USDA Natural Resources
Conservation Service

Ecological site R053CY003SD
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.

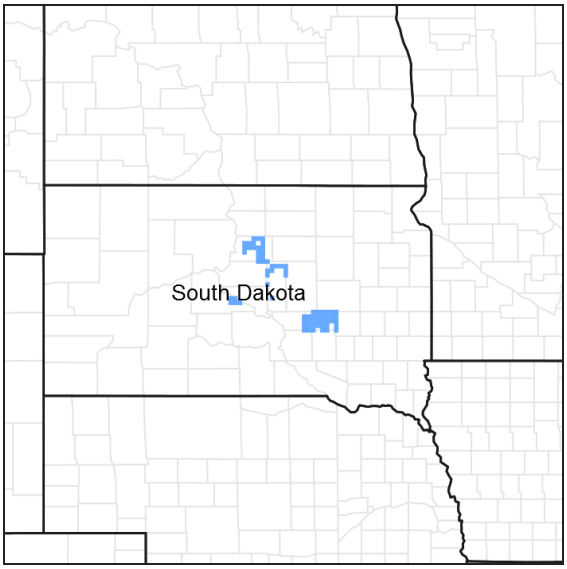


Figure 1. Mapped extent

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): 053C–Southern Dark Brown Glaciated Plains

The Southern Dark Brown Glaciated Plains (53C) is located within the Northern Great Plains Region. It is entirely in South Dakota encompassing about 3,990 square miles (Figure 1). The elevation ranges from 1,300 to 2,300 feet. The MLRA is level to gently rolling till plains including many areas of potholes. A terminal moraine occurs in the southern end of the MLRA. Moderately steep and steep slopes are adjacent to the major valleys. The headwaters of many creeks in central South Dakota occur in the high-lying MLRA. (USDA-NRCS 2006).

The dominant soil orders in this MLRA is Mollisols and Inceptisols. 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 or moderately well drained, and are loamy or clayey. This area supports natural prairie vegetation characterized by western wheatgrass (Pascopyrum smithii), big bluestem (Andropogon gerardii), needleandthread (Hesperostipa comata), and green needlegrass (Nassella viridula). Little bluestem (*Schizachyrium scoparium*), sideoats grama (Bouteloua curtipendula), and prairie sandreed (Calamovilfa longifolia) are important species on steeper sites. Western snowberry (Symphoricarpos occidentalis) and prairie rose (Rosa arkansana) are commonly dispersed throughout the area. (USDA-NRCS 2006).

Classification relationships

Major Land Resource Area (MLRA): Southern Dark Brown Glaciated Plains (53C) (USDA-NRCS 2006)

USFS Subregions: Northeastern Glaciated Plains Section (331E); Missouri Coteau Subsection (331Ea); Western Great Plains Section (331F); Missouri Breaks Subsection (331Fe); Western Glaciated Plains Section (332B); Southern Missouri Coteau Slope Subsection (332Bd, 332Be); 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: Missouri Coteau (42a); Southern Missouri Coteau (42e); Southern Missouri Coteau Slope (42f) - (USEPA 2013)

Ecological site concept

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

Vegetation in the Reference State is dominated by warm-season grasses including big bluestem, Indiangrass, and switchgrass. Grass-like species occurring on this site may include clustered field sedge. Forbs present may include goldenrod, showy milkweed, asters, and American licorice. Non-native species such as Kentucky bluegrass and smooth brome may invade the site due to changes in disturbance regime.

Associated sites

R053CY004SD	**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.
R053CY006SD	**Limy Subirrigated** These sites occur along the edges of drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. Soils will effervesce with acid at or near the surface. The central concept soil series is Davison, but other series are included.
R053CY020SD	**Loamy Overflow** These sites occur in upland swales. Soils are moderately well drained which have water flow into and over/through the site. The central concept soil series is Mobridge, Onita, and Prosper, but other series are included.

Similar sites

R053CY020SD	**Loamy Overflow** These sites occur in upland swales. Soils are moderately well drained which have water flow into and over/through the site. (less sedges and prairie cordgrass; lower production)
R053CY006SD	**Limy Subirrigated** The Limy Subirrigated site occurs along the edges of drainageways. Soils are similar in drainage class and water table but will effervesce with acid at or near the surface.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on nearly level floodplains.

