Ecological site R102BY020SD
Loamy Overflow

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General information

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

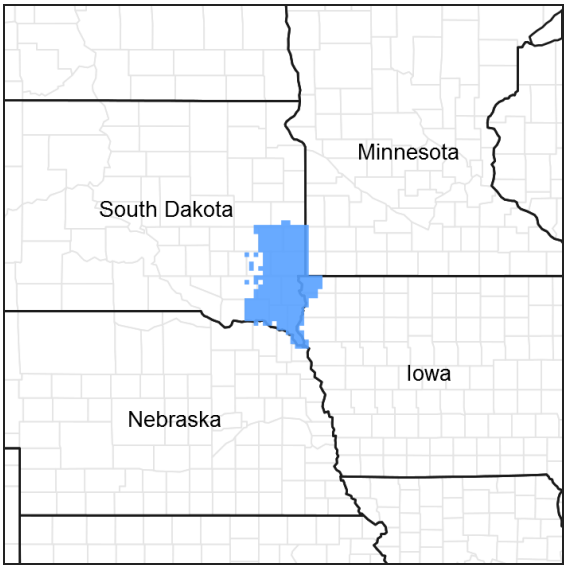

Figure 1. Mapped extent

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

MLRA notes

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

The Till Plains (102B) is located within the Western Lake Section of the Central Lowland Province of the Interior Plains. It is entirely in South Dakota, encompassing 2,215 square miles (Figure 1). The elevation ranges from 1,140 to 1,880 feet. The MLRA is characterized by glaciated, nearly level to hilly plains populated by stagnation and end moraines, glacial outwash terraces, and floodplains as the major landforms. The dominant parent materials are silty drift, glacial till, glacial outwash, and alluvium. (USDA-NRCS, 2006)

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

Classification relationships

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

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

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

Ecological site concept

The Loamy Overflow ecological site occurs in upland swales which receive additional run off moisture from adjoining slopes. Soils are moderately well drained which have water flow into and over or through the site and have less than 40 percent clay in the surface and subsoil.

Vegetation in the Reference State includes big bluestem, Indiangrass, and Switchgrass. Forbs include goldenrods, cudweed sagewort, heath aster, and western yarrow. Non-native grasses such as Kentucky bluegrass, smooth bromegrass, quackgrass, and Eastern redcedar may invade the site due to changes in disturbance regime.

Associated sites

R102BY003SD	**Subirrigated** These sites occur in drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. The central concept soil series is Chancellor, but other series are included.
R102BY010SD	**Loamy** These sites occur on upland areas. The soils are well drained and have less than 40 percent clay in the surface and subsoil. The central concept soil series are Egan and Wentworth, but other series are included.
R102BY012SD	**Thin Upland** These sites occur on uplands. Soils are well drained and will effervesce with acid at or near the surface. The central concept soil series are Betts and Ethan, but other series are included.

Similar sites

R102BY010SD	**Loamy** The Loamy site occurs in a backslope landscape position. Soils are well drained and do not have water flow into and over or through the site. The Loamy site will have less big bluestem, more needlegrass, and lower production than the Loamy Overflow site.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on nearly level drainageways, flood plains, or swales.

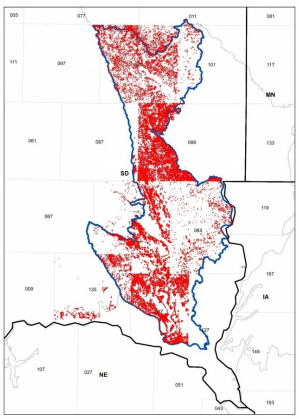

Figure 2. Site Distribution Map for the Loamy Overflow site in MLRA 102B.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Drainageway (3) Till plain
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	335–579 m
Slope	1–3%
Water table depth	91–203 cm
Aspect	Aspect is not a significant factor

Climatic features

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

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

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

Table 3. Representative climatic features

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

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

Climate stations used

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

Influencing water features

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

Soil features

The soils in this site are moderately well to somewhat poorly drained and formed in alluvium, loamy drift, or either material over till. The loam to silty clay loam surface layer is eight to 24 inches thick and typically has a granular structure. Dark colors are very deep in these soils. The soils have a moderately slow to slow infiltration rate. This site typically occurs in swales, drainageways, or along flood plains, but can also occur on toe-slopes. This site should show no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer on this site can result in a shift in species composition and production.

The central concept soil series for this site are Bonilla and Prosper, but other series are included.

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

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Slow to moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0–3%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%

Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–8%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

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

The site which is located in the Till Plains Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Big Bluestem-Green Needlegrass-Western Wheatgrass Plant Community Phase. This community phase and the Reference State have been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered.

This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dynamics of this site. 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 will initially increase. Big bluestem, little bluestem, and green needlegrass will decrease in frequency and production. Heavy, continuous grazing causes Kentucky bluegrass (*Poa pratensis*) to increase and eventually develop into a sod condition. Extended periods of non-use and no surface fire will result in a plant community having high litter levels which favors an increase in Kentucky bluegrass and smooth bromegrass (*Bromus inermis*). In time, shrubs such as western snowberry (*Symphoricarpos occidentalis*) and chokecherry (*Prunus virginiana*) will also increase. Extended periods of no surface fire could result in the invasion of conifers in which eastern redcedar (*Juniperus virginiana*) and Rocky Mountain juniper (*Juniperus scopulorum*) will increase and could eventually dominate the site.

