USDA Natural Resources Conservation Service

Ecological site R055CY007SD
Saline Lowland

Last updated: 1/31/2024
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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.

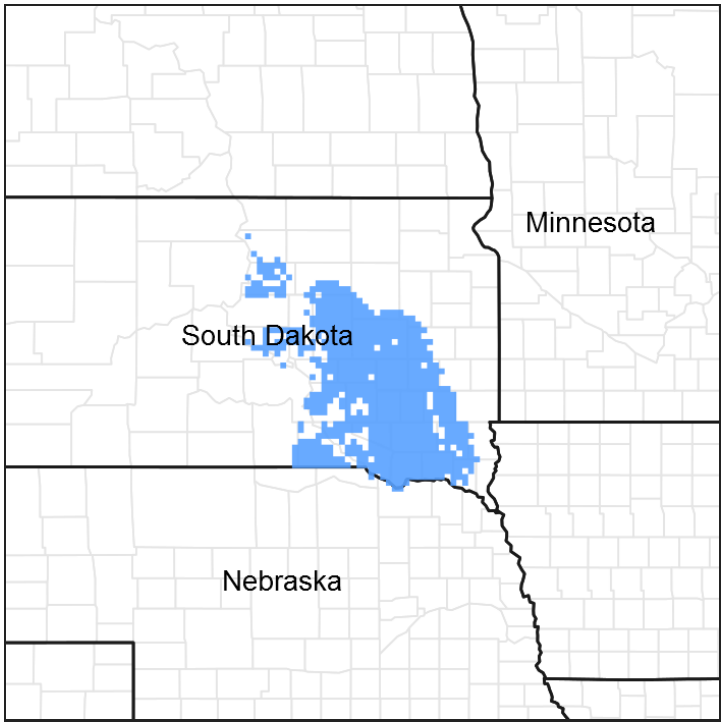


Figure 1. Mapped extent

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): 055C–Southern Black Glaciated Plains

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

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

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

Classification relationships

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

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

US EPA Level IV Ecoregion: Southern Missouri Coteau (42e); Southern Missouri Coteau Slope (42f); James River Lowland (46n) - (USEPA, 2013)

Ecological site concept

The Saline Lowland ecological site typically occurs in drainageways. Soils are poorly and very poorly drained which have a water table within 0 to 2 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. The soils will have visible salts within 16 inches of the soil surface. Dominant vegetation is adapted to high salinity and excessive wetness, which includes species such as Prairie Cordgrass, Alkali cordgrass, Nuttal’s alkaligrass, and switchgrass. Salt tolerant forbs present may include alkali plantain, western dock, and Pursh seepweed. The site my become degraded due to change in disturbance regime, and vegetation may shift to community dominated by foxtail barley, inland saltgrass, and foxtail barley.

Associated sites

R055CY013SD	**Claypan** These sites occur in drainageways. Soils are somewhat poorly drained and have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. Soils have a claypan (columnar structure) between 6 and 16 inches from the soil surface. The central concept soil series is Farmsworth, but other series could be included.
R055CY015SD	**Thin Claypan** These sites can occur along the edges of drainageways on a slightly higher landscape. Soils are moderately well drained. Soils will have a claypan (columnar structure) within 6 inches and visible salts within 16 inches of the soil surface. The central concept soil series is Jerauld, but other series could be included.
R055CY002SD	**Linear Meadow** These sites occur in drainageways. Soils are poorly and very poorly drained and have a water table within 0 to 2 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. Soils do not have visible salts within 16 inches of the soil surface. The central concept soil series are Clamo and Baltic, but other series are included.