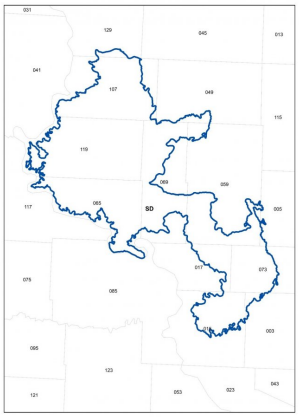


Figure 2.

Table 2. Representative physiographic features

Landforms	(1) Lake plain (2) Till plain (3) Outwash plain
Flooding duration	Very brief (4 to 48 hours) to very long (more than 30 days)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	1,300–2,300 ft
Slope	0–1%
Water table depth	6–24 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 53C 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 15 to 25 inches per year. The average annual temperature is about 45°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, South Dakota (SD)), to about 16°F (Onida 4 NW, SD). July is the warmest month with temperatures averaging from about 72°F (Stephan, SD), to about 74°F (Onida 4 NW, 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. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (average)	141 days
Freeze-free period (average)	160 days

Precipitation total (average)	25 in

Influencing water features

This ecological site (ES) has a combination of physical and hydrological features that: 1) typically provides ground water within two to five feet of the surface for most of the season, 2) allows relatively free movement of water and air in the upper part of the soil, and 3) are rarely to frequently flooded.

Wetland description

Cowardin, et. al., 1979
System: Palustrine
Subsystem: N/A
Class: Emergent Wetland
Subclass: Persistent

Soil features

These are very deep, poorly to somewhat poorly drained, moderately fine textured soils. Permeability is very slow to slow and available water capacity is moderate to high. Salinity is none to very slight and sodicity is typically none to slight. These soils have a high water table (one to two feet from the surface) which keeps the rooting zone moist for most of the growing season. This site is on flood plains and on the rims of potholes. Slope ranges from zero to one 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. The central concept soil series for this site is Crossplain, but others are included as well.

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

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Loam
Family particle size	(1) Loamy
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Slow to very slow
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6–7 in
Calcium carbonate equivalent (0-40in)	0–45%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–20
Soil reaction (1:1 water) (0-40in)	5.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–2%

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 Dark Brown 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/or management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase. This community phase and the Reference State have been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered. Due to a general invasion of exotic species (such as Kentucky bluegrass (Poa pratentsis) and smooth bromegrass (*Bromus inermis*)) across the MLRA within this site, returning to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase may not be possible.