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

Loamy Overflow – R102BY020SD

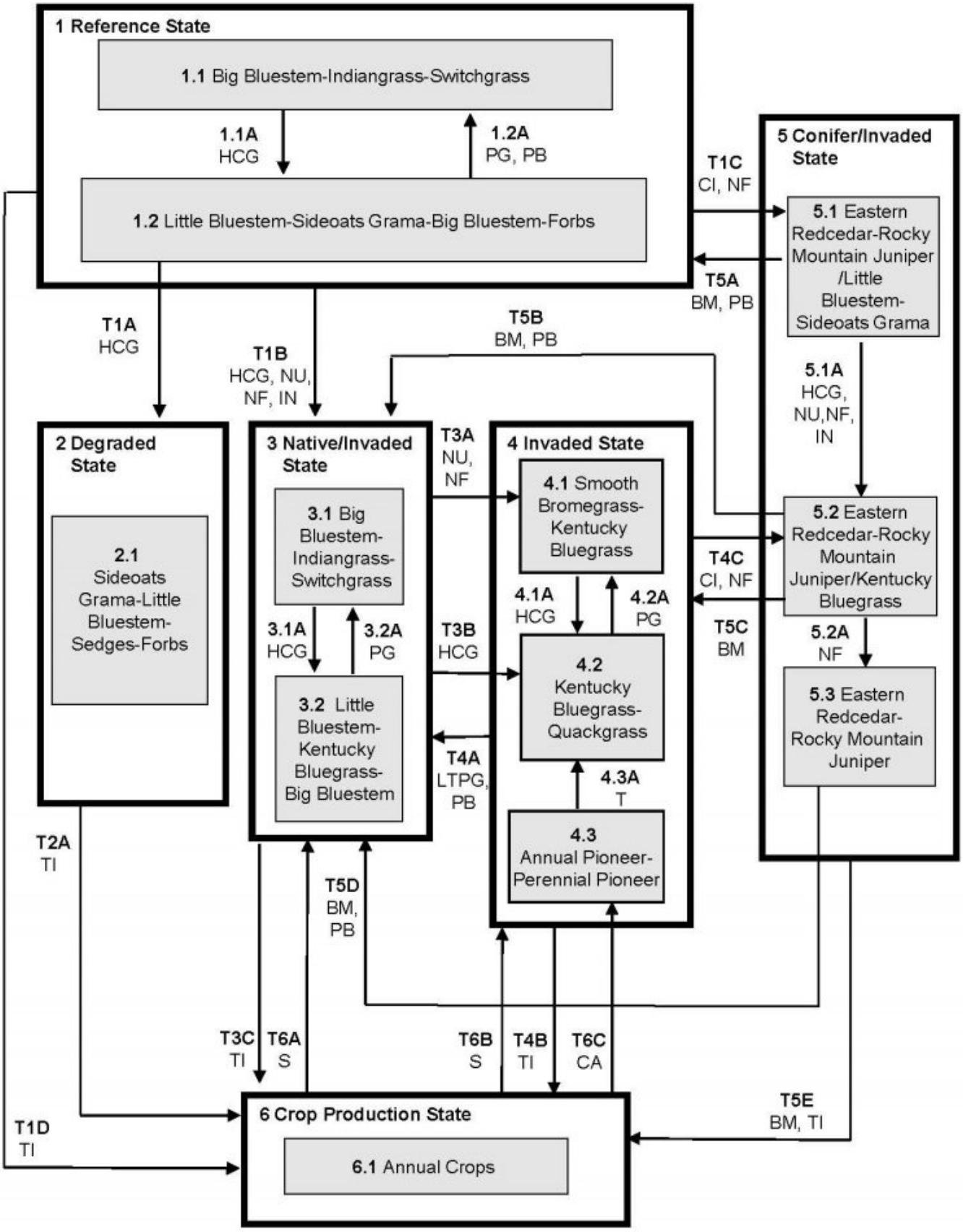

Figure 9. State-and-Transition Model for the Loamy Overflow site in MLRA 102B.

Loamy Overflow – R102BY020SD

LEGEND
Loamy Overflow – R102BY020SD

BM – Brush management
CA – Cropped and abandoned
CI – Conifer invasion
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 10. Legend for the Loamy Overflow site in MLRA 102B.

