx6k) as used in the adjoining SD111 Sanborn County, SD.
• SD073 Jerauld County, SD did not use the (TcA) Tetonka-Davison-Clarno complex, 0 to 2 percent slopes (national symbol cx6k) as used in the adjoining SD111 Sanborn County, SD.
• SD035 Davison County, SD did not use the (TcA) Tetonka-Davison-Clarno complex, 0 to 2 percent slopes (national symbol cx6k) as used in the adjoining SD111 Sanborn County, SD.
• SD005 Beadle County, SD did not use the (TcA) Tetonka-Davison-Clarno complex, 0 to

2 percent slopes (national symbol cx6k) as used in the adjoining SD111 Sanborn County, SD.
• SD097 Miner County, SD did not use the (TcA) Tetonka-Davison-Clarno complex, 0 to 2 percent (national symbol cx6k) as used in the adjoining SD111 Sanborn County, SD.
• SD097 Miner County, SD did not use the (Dc) Davison-Crossplain complex (national symbol g0dt) as used in the adjoining SD077 Kingsbury County, SD.
• SD079 Lake County, SD did not use the (HdA) Hand-Davison-Crossplain complex, 0 to 2 percent slopes (national symbol g0zv) as used in the adjoining SD087 McCook County, SD.
• SD079 Lake County, SD did not use the (HcB) Hand-Davison complex, 2 to 5 percent slopes (national symbol g0zt) as used in the adjoining SD087 McCook County, SD.
• SD059 Hand County, SD did not use the (Lp) Lawet-Davison loams, 0 to 2 percent slopes (national symbol cz4q) as used in the adjoining SD115 Spink County, SD.
• SD059 Hand County, SD did not use the (Dd) Davison-Tetonka complex, 0 to 2 percent slopes (national symbol cz1r) as used in the adjoining SD115 Spink County, SD.
• SD005 Beadle County, SD did not use the (Lp) Lawet-Davison loams, 0 to 2 percent slopes (national symbol cz4q) as used in the adjoining SD115 Spink County, SD.
• SD005 Beadle County, SD did not use the (Dd) Davison-Tetonka complex, 0 to 2 percent slopes (national symbol cz1r) as used in the adjoining SD115 Spink 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.

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Contributors

Stan Boltz

Approval

Suzanne Mayne-Kinney, 1/31/2024

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Contact for Lead Authors: Natural Resources Conservation Service (USDA-NRCS), Redfield Soil Survey Office Redfield, SD; Lance Howe (Lance.Howe@usda.gov), Soil Survey Office Leader, USDA-NRCS, Redfield, SD; and Steve Winter (Steven.Winter@usda.gov), Soil Scientist, USDA-NRCS, Redfield, SD

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

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

Rangeland health reference sheet

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

Author(s)/participant(s)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	david.schmidt@sd.usda.gov 605-352-1236
Date	12/07/2004

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

Indicators

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

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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 five percent and less than two inches in diameter.

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

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

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

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

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color**

and thickness): Use soil series description for depth and color of A-horizon.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep rooted native grasses enhance infiltration and reduce runoff.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be evident.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Mid-warm season bunch grass >>

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

    Other: Mid cool-season rhizomatous grass > short cool-season grass = forb.

    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):** Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3,200–4,800 lbs./acre air-dry weight, average 4,000 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, Kentucky bluegrass.

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