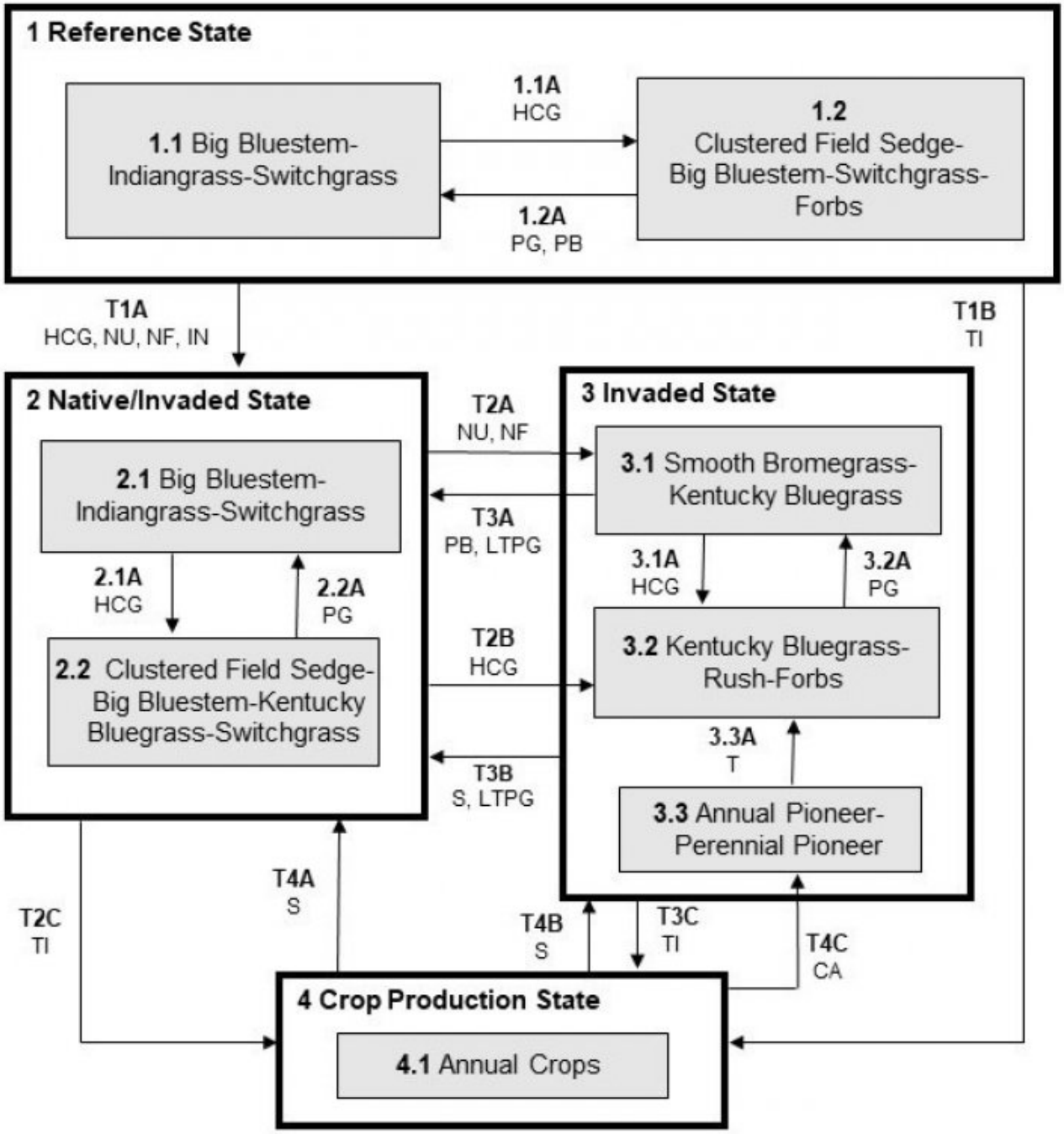
This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dymanics of this site. Heavy continuous grazing causes Kentucky bluegrass to invade and eventually develop into a sod condition. Extended periods of non-use and no fire will result in a plant community having high litter levels, which favors an increase in Redtop (*Agrostis stolonifera*), Kentucky bluegrass and smooth bromegrass. Warm-season grasses such as Indiangrass and big bluestem will decrease in frequency and production.

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

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

State and transition model

Subirrigated – R053CY003SD



LEGEND
Subirrigated– R053CY003SD

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 5. State-And-Transition model

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

Figure 6. Matrix

State 1
Reference State

The Subirrigated site typically occurs in drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The central concept soil series is Crossplain, but others are included. This state represents the natural range of variability that dominates the dynamics of this ES. This state is typically dominated by warm-season grasses. Before European settlement, the primary disturbance mechanisms for this site in the reference condition included periodic fire, grazing by large herding ungulates, and fluctuations in the water table and ponding frequency and duration. Frequent surface fires (3 to 5 years) and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Currently, 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. Today a similar state (State 2) exists on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. These sites are differentiated by the presence of exotic species such as Kentucky bluegrass and smooth bromegrass. On most subirrigated ESs within the MLRA, these species have invaded and are now present. It is likely that attaining the reference state as described here (without the presence of exotic herbaceous species) is not possible.

Community 1.1
Big Bluestem-Indiangrass-Switchgrass

– Interpretations are based primarily on the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase (this is also considered to be climax). 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 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community was dominated by warm-season grasses. The major grasses included big bluestem, Indiangrass, and switchgrass. Other grass or grass-like species included sedges (Cyperaceae), little bluestem (*Schizachyrium scoparium*), porcupine grass (*Hesperostipa spartea*), Canada wildrye (*Elymus canadensis*), slender wheatgrass (*Elymus trachycaulus*), and western wheatgrass. Common forbs are Maximillian sunflower (*Helianthus maximiliani*), Illinois bundleflower (*Desmanthus illinoensis*), Indian hemp (*Apocynum cannabinum*), goldenrod (Solidago), showy milkweed (*Asclepias speciosa*), gayfeather (Liatris), black-eyed Susan (*Rudbeckia hirta*), and American licorice (*Glycyrrhiza lepidota*). This site does not support a large amount of woody

species, but rose (Rosa), leadplant (*Amorpha canescens*), and western snowberry are the most common shrubs. This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high drought tolerance. This was a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3530	4565	5500
Forb	220	383	610
Shrub/Vine	50	152	290
Total	**3800**	**5100**	**6400**

Figure 8. Plant community growth curve (percent production by month). SD5310, Southern Dark Brown Glaciated Plains, lowland warm-season dominant.. Warm-season dominant, lowland..