Code	Process
T1A	Heavy, continuous grazing
T1B	Heavy, continuous grazing, non-use, no fire, invasion
T1C	Conifer invasion, no fire
T1D	Tillage
T2A	Tillage
T3A	Non-use, no fire
T3B	Heavy, continuous grazing
T3C	Tillage
T4A	Long term prescribed grazing, prescribed burning
T4B	Tillage
T4C	Conifer invasion, no fire
T5A	Brush management, prescribed burning
T5B	Brush management, prescribed burning
T5C	Brush management
T5D	Brush management, prescribed burning
T5E	Brush management, tillage
T6A	Seeding
T6B	Seeding
T6C	Cropped and abandoned
1.1A	Heavy, continuous grazing
1.2A	Prescribed grazing with recovery periods, prescribed burning
3.1A	Heavy, continuous grazing
3.2A	Prescribed grazing with recovery periods
4.1A	Heavy, continuous grazing
4.2A	Prescribed grazing with recovery periods
4.3A	Time w/wo disturbances
5.1A	Heavy,continuous grazing, non-use, no fire, invasion
5.2A	No fire

Figure 11. Matrix for the Loamy Overflow site in MLRA 102B.

State 1
Reference State

The Reference State represents the natural range of variability that dominated the dynamics of this ecological site (ES). This state was dominated by warm-season grasses. Before North America was settled by Europeans, the primary disturbance mechanisms for this site in the Reference condition included periods of below and above average precipitation, periodic fire, and herbivory by insects and large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined and shorter warm-season grasses would have increased. Today, a similar state, the Native/Invaded State (State 3) can be found on areas that are properly managed with grazing and/or prescribed burning and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Big Bluestem-Indiangrass-Switchgrass

Figure 12. Typical vegetation of the Loamy Overflow Reference Community in MLRA 102B.

Interpretations are based primarily on the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase (this is also considered to be Reference). The potential vegetation was about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. The community was dominated by warm-season grasses. The major grasses included big bluestem, Indiangrass, switchgrass (*Panicum virgatum*), and little bluestem. Other grass or grass-like species included porcupinegrass, green needlegrass, slender wheatgrass (*Elymus trachycaulus*), and little bluestem. This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high tolerance to drought. This was a sustainable plant community in regards to site and soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3800	4573	5223
Shrub/Vine	230	404	639
Forb	230	404	639
Total	**4260**	**5381**	**6501**

Figure 14. Plant community growth curve (percent production by month). SD0215, Till Plains, warm-season dominant.. Warm-season dominant..

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

Community 1.2
Little Bluestem-Sideoats Grama-Big Bluestem-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 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses included little bluestem, sideoats grama (*Bouteloua curtipendula*), and big bluestem. Grasses and grass-like species of secondary importance included Indiangrass, switchgrass, green needlegrass, tall dropseed (*Sporobolus compositus*), and slender wheatgrass. Forbs commonly found in this plant community included cudweed sagewort (*Artemisia ludoviciana*), prairie coneflower (Ratibida), and western yarrow (*Achillea millefolium*). This plant community had similar plant composition to the 3.2 Little Bluestem-Kentucky Bluegrass-Big Bluestem 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 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, sideoats grama and little bluestem increased. 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 15. Plant community growth curve (percent production by month). SD0215, Till Plains, warm-season dominant.. Warm-season dominant..

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

Pathway 1.1A
Community 1.1 to 1.2

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

Pathway 1.2A
Community 1.2 to 1.1

Any combination of prescribed grazing (alternating season of use and providing adequate recovery periods), periodic light to moderate grazing, prescribed burning occurring at relatively frequent intervals (every 3 to 5 years), and a return to normal disturbance regime will shift this plant community to the 1.1 Big Bluestem-Switchgrass-Indiangrass Plant Community Phase.

State 2
Degraded State

This state is the result of heavy, continuous grazing, and the absence of periodic fire due to fire suppression. This state is dominated by sideoats grama, little bluestem, sedges, and forbs. Taller warm-season species will decline and a corresponding increase in short statured grass will occur. Once the threshold is crossed, a change in grazing management alone cannot restore the degraded state.

Community 2.1
Sideoats Grama-Little Bluestem-Sedges-Forbs

This plant community evolved under heavy, continuous season grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 80 percent grasses and grass-like species, 15 percent forbs, and five percent shrubs. Dominant grass and grass-like species included sideoats grama, little bluestem, sedge (Carex), and forbs. Grasses of secondary importance included big bluestem, switchgrass, green needlegrass, slender wheatgrass, and tall dropseed. Forbs commonly found in this plant community included cudweed sagewort, goldenrod (Solidago), and western yarrow. When compared to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, tall warm-season grasses were reduced, and the more grazing tolerant species such as sideoats grama, little bluestem, and sedge were dominant on this plant community. This vegetation state was very resistant to change, especially if the disturbance continued and the short-statured species

such as sedge increased. The herbaceous species present were well adapted to grazing. This plant community was less productive than other phases. The thick sod prevented other species from getting established.

Figure 16. Plant community growth curve (percent production by month). SD0214, Till Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

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

State 3
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. The Native/Invaded 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 warm-season species can decline and a corresponding increase in short statured grass will occur.

Community 3.1
Big Bluestem-Indiangrass-Switchgrass

This plant community phase is similar to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase but it also contains minor amounts of non-native invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 15 percent by air-dry weight). The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. This community is dominated by warm-season grasses. The major grasses include big bluestem, Indiangrass, and switchgrass. Other grass or grass-like species include porcupinegrass, green needlegrass, slender wheatgrass, and little bluestem. 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 17. Plant community growth curve (percent production by month). SD0215, Till Plains, warm-season dominant.. Warm-season dominant..