Similar sites

R055CY002SD	**Linear Meadow** These sites occur in drainageways. Soils are poorly and very poorly drained and have a water table within 0 to 2 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. Soils do not have visible salts within 16 inches of the soil surface. The central concept soil series are Clamo and Baltic, but other series are included. The Linear Meadow site will have more grass-likes and higher production than the Saline Lowland.
R055CY013SD	**Claypan** These sites occur in drainageways. Soils are somewhat poorly drained and have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season, typically until the month of August. Soils have a claypan (columnar structure) within 16 inches, but greater than 6 inches of the soil surface. The central concept soil series is Farmsworth, but other series could be included. The Claypan site will have no prairie cordgrass, more western wheatgrass and green needlegrass, and less production than the Saline Lowland site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified

Herbaceous	(1) *Spartina pectinata* (2) *Spartina gracilis*

Physiographic features

This site occurs on nearly level lowlands and adjacent to small drainageways.

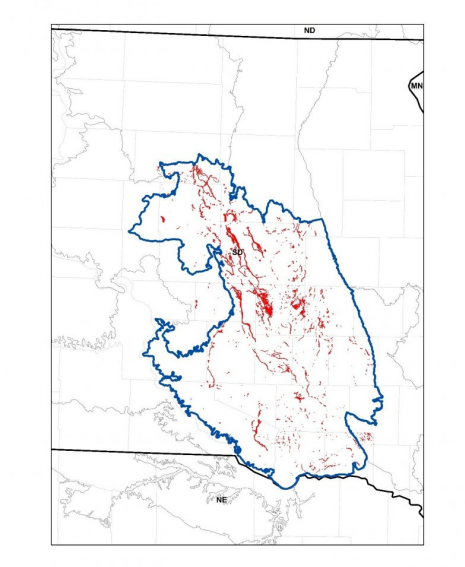


Figure 2. Distribution of Saline Lowland within MLRA 55C. In many cases, data is not spatially consistent across political boundaries due to the method with which soils were mapped; e. g. county subsets.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Pothole
Flooding duration	Very brief (4 to 48 hours) to long (7 to 30 days)
Flooding frequency	Rare to frequent
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None to frequent
Elevation	1,300–2,000 ft
Slope	0–1%
Ponding depth	0–6 in
Water table depth	9–30 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 55C is considered to have a continental climate: Cold winters and hot summers,

low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains, and air masses move freely across the plains and account for rapid changes in temperature.

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

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	122-130 days
Freeze-free period (characteristic range)	137-150 days
Precipitation total (characteristic range)	22-26 in
Frost-free period (actual range)	114-131 days
Freeze-free period (actual range)	133-155 days
Precipitation total (actual range)	21-27 in
Frost-free period (average)	125 days
Freeze-free period (average)	144 days
Precipitation total (average)	24 in

Climate stations used

- (1) FAULKTON 1 NW [USC00392927], Faulkton, SD
- (2) REDFIELD [USC00397052], Redfield, SD
- (3) MILLER [USC00395561], Miller, SD
- (4) HURON RGNL AP [USW00014936], Huron, SD
- (5) DE SMET [USC00392302], De Smet, SD

- (6) FORESTBURG 4 NNE [USC00393029], Artesian, SD
- (7) HOWARD [USC00394037], Howard, SD
- (8) SALEM 5NE [USC00395360], Salem, SD
- (9) MITCHELL MUNI AP [USW00094950], Mitchell, SD
- (10) MITCHELL 2 N [USC00395671], Mitchell, SD
- (11) MITCHELL [USC00395669], Mitchell, SD
- (12) ALEXANDRIA [USC00390128], Alexandria, SD
- (13) CHAMBERLAIN MUNI AP [USW00094943], Chamberlain, SD
- (14) CHAMBERLAIN 5 S [USC00391621], Chamberlain, SD
- (15) ACADEMY 2NE [USC00390043], Platte, SD
- (16) ARMOUR [USC00390296], Armour, SD
- (17) BRIDGEWATER [USC00391032], Bridgewater, SD
- (18) MENNO [USC00395481], Menno, SD
- (19) WAGNER [USC00398767], Wagner, SD
- (20) TYNDALL [USC00398472], Tyndall, SD