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

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

This plant community evolved under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grass and grass-like species included clustered field sedge (*Carex praegracilis*), big bluestem, and switchgrass. Grass and grass-like species of secondary importance included plains bluegrass (*Poa arida*), rushes (Juncus), Indiangrass, Canada wildrye, and foxtail barley (*Hordeum jubatum*). Forbs commonly found in this plant community included cudweed sagewort (*Artemisia ludoviciana*), goldenrod (Solidago), and western yarrow (*Achillea millefolium*). This plant community had similar plant composition to the 2.2 Clustered Field Sedge-Big Bluestem-Kentucky Bluegrass-Switchgrass Plant Community Phase. The main difference is that this plant community phase did not have the presence of non-native invasive grass species such as Kentucky Bluegrass and Smooth Bromegrass. When compared to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, sedges, slender wheatgrass, and western wheatgrass increased. Big bluestem and Indiangrass decreased, and production of tall warm-season grasses was reduced. This plant community was moderately resistant to change. The herbaceous species present were well adapted to grazing; however, species composition could be altered through long-term overgrazing. If the herbaceous component was intact, it tended to be resilient if the disturbance was not long-term. Most of the components of the ecological processes would have been functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses would have been reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allowed for an increase in shorter-statured (and shallower rooted) species.

Figure 9. Plant community growth curve (percent production by month). SD5307, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	13	20	25	18	11	5	3	0	0

Pathway 1.1A
Community 1.1 to 1.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community

to the 1.2 Clusterd Field Sedge-Big Bluestem-Switchgrass-Forbs Plant Community Phase.

Pathway 1.2A
Community 1.2 to 1.1

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

State 2
Native/Invaded State

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

Community 2.1
Big Bluestem-Indiangrass-Switchgrass

This plant community phase is similar to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, but it also contains minor amounts of nonnative invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 15 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 warm-season grasses. The major grasses include big bluestem, Indiangrass, and switchgrass. Other grass or grass-like species include sedges, little bluestem, porcupine grass, Canada wildrye, slender wheatgrass, and western wheatgrass. Common forbs are Maximillian sunflower, Illinois bundleflower, Indian hemp, goldenrod, showy milkweed, gayfeather, black-eyed Susan, and American licorice. This site does not support a large amount of woody species, but rose, leadplant, and western snowberry are the most common shrubs. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regard to site/soil stability, watershed function, and biologic integrity.

Figure 10. Plant community growth curve (percent production by month). SD5310, Southern Dark Brown Glaciated Plains, lowland warm-season dominant.. Warm-season dominant, lowland..

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

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

This plant community is a result of heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 87 percent grasses and grass-like species, 10 percent forbs, and 3 percent shrubs. Dominant grass and grass-like species include clustered field sedge, big bluestem, Kentucky bluegrass, and switchgrass, slender wheatgrass, western wheatgrass, and little bluestem. Grass and grass-like species of secondary importance include plains bluegrass (*Poa arida*), rushes (Juncus), Indiangrass, Canada wildrye, and foxtail barley. Forbs commonly found in this plant community included cudweed sagewort, goldenrod, and western yarrow. When compared to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, sedges, slender wheatgrass, and western wheatgrass increase. Big bluestem and Indiangrass decrease and production of all tall warm-season grasses is reduced. Kentucky bluegrass has also invaded. 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 nonnative 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.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3190	3620	4195
Forb	175	300	475
Shrub/Vine	35	80	130
Total	**3400**	**4000**	**4800**

Figure 12. Plant community growth curve (percent production by month). SD5307, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	13	20	25	18	11	5	3	0	0

Pathway 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 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 2.2 Clustered Field Sedge-Big Bluestem-Kentucky Bluegrass-Switchgrass Plant Community Phase.

Pathway 2.2A
Community 2.2 to 2.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase.

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 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. The opportunity for high intensity spring burns is severely reduced by early green up and increased moisture and humidity at the soil surface, and grazing pressure cannot cause a reduction in sod grass dominance. Production is limited to the sod forming species. Infiltration continues to decrease and runoff increases and energy capture into the system is restricted to early season low producing species. Nutrient cycling is limited by root depth of the dominant species. Once the state is well established, even drastic events such as high intensity fires driven by high fuel loads of litter and thatch will not result in more than a very short-term reduction of Kentucky bluegrass. These events may reduce 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 and dominate before Kentucky bluegrass rebounds and again dominates the system.