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

Community 3.2
Little Bluestem-Kentucky Bluegrass-Big Bluestem

This plant community is a result of heavy, continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses include little bluestem, Kentucky bluegrass, and big bluestem. Grasses of secondary importance include Indiangrass, switchgrass, smooth bromegrass, sideoats grama, green needlegrass, tall dropseed, slender wheatgrass, and sedge. Forbs commonly found in this plant community include cudweed sagewort, heath aster (*Symphyotrichum ericoides*), Canada goldenrod (*Solidago canadensis*), stiff goldenrod (*Oligoneuron rigidum*), scurfpea (Psoralidium), Indian hemp (*Apocynum cannabinum*), prairie coneflower, and western yarrow. When compared to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, little bluestem has increased and Kentucky bluegrass has invaded and become co-dominant. Production of tall warm-season grasses is 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.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2768	3389	3957
Forb	179	404	729
Shrub/Vine	78	242	471
Total	**3025**	**4035**	**5157**

Figure 19. Plant community growth curve (percent production by month). SD0214, Till Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

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

Pathway 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 will shift this community to the 3.2 Little Bluestem-Kentucky Bluegrass-Big Bluestem 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 will convert this plant community to the 3.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 4
Invaded State

The Invaded State is a result of encroachment mainly by invasive introduced cool-season grasses. It is characterized by the dominance of Kentucky bluegrass and smooth bromegrass, 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 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 the invasive grass dominance. Preliminary studies indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition. 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 4.1
Smooth Bromegrass-Kentucky Bluegrass

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 to a lesser extent Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface and eventually a thatch-mat layer may develop at the surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. When dominated by smooth bromegrass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short as these cool-season species mature rapidly. Energy capture is also reduced. The dominance of these introduced species has been shown to alter the biotic component of the soil 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3284	4168	4909
Shrub/Vine	95	289	572
Forb	207	362	572
Total	**3586**	**4819**	**6053**

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

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

Community 4.2
Kentucky Bluegrass-Quackgrass

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

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1961	2715	3262
Forb	140	314	560
Shrub/Vine	28	110	213
Total	**2129**	**3139**	**4035**

Figure 23. Plant community growth curve (percent production by month). SD0211, Till Plains, cool-season dominant.. Cool-season dominant..

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

Community 4.3

Annual Pioneer-Perennial Pioneer

The Annual Pioneer-Perennial Pioneer 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 zero to five percent shrubs. The species present in this phase are highly variable but often include non-native invasive or early seral 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. This community can be renovated to improve the production capability; however, if management changes are not made the vegetation could revert back to early seral species.

Pathway 4.1A
Community 4.1 to 4.2

Heavy, continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation will shift this community to the 4.2 Kentucky Bluegrass-Quackgrass Plant Community Phase.

Pathway 4.2A
Community 4.2 to 4.1

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 4.1 Smooth Bromegrass-Kentucky Bluegrass Plant Community Phase.

Conservation practices

Prescribed Grazing

Pathway 4.3A
Community 4.3 to 4.2

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 4.2 Kentucky Bluegrass-Quackgrass Plant Community Phase.

Conservation practices

Integrated Pest Management (IPM)

State 5
Conifer/Invaded State

This state is dominated (canopy exceeds 20 percent of total surface area) by areas where trees have become established or have encroached onto the site due to the absence of periodic fire. This state is dominated by eastern redcedar and Rocky Mountain juniper with cool-season grasses being subdominant. The plant community can develop into a closed canopy that impedes the reproductive capability of the major native perennial grass species. A single eastern redcedar tree with a 7 foot crown diameter eliminates the equivalent of 3 pounds of forage. Further, the forage potential of a pasture with 250 mature eastern redcedar trees per acre (or one tree every thirteen feet) is reduce by 50 percent. It is suggested that reducing stocking rates by 10 percent for every 50 trees per acre. The increase in tree canopy which is a result of a disruption of the natural and human related fire regimes that occurred prior to European settlement in North America, which kept trees from encroaching much of the grasslands.

Community 5.1
Eastern Redcedar-Rocky Mountain Juniper/Little Bluestem-Sidoats Grama

This plant community evolved due to the invasion of conifers, such as eastern redcedar and Rocky Mountain juniper. This phase was a result of the absence of periodic fire. These events may cause a reduction in warm-season grasses and an increase in cool-season grasses and allow for the encroachment of conifers. The potential plant community is made up of approximately 50 percent grasses and grass-like species, 10 percent forbs, 10 percent shrubs, and 30 percent trees. Dominant grasses and grass-likes include little bluestem, sideoats grama, and big bluestem. As the canopy increases, warm-season grasses tend to decrease as the cool-season grasses increase. Forbs will be diverse. Trees species will include eastern redcedar and Rocky Mountain juniper. When compared to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community, coniferous trees have increased significantly and herbaceous component has decreased. This plant community is susceptible to the encroachment of eastern redcedar and Rocky Mountain juniper.