Influencing water features

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

Soil features

The common features of soils in this site are the clay loam to clay textured subsoil and slopes of 0 to 1 percent. The soils in this site are poorly drained and formed in alluvium. The silt loam to silty clay loam surface layer is typically 1 to 4 inches thick. The soils have a very slow infiltration rate. Areas within this site can become nearly barren due to the accumulation of sodium at the surface. Where vegetation is present, this site should show no evidence of rills, wind scoured areas, or pedestalled plants. The soil surface is stable and intact. Subsurface soil layers are non-restrictive to water movement and root penetration. These soils are somewhat susceptible to water erosion. Slow permeability and salt accumulation strongly influences the soil-water-plant relationship.

Soil series is Playmoor or Durrstein

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) Silt loam (2) Silty clay loam
Family particle size	(1) Clayey

Drainage class	Poorly drained
Permeability class	Very slow
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4–6 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	4–16 mmhos/cm
Sodium adsorption ratio (0-40in)	2–25
Soil reaction (1:1 water) (0-40in)	6.1–9.6
Subsurface fragment volume <=3" (Depth not specified)	0–4%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

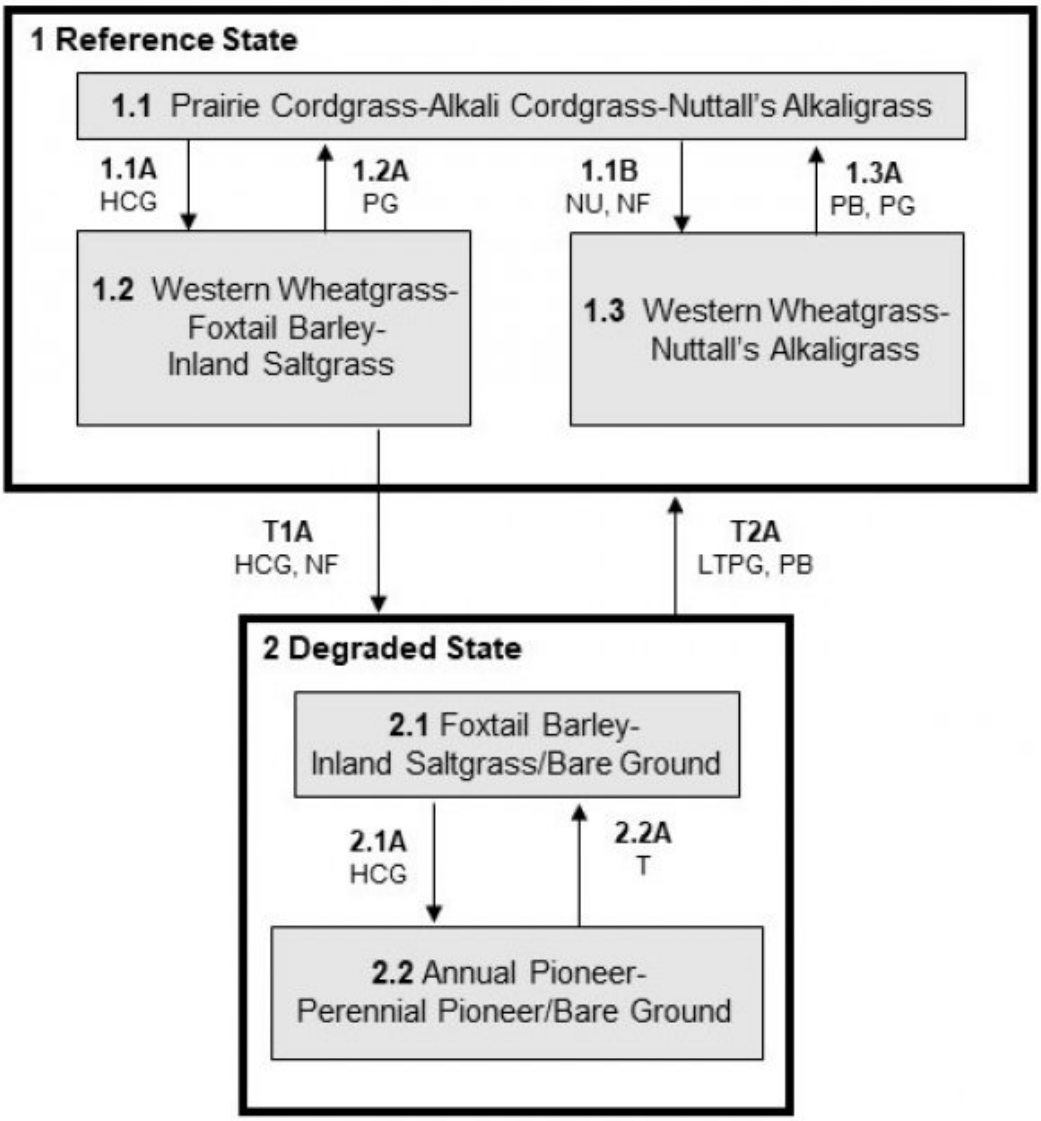
State and Community Phases
The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant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