Community 3.1
Smooth Bromegrass-Kentucky Bluegrass

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.. 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.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3370	3938	4325
Forb	190	330	525
Shrub/Vine	40	132	250
Total	**3600**	**4400**	**5100**

Figure 14. Plant community growth curve (percent production by month). SD5306, Southern Dark Brown 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-Rush-Forbs

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

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2160	2666	3160
Forb	140	388	745
Shrub/Vine	0	46	95
Total	**2300**	**3100**	**4000**

Figure 16. Plant community growth curve (percent production by month).

SD5306, Southern Dark Brown 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
Annual Pioneer-Perennial Pioneer

This plant community developed under continuous heavy grazing or other excessive disturbances, typically abandonment after cropping. The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and 0 to 5 percent shrubs. The species present in this phase are highly variable, but often include nonnative invasive and/or early seral species. Grasses may include foxtail barley, barnyard grass (Echinochia crus-galli), and quackgrass (*Elymus repens*). Dominant forbs include curlycup gumweed (*Grindelia squarrosa*), Canada thistle (*Cirsium arvense*), and other early successional species. Plant diversity is low (plant richness may be high but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites.

Pathway 3.1A
Community 3.1 to 3.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, 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 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-Rush-Forbs Plant Community Phase.

State 4
Crop Production State

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

Community 4.1
Annual crops

This plant community developed with the use of a variety of tillage systems 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, 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 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

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 Plant 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-Rush-Forbs Plant Community Phase within the Invaded State (State 3). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

Transition T2C
State 2 to 4

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

Restoration pathway T3A & T3B
State 3 to 2

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

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	**Tall Warm-Season Grasses**			1530–2550	
	big bluestem	ANGE	*Andropogon gerardii*	1020–2295	–
	switchgrass	PAVI2	*Panicum virgatum*	153–1020	–
	Indiangrass	SONU2	*Sorghastrum nutans*	255–1020	–
	prairie cordgrass	SPPE	*Spartina pectinata*	51–255	–
	marsh muhly	MURA	*Muhlenbergia racemosa*	0–153	–
2	**Mid & Tall Cool-Season Grasses**			510–1275	
	Canada wildrye	ELCA4	*Elymus canadensis*	102–408	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	102–408	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–255	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	51–255	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	51–255	–
	plains bluegrass	POAR3	*Poa arida*	51–153	–
	prairie wedgescale	SPOB	*Sphenopholis obtusata*	0–102	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–102	–
	green needlegrass	NAVI4	*Nassella viridula*	0–102	–
3	**Grass-likes**			510–765	
	clustered field sedge	CAPR5	*Carex praegracilis*	102–510	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	102–510	–
	manyhead sedge	CASY	*Carex sychnocephala*	102–510	–
	rush	JUNCU	*Juncus*	51–255	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–255	–
4	**Mid Warm-Season Grasses**			153–510	
	little bluestem	SCSC	*Schizachyrium scoparium*	102–510	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	51–255	–
5	**Other Native Grasses**			102–255	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–255	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	51–102	–

	prairie Junegrass	KOMA	*Koeleria macrantha*	51–102	–
Forb					
6	**Forbs**			255–510	
	Forb, native	2FN	*Forb, native*	51–153	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	51–153	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	51–102	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	51–102	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–102	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	51–102	–
	showy milkweed	ASSP	*Asclepias speciosa*	51–102	–
	purple prairie clover	DAPU5	*Dalea purpurea*	51–102	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–102	–
	blazing star	LIATR	*Liatris*	51–102	–
	cinquefoil	POTEN	*Potentilla*	51–102	–
	scurfpea	PSORA2	*Psoralidium*	0–102	–
	western dock	RUAQ	*Rumex aquaticus*	51–102	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	0–102	–
	goldenrod	SOLID	*Solidago*	51–102	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–51	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–51	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–51	–
	palespike lobelia	LOSP	*Lobelia spicata*	0–51	–
	mint	MENTH	*Mentha*	0–51	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–51	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–51	–
	northern bedstraw	GABO2	*Galium boreale*	0–51	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–51	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–51	–
	stickseed	HACKE	*Hackelia*	0–51	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–51	–
Shrub/Vine					
7	**Shrubs**			51–255	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–153	–
	leadplant	AMCA6	*Amorpha canescens*	51–153	–
	rose	ROSA5	*Rosa*	51–102	–
	snowberry	SYMPH	*Symphoricarpos*	0–102	–