Community 5.2
Eastern Redcedar-Rocky Mountain Juniper/Kentucky Bluegrass

This plant community phase is a result of heavy, continuous seasonal grazing or heavy, continuous season-long grazing, or non-use and/or no surface fire for extended periods of time (typically for 10 or more years). When compared to the 5.1 Eastern Redcedar-Rocky Mountain Juniper/Little Bluestem-Sideoats Grama Plant Community, the amount of non-native invasive cool-season grasses such as Kentucky bluegrass and smooth bromegrass have increased significantly. It is characterized by a dominance of Kentucky bluegrass and smooth bromegrass. The dominance of Kentucky bluegrass is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface and a thatch-mat layer often develops at the surface. Production is limited to the sod forming species. The period that palatability is high is relatively short, as Kentucky bluegrass matures rapidly. 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 dominate species. Biological activity in the soil is likely reduced significantly in this phase.

Community 5.3
Eastern Redcedar-Rocky Mountain Juniper

This plant community phase is a result of no surface fire for extended periods of time (typically for 10 or more years). Coniferous trees have increased significantly, and the herbaceous component has decreased. With the dominance of the coniferous trees such as eastern redcedar and Rocky Mountain juniper, the canopy covers the area and grass species are unable to survive. Grass production for livestock is severely limited. Prescribed burning before the juniper species reach maturity and are still susceptible to fire (< 5 foot in height), or mechanical brush management can be used to maintain or recover 5.3 Eastern Redcedar-Rocky Mountain Juniper Plant Community Phase.

Pathway 5.1A
Community 5.1 to 5.2

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 shift this plant community to the 5.2 Eastern Redcedar-Rocky Mountain Juniper/Kentucky Bluegrass Plant Community Phase.

Pathway 5.2A
Community 5.2 to 5.3

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 shift this plant community to the 5.3 Eastern Redcedar-Rocky Mountain Juniper Plant Community Phase.

State 6
Crop Production State

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

Community 6.1
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

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, typically beginning early in the season) will convert this plant community to the 2.1 Sideoats Grama-Little Bluestem-Sedges-Forbs Plant Community Phase within the Short Grass Sod State (State 2).

Transition T1B
State 1 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), heavy continuous grazing, or invasion of non-native plant species will lead this state over a threshold to the Native/Invaded State (State 3).

Transition T1C
State 1 to 5

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 invasion of conifer will lead this state over a threshold to the 5.1 Eastern Redcedar-Rocky Mountain Juniper/Little Bluestem-Sideoats Grama Plant Community Phase within the Conifer/Invaded State (State 5).

Transition T1D
State 1 to 6

Tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Plant Community Phase within the Crop Production State (State 6).

Transition T2
State 2 to 4

Encroachment of non-native invasive and noxious species, abandonment of cropping, or seeding of introduced and native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 4), and more specifically to the 4.3 Annual/Pioneer, Non-native Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group (FSG) description for adapted species and expected production (production estimates in the FSG description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T2A
State 2 to 6

Tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Plant Community Phase within the Crop Production State (State 6).

Transition T3A & T3B

State 3 to 4

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 to the 4.1 Smooth Bromegrass-Kentucky Bluegrass Community Phase within the Invaded State (State 4). 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 4.2 Kentucky Bluegrass-Quackgrass Community Phase within the Invaded State (State 4). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

Transition T3C
State 3 to 6

Tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Plant Community Phase within the Crop Production State (State 6).

Restoration pathway T4A
State 4 to 3

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

Transition T4C
State 4 to 5

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 invasion of conifer will likely lead this state over a threshold to the 5.2 Eastern Redcedar-Rocky Mountain Juniper/Kentucky Bluegrass Plant Community Phase within the Conifer/Invaded State (State 5).

Transition T4B
State 4 to 6

Tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Community Phase within the Crop Production State (State 6).

Restoration pathway T5A
State 5 to 1

Brush management, which would include the mechanical removal of the conifers, coupled with prescribed burning occurring at relatively frequent intervals (every 3 to 5 years) and a return to normal disturbance regime levels may lead this 5.1 Eastern Redcedar-Rocky Mountain Juniper/Little Bluestem-Sideoats Grama Plant Community Phase within the Conifer/Invaded State (State 5) to the Reference State (State 1).

Restoration pathway T5B & T5D
State 5 to 3

Brush management, which would include the mechanical removal of the conifers, coupled with prescribed burning occurring at relatively frequent intervals (every 3 to 5 years) and a return to normal disturbance regime levels may lead this 5.2 Eastern Redcedar-Rocky Mountain Juniper/Kentucky Bluegrass Plant Community Phase within the Conifer/Invaded State (State 5) to the Native/Invaded State (State 3). Brush management, which would include the mechanical removal of the conifers, coupled with prescribed burning occurring at relatively frequent intervals (every 3 to 5 years) and a return to normal disturbance regime levels may lead this 5.3 Eastern Red Cedar-Rocky Mountain Juniper Plant Community Phase within the Conifer/Invaded State (State 5) to the Native/Invaded State (State 3).

Restoration pathway T5C
State 5 to 4

Brush management, which would include the mechanical removal of the conifers, may lead this 5.2 Eastern Redcedar-Rocky Mountain Juniper/Kentucky Bluegrass Plant Community Phase within the Conifer/Invaded State (State 5) to the Invaded State (State 4).