The site which is located in the Southern Black Glaciated Plains Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Prairie Cordgrass-Alkali Cordgrass-Nuttall’s Alkaligrass 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 were introduced into the area. As this site deteriorates, species such as inland saltgrass (*Distichlis spicata*) and foxtail barley (*Hordeum jubatum*) increase and annual species may invade the site. Grasses such as alkali sacaton (*Sporobolus airoides*), Alkali Cordgrass, and Nuttall's alkaligrass will decrease in frequency and production. The high sodium and other salts content of the soils greatly influence the plant species present. Plant vigor can vary on a year-to-year basis in relation to current precipitation amounts, which influences the translocation of salts in the soil profile. Typically, only salt tolerant plants are found on this 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

Saline Lowland – R055CY007SD



LEGEND
Saline Lowland – R055CY007SD

HCG – Heavy continuous grazing
LTPG – Long-term prescribed grazing
NF – No fire
NU – Non-use
PB – Prescribed burning
PG – Prescribed grazing
T – Time w/wo disturbances

Figure 9. State-And-Transition Model and Legend for the Saline Lowland site in MLRA 55C.

Code	Process
T1A	Heavy continuous grazing, no fire
T2B	Long term prescribed grazing, prescribed burning
1.1A	Heavy continuous grazing
1.1B	Non-use, no fire
1.2A	Prescribed grazing with recovery periods
1.3B	Prescribed grazing with recovery periods, prescribed burning
2.1A	Heavy continuous grazing
2.2A	Time w/wo disturbances

Figure 10. Matrix for the Saline Lowland site in MLRA 55C.

State 1

Reference State

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

Community 1.1
Prairie Cordgrass-Alkali Cordgrass-Nutall's Alkaligrass

Interpretations are based primarily on the 1.1 Prairie Cordgrass-Alkali Cordgrass-Nutall's Alkaligrass Plant Community Phase (this is also considered to be the Reference community). This community evolved with grazing by large herbivores, occasional prairie fires, and periodic flooding events, and 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. The potential vegetation is about 85 percent grasses and grass-like plants and 15 percent forbs. The major grasses include prairie cordgrass, alkali cordgrass, and Nuttall's alkaligrass. Other grass and grass-like species present include western wheatgrass, slender wheatgrass (*Elymus trachycaulus*), inland saltgrass, and foxtail barley. Salt tolerant forbs such as alkali plantain (Plantago eripoda), western dock (*Rumex aquaticus*), and seepweed (Suaeda) are common. Interpretations are based primarily on this plant community phase. This community phase is diverse, stable, productive, and well adapted to both saline soils and the Northern Great Plains climatic conditions. Community dynamics, the nutrient and water cycles, and energy flow are functioning properly. Litter is properly distributed with very little movement offsite and natural plant mortality is very low. This community is resistant to many disturbances except continuous grazing, tillage, and development into urban or other uses. The diversity in plant species allows for both the fluctuation of flooding, as well as, large variations in climate.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2825	3600	4280
Forb	175	400	720
Total	**3000**	**4000**	**5000**