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**			400–800	
	switchgrass	PAVI2	*Panicum virgatum*	200–800	–
	big bluestem	ANGE	*Andropogon gerardii*	80–600	–

	Indiangrass	SONU2	*Sorghastrum nutans*	0–200	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–120	–
2	**Mid & Tall Cool-Season Grasses**			400–1200	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	120–800	–
	western wheatgrass	PASM	*Pascopyrum smithii*	120–800	–
	plains bluegrass	POAR3	*Poa arida*	80–400	–
	foxtail barley	HOJU	*Hordeum jubatum*	40–320	–
	green needlegrass	NAVI4	*Nassella viridula*	0–200	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–200	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–120	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–80	–
3	**Grass-likes**			400–1200	
	clustered field sedge	CAPR5	*Carex praegracilis*	80–800	–
	manyhead sedge	CASY	*Carex sychnocephala*	80–800	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	80–600	–
	rush	JUNCU	*Juncus*	80–320	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–200	–
4	**Mid Warm-Season Grasses**			80–600	
	little bluestem	SCSC	*Schizachyrium scoparium*	80–600	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–80	–
5	**Other Native Grasses**			40–200	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–200	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	40–80	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–40	–
6	**Non-Native Grasses**			200–800	
	Kentucky bluegrass	POPR	*Poa pratensis*	200–800	–
	smooth brome	BRIN2	*Bromus inermis*	40–400	–
	quackgrass	ELRE4	*Elymus repens*	0–200	–
	creeping bentgrass	AGST2	*Agrostis stolonifera*	0–200	–
Forb					
7	**Forbs**			200–400	
	Forb, introduced	2FI	*Forb, introduced*	40–120	–
	Forb, native	2FN	*Forb, native*	40–120	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	40–120	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	40–120	–
	goldenrod	SOLID	*Solidago*	40–120	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–80	–
	cinquefoil	POTEN	*Potentilla*	40–80	–
	showy milkweed	ASSP	*Asclepias speciosa*	40–80	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	40–80	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–80	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–40	–

	smooth horsetail	EQLA	*Equisetum laevigatum*	0–40	–
	scurfpea	PSORA2	*Psoralidium*	0–40	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–40	–
	western dock	RUAQ	*Rumex aquaticus*	0–40	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–40	–
	blazing star	LIATR	*Liatris*	0–40	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–40	–
Shrub/Vine					
8	**Shrubs**			40–120	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–80	–
	rose	ROSA5	*Rosa*	40–80	–
	snowberry	SYMPH	*Symphoricarpos*	0–80	–
	leadplant	AMCA6	*Amorpha canescens*	0–40	–

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**			0–220	
	big bluestem	ANGE	*Andropogon gerardii*	0–220	–
	switchgrass	PAVI2	*Panicum virgatum*	0–132	–
2	**Mid & Tall Cool-Season Grasses**			44–660	
	foxtail barley	HOJU	*Hordeum jubatum*	44–440	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–220	–
	plains bluegrass	POAR3	*Poa arida*	0–132	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–132	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–132	–
	green needlegrass	NAVI4	*Nassella viridula*	0–44	–
3	**Grass-likes**			220–880	
	clustered field sedge	CAPR5	*Carex praegracilis*	88–440	–
	rush	JUNCU	*Juncus*	88–440	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–220	–
	manyhead sedge	CASY	*Carex sychnocephala*	0–220	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	0–132	–
4	**Mid Warm-Season Grasses**			0–220	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–220	–
5	**Other Native Grasses**			0–220	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–220	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–44	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–44	–
6	**Non-Native Grasses**			1320–2640	
	smooth brome	BRIN2	*Bromus inermis*	660–2200	–