Transition T5E
State 5 to 6

Brush management, which would include the mechanical removal of the conifers, coupled with tillage will cause a shift over a threshold to the 6.1 Annual Crops Plant Community Phase within the Crop Production State (State 6).

Restoration pathway T6A
State 6 to 3

Seeding may lead this Crop Production State (State 6) over a threshold to the Native/Invaded State (State 3).

Restoration pathway T6B & T6C
State 6 to 4

Seeding may lead this Crop Production State (State 6) over a threshold to the Invaded State (State 4). Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 4) and more specifically to the 4.3 Annual Pioneer-Perennial Pioneer Plant Community Phase.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			1614–3766	
	big bluestem	ANGE	*Andropogon gerardii*	807–2690	–
	Indiangrass	SONU2	*Sorghastrum nutans*	538–1614	–
	switchgrass	PAVI2	*Panicum virgatum*	269–807	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	0–269	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–161	–
2	**Mid Warm-season Grasses**			269–538	
	little bluestem	SCSC	*Schizachyrium scoparium*	108–538	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	54–269	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–161	–
3	**Cool-season Bunchgrasses**			269–538	
	green needlegrass	NAVI4	*Nassella viridula*	108–538	–
	Canada wildrye	ELCA4	*Elymus canadensis*	54–269	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	54–269	–
4	**Wheatgrass**			108–538	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	108–538	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–269	–
5	**Other Native Grasses**			108–269	

	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	54–269	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	54–108	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–54	–
6	**Grass-likes**			54–269	
	sedge	CAREX	*Carex*	54–269	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–108	–
Forb					
7	**Forbs**			269–538	
	Forb, native	2FN	*Forb, native*	54–161	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–161	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	54–161	–
	blazing star	LIATR	*Liatris*	54–108	–
	cinquefoil	POTEN	*Potentilla*	54–108	–
	scurfpea	PSORA2	*Psoralidium*	54–108	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	54–108	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	54–108	–
	purple prairie clover	DAPU5	*Dalea purpurea*	54–108	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–108	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	54–108	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	54–108	–
	goldenrod	SOLID	*Solidago*	54–108	–
	white heath aster	SYER	*Symphyotrichum ericoides*	54–108	–
	American vetch	VIAM	*Vicia americana*	54–108	–
	golden tickseed	COTI3	*Coreopsis tinctoria*	0–54	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–54	–
	northern bedstraw	GABO2	*Galium boreale*	0–54	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–54	–
	ragwort	SENEC	*Senecio*	0–54	–
	wood lily	LIPH	*Lilium philadelphicum*	0–54	–
Shrub/Vine					
8	**Shrubs**			269–538	
	snowberry	SYMPH	*Symphoricarpos*	54–215	–
	leadplant	AMCA6	*Amorpha canescens*	54–215	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–108	–
	American plum	PRAM	*Prunus americana*	0–108	–
	chokecherry	PRVI	*Prunus virginiana*	0–108	–
	currant	RIBES	*Ribes*	0–108	–
	rose	ROSA5	*Rosa*	54–108	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–108	–

Table 10. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)

Grass/Grasslike					
1	**Tall Warm-season Grasses**			202–1009	
	big bluestem	ANGE	*Andropogon gerardii*	202–807	–
	switchgrass	PAVI2	*Panicum virgatum*	0–404	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–404	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–202	–
2	**Mid Warm-season Grasses**			404–1009	
	little bluestem	SCSC	*Schizachyrium scoparium*	404–1009	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	81–323	–
3	**Cool-season Bunchgrasses**			40–404	
	green needlegrass	NAVI4	*Nassella viridula*	40–323	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–81	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–81	–
4	**Other Native Grasses**			40–202	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–202	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–121	–
5	**Other Native Grasses**			40–202	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	40–202	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–81	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–40	–
6	**Grass-likes**			40–202	
	sedge	CAREX	*Carex*	40–202	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–81	–
7	**Non-Native Grasses**			404–1009	
	Kentucky bluegrass	POPR	*Poa pratensis*	202–807	–
	smooth brome	BRIN2	*Bromus inermis*	81–404	–
	quackgrass	ELRE4	*Elymus repens*	0–202	–
Shrub/Vine					
8	**Shrubs**			81–404	
	snowberry	SYMPH	*Symphoricarpos*	40–323	–
	rose	ROSA5	*Rosa*	40–121	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–121	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–81	–
	leadplant	AMCA6	*Amorpha canescens*	0–40	–
	American plum	PRAM	*Prunus americana*	0–40	–
	chokecherry	PRVI	*Prunus virginiana*	0–40	–
Forb					
8	**Forbs**			202–605	
	goldenrod	SOLID	*Solidago*	40–202	–
	white heath aster	SYER	*Symphyotrichum ericoides*	40–161	–
	Forb, introduced	2FI	*Forb, introduced*	40–161	–

	white sagebrush	ARLU	*Artemisia ludoviciana*	40–161	–
	Forb, native	2FN	*Forb, native*	0–121	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	40–121	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–121	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–121	–
	scurfpea	PSORA2	*Psoralidium*	40–121	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–81	–
	blazing star	LIATR	*Liatris*	0–81	–
	cinquefoil	POTEN	*Potentilla*	0–81	–
	common dandelion	TAOF	*Taraxacum officinale*	0–81	–
	Canada thistle	CIAR4	*Cirsium arvense*	0–81	–
	white clover	TRRE3	*Trifolium repens*	0–81	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–40	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–40	–
	American vetch	VIAM	*Vicia americana*	0–40	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–40	–
	ragwort	SENEC	*Senecio*	0–40	–

Table 11. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			0–482	
	big bluestem	ANGE	*Andropogon gerardii*	0–386	–
	switchgrass	PAVI2	*Panicum virgatum*	0–386	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–241	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–96	–
2	**Mid Warm-season Grasses**			0–241	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–241	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–241	–
3	**Cool-season Bunchgrasses**			0–386	
	green needlegrass	NAVI4	*Nassella viridula*	0–386	–
4	**Wheatgrass**			0–241	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–241	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–96	–
5	**Other Native Grasses**			0–241	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–193	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–48	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–48	–
6	**Grass-likes**			0–241	
	sedge	CAREX	*Carex*	0–241	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–48	–

7	**Non-Native Grasses**			1446–3374	
	smooth brome	BRIN2	*Bromus inermis*	964–2892	–
	Kentucky bluegrass	POPR	*Poa pratensis*	482–1687	–
	quackgrass	ELRE4	*Elymus repens*	0–386	–
Forb					
8	**Forbs**			241–482	
	goldenrod	SOLID	*Solidago*	48–145	–
	white heath aster	SYER	*Symphyotrichum ericoides*	48–145	–
	white clover	TRRE3	*Trifolium repens*	0–145	–
	Forb, introduced	2FI	*Forb, introduced*	48–145	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	48–145	–
	Canada thistle	CIAR4	*Cirsium arvense*	0–145	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–96	–
	Forb, native	2FN	*Forb, native*	0–96	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	48–96	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–96	–
	scurfpea	PSORA2	*Psoralidium*	48–96	–
	common dandelion	TAOF	*Taraxacum officinale*	0–96	–
	cinquefoil	POTEN	*Potentilla*	0–48	–
Shrub/Vine					
9	**Shrubs**			96–482	
	snowberry	SYMPH	*Symphoricarpos*	48–386	–
	rose	ROSA5	*Rosa*	48–145	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–96	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–96	–
	American plum	PRAM	*Prunus americana*	0–96	–

Table 12. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			0–157	
	switchgrass	PAVI2	*Panicum virgatum*	0–94	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–94	–
2	**Mid Warm-season Grasses**			0–94	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–94	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–94	–
3	**Cool-season Bunchgrasses**			0–157	
	green needlegrass	NAVI4	*Nassella viridula*	0–157	–
4	**Wheatgrass**			0–157	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–126	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–63	–
5	**Other Native Grasses**			0–94	
	Graminoid (grass or	2GRAM	Graminoid (grass or grass-like)	0–94	

	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–94	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–31	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–31	–
6	**Grass-likes**			31–251	
	sedge	CAREX	*Carex*	31–251	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–63	–
7	**Non-Native Grasses**			1098–2354	
	Kentucky bluegrass	POPR	*Poa pratensis*	785–2040	–
	quackgrass	ELRE4	*Elymus repens*	157–628	–
	smooth brome	BRIN2	*Bromus inermis*	0–471	–
Forb					
8	**Forbs**			157–471	
	Canada thistle	CIAR4	*Cirsium arvense*	31–251	–
	Forb, introduced	2FI	*Forb, introduced*	31–220	–
	white clover	TRRE3	*Trifolium repens*	0–188	–
	common dandelion	TAOF	*Taraxacum officinale*	0–157	–
	goldenrod	SOLID	*Solidago*	31–126	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	31–126	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	31–94	–
	scurfpea	PSORA2	*Psoralidium*	31–94	–
	white heath aster	SYER	*Symphyotrichum ericoides*	31–94	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–63	–
	cinquefoil	POTEN	*Potentilla*	0–31	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–31	–
	Forb, native	2FN	*Forb, native*	0–31	–
Shrub/Vine					
9	**Shrubs**			31–188	
	snowberry	SYMPH	*Symphoricarpos*	31–157	–
	rose	ROSA5	*Rosa*	0–63	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–31	–
	American plum	PRAM	*Prunus americana*	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. Stocking rates are calculated using Animal-Unit-Month (AUM), which is the amount of air-dry forage required to feed a cow, with or without calf, for one month.