	Kentucky bluegrass	POPR	*Poa pratensis*	132–880	–
	quackgrass	ELRE4	*Elymus repens*	0–352	–
	creeping bentgrass	AGST2	*Agrostis stolonifera*	0–352	–
Forb					
7	**Forbs**			220–440	
	Forb, introduced	2FI	*Forb, introduced*	44–220	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	44–176	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	44–176	–
	goldenrod	SOLID	*Solidago*	44–176	–
	showy milkweed	ASSP	*Asclepias speciosa*	44–132	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	44–132	–
	Forb, native	2FN	*Forb, native*	0–132	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–88	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–88	–
	cinquefoil	POTEN	*Potentilla*	44–88	–
	scurfpea	PSORA2	*Psoralidium*	0–44	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–44	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–44	–
Shrub/Vine					
8	**Shrubs**			44–220	
	snowberry	SYMPH	*Symphoricarpos*	0–220	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–88	–
	rose	ROSA5	*Rosa*	44–88	–

Table 12. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid & Tall Cool-Season Grasses**			31–465	
	foxtail barley	HOJU	*Hordeum jubatum*	31–465	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–93	–
	green needlegrass	NAVI4	*Nassella viridula*	0–62	–
2	**Grass-likes**			155–775	
	rush	JUNCU	*Juncus*	155–620	–
	clustered field sedge	CAPR5	*Carex praegracilis*	0–248	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–155	–
3	**Other Native Grasses**			0–155	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–155	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–31	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–31	–
4	**Non-Native Grasses**			775–1860	
	Kentucky bluegrass	POPR	*Poa pratensis*	620–1550	–
	creeping bentgrass	AGST2	*Agrostis stolonifera*	0–465	–
	smooth brome	BRIN2	*Bromus inermis*	31–465	–
	quackgrass	ELRE4	*Elymus repens*	0–372	–
Forb					
5	**Forbs**			155–620	
	Forb, introduced	2FI	*Forb, introduced*	31–310	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	31–155	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	31–155	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	31–155	–
	goldenrod	SOLID	*Solidago*	31–155	–
	cinquefoil	POTEN	*Potentilla*	31–124	–
	showy milkweed	ASSP	*Asclepias speciosa*	31–93	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–62	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–62	–
	Forb, native	2FN	*Forb, native*	0–62	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–62	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–31	–
Shrub/Vine					
6	**Shrubs**			0–93	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–31	–
	rose	ROSA5	*Rosa*	0–31	–
	snowberry	SYMPH	*Symphoricarpos*	0–31	–

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.

Big Bluestem/Indiangrass/Switchgrass (1.1)
Average Annual Production (lbs./acre, air-dry): 5,100
Stocking Rate* (AUM/acre): 1.40

Sedge/Wheatgrass/Kentucky Bluegrass/Switchgrass Sod (2.2)
Average Annual Production (lbs./acre, air-dry): 4,000
Stocking Rate* (AUM/acre): 1.10

Smooth Brome/Kentucky Bluegrass (3.1)
Average Annual Production (lbs./acre, air-dry): 4,400
Stocking Rate* (AUM/acre): 1.21

Kentucky Bluegrass/Baltic Rush/Forbs (3.2)
Average Annual Production (lbs./acre, air-dry): 3,100
Stocking Rate* (AUM/acre): 0.85

Annual/Pioneer, Non Native Perennial (3.3)
Average Annual Production (lbs./acre, air-dry): 1,800
Stocking Rate* (AUM/acre): 0.49

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

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Ecological Site Correlation Issues and Questions:

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

Inventory data references

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

Data Source Sample Period State County
None

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Acknowledgments

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This Provisional Ecological Site concept has passed both Quality Control and Quality Assurance processes. Quality Assurance was approved by David Kraft, NRCS Regional Ecologist 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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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 or not present.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 5 percent and pathces 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 present.

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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):** Soil aggregate stability normally a 6 rating. Typically high root content and organic matter in the soil surface. 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):** Soil surface structure is granular, and mollic (higher organic matter) colors of A-horizon down to about 6 to 15 inches.

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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 grass and grass-like species 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 present.

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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: Tall, warm-season grasses >>

    Sub-dominant: Mid and tall, cool-season grasses > grass-like species >

    Other: Mid warm-season grasses > forbs > shrubs

    Additional: Other native grasses occur in other functional 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 percent plant litter cover, roughly 0.5 to 1 inches in depth. Litter cover is in contact with the soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 5,100 pounds/acre (air-dry basis)

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Refer to State and local Noxious Weed List; also Kentucky bluegrass and smooth bromegrass.

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17. **Perennial plant reproductive capability:** Perennial grass and grass-like species have vigorous rhizomes and/or tillers.