Big Bluestem/Indiangrass/Switchgrass (1.1 & 3.1)
Average Annual Production (lbs./acre, air-dry): 4,800
Stocking Rate* (AUM/acre): 1.32

Little Bluestem/Kentucky Bluegrass/Big Bluestem (3.2)
Average Annual Production (lbs./acre, air-dry): 3,600
Stocking Rate* (AUM/acre): 0.99

Smooth Bromegrass/Kentucky Bluegrass (4.1)
Average Annual Production (lbs./acre, air-dry): 4,300
Stocking Rate* (AUM/acre): 1.18

Kentucky Bluegrass/Quackgrass (4.2)
Average Annual Production (lbs./acre, air-dry): 2,800
Stocking Rate* (AUM/acre): 0.77

Annual/Pioneer, Non-Native Perennial (4.3)
Average Annual Production (lbs./acre, air-dry): 1,200
Stocking Rate* (AUM/acre): 0.33

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

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

Hydrological functions

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

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Ecological Site Correlation Issues and Questions:

• SD083 Lincoln County, SD did not use the (EeB) Egan-Ethan-Trent complex, 1 to 6 percent slopes (national symbol gz45) as used in the adjoining SD099 Minnehaha County, SD.
• SD083 Lincoln County, SD did not use the (EgB) Egan-Wentworth-Trent complex, 2 to 6 percent slopes (national symbol 2vwcf) as used in the adjoining SD099 Minnehaha County, SD.
• SD083 Lincoln County, SD did not use the (WhA) Wentworth-Trent complex, 0 to 2 percent slopes (national symbol 2vwc9) as used in the adjoining SD099 Minnehaha County, SD.
• SD083 Lincoln County, SD did not use the (EfA) Egan-Trent silty clay loams, 0 to 2 percent slopes (national symbol g168) as used in the adjoining SD125 Turner County, SD.
• SD083 Lincoln County, SD did not use the (DaB) Davis loam, 2 to 6 percent slopes (national symbol g160) as used in the adjoining SD125 Turner County, SD.
• SD083 Lincoln County, SD did not use the (EdB) Egan-Clarno-Trent, 1 to 6 percent slopes (national symbol gymn) as used in the adjoining SD027 Clay County, SD.
• SD083 Lincoln County, SD did not use the (EhA) Egan-Trent, 0 to 2 percent slopes (national symbol gyms) as used in the adjoining SD027 Clay County, SD.
• SD087 McCook County, SD did not use the (EgB) Egan-Wentworth-Trent complex, 2 to 6 percent slopes (national symbol 2vwcf) as used in the adjoining SD099 Minnehaha County, SD.
• SD087 McCook County, SD did not use the (WhA) Wentworth-Trent complex, 0 to 2 percent slopes (national symbol 2vwc9) as used in the adjoining SD099 Minnehaha County, SD.
• SD087 McCook County, SD did not use the (EgA) Egan-Viborg silty clay loams, 0 to 3 percent slopes (national symbol fzd7) as used in the adjoining SD079 Lake County, SD.
• SD101 Moody County, SD did not use the (VbA) Viborg silty clay loam, 0 to 2 percent slopes (national symbol fzf2) as used in the adjoining SD079 Lake County, SD.
• SD101 Moody County, SD did not use the (EgB) Egan-Wentworth-Trent complex, 2 to 6 percent slopes (national symbol 2vwcf) as used in the adjoining SD099 Minnehaha County, SD.
• SD125 Turner County, SD did not use the (EgB) Egan-Wentworth-Trent complex, 2 to 6 percent slopes (national symbol 2vwcf) as used in the adjoining SD099 Minnehaha County, SD.
• SD125 Turner County, SD did not use the (Cd) Chancellor-Viborg silty clay loams, (national symbol fzjl) as used in the adjoining SD093 Lincoln County, SD.
• SD125 Turner County, SD did not use the (EbB) Egan-Ethan-Trent complex, 1 to 6 percent slopes (national symbol g117) as used in the adjoining SD135 Yankton County, SD.
• SD125 Turner County, SD did not use the (EbC) Egan-Ethan-Trent complex, 2 to 9 percent slopes (national symbol g118) as used in the adjoining SD135 Yankton County, SD.
• SD125 Turner County, SD did not use the (EgB) Egan-Ethan-Trent complex, 1 to 6 percent slopes (national symbol gymr) as used in the adjoining SD027 Clay County, SD.
• SD127 Union County, SD did not use the (EdA) Egan-Clarno-Trent complex, 0 to 2 percent slopes (national symbol gymm) as used in the adjoining SD027 Clay County, SD.
• SD127 Union County, SD did not use the (EhA) Egan-Trent silty clay loams, 0 to 2 percent slopes (national symbol gyms) as used in the adjoining SD027 Clay County, SD.
• SD127 Union County, SD did not use the (TtA) Trent-Tetonka-Wakonda complex, 0 to 3 percent slopes (national symbol gypr) as used in the adjoining SD027 Clay County, SD.
• Reference and alternative states within the state and transition model are may not be fully documented and may require additional field sampling for refinement.

Inventory data references

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

Data Source Sample Period State County
None

Other references

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

Rangeland health reference sheet

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

Author(s)/participant(s)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	
Date	12/07/2004
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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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: Tall warm-season grasses >>

    Sub-dominant: Mid and tall cool-season bunchgrasses = shrubs >

    Other: Mid warm-season grasses = mid cool-season rhizomatous grasses = forbs > grass-like species > short cool-season grasses

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

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 3,800-5,800 lbs./acre (air-dry weight). Reference value production is 4,800 lbs./acre (air-dry weight).

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

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