Figure 12. Plant community growth curve (percent production by month). SD5507, Southern Black 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

Community 1.2
Western Wheatgrass-Foxtail Barley-Inland Saltgrass

This plant community develops with heavy, continuous grazing with lack of adequate recovery periods during the growing season, and/or annual, early spring seasonal grazing. Lack of litter and reduced plant heights result in higher soil temperatures, poor water infiltration rates, high evapotranspiration, and increased percolation of the high water table which increases salt concentrations on the surface. This gives inland saltgrass and other salt tolerant species a competitive advantage over less tolerant species. Nuttall's alkaligrass, slender wheatgrass, prairie cordgrass, and alkali cordgrass have decreased while western wheatgrass and inland saltgrass will initially increase in composition. Mat muhly (*Muhlenbergia richardsonis*), foxtail barley, silverleaf cinquefoil (*Potentilla argentea*), dock (Rumex), and plantain (Plantago) will also increase in composition. As long as the herbaceous component remains intact, the plant community tends to be resilient. However, species composition can be further altered through long-term heavy, continuous grazing. With loss of Nuttall's alkaligrass, Prairie cordgrass, Alkali Cordgrass, slender wheatgrass, and much of the western wheatgrass, the inland saltgrass will eventually become the dominant species. This plant community is relatively stable and well adapted to increased salinity. Plant vigor, litter, plant density, and production have decreased. The biological integrity, water, and nutrient cycles of this plant community are becoming impaired.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1865	2625	3280
Forb	135	375	720
Total	**2000**	**3000**	**4000**

Figure 14. Plant community growth curve (percent production by month). SD5507, Southern Black 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

Community 1.3
Western Wheatgrass-Nuttail's Alkaligrass

This plant community occurs when grazing is removed for long periods of time (rest) in the absence of fire. Plant composition is similar to 1.1 Prairie Cordgrass-Alkali Cordgrass-Nuttail's Alkaligrass Plant Community Phase; however, individual species production and frequency will be lower. Much of the nutrients are tied up in excessive litter. The nutrient cycle is slowed due to standing dead plant residues not in contact with a moist soil surface. Aboveground litter also limits sunlight from reaching plant crowns. Tall warm-season grasses (cordgrasses) die off or are reduced in density and vigor and typically develop into small but dense colonies. Thick litter and absence of grazing animals (animal impact) or fire reduces seed germination and establishment. This plant community develops after an extended period of 10 or more years of non-use by herbivores and exclusion of fire. This plant community is resistant to change without prescribed grazing or fire.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	935	1520	1815
Forb	165	380	685
Total	**1100**	**1900**	**2500**

Figure 16. Plant community growth curve (percent production by month). SD5506, Southern Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

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

Pathway 1.1A
Community 1.1 to 1.2

Heavy, continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites, will shift this community to the 1.2 Western Wheatgrass-Foxtail Barley-Inland Saltgrass Plant Community Phase.

Pathway 1.1B
Community 1.1 to 1.3

Non-use and no surface fire for extended periods of time will tend to favor the cool-season grasses, and the warm-season grasses will decline causing a shift to the 1.3 Western Wheatgrass-Nuttail's Alkaligrass Plant Community Phase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing (alternating season of use and providing adequate recovery periods, or periodic light to moderate grazing, possibly including periodic rest), 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 Prairie Cordgrass-Alkali Cordgrass-Nutall's Alkaligrass Plant Community Phase.

Pathway 1.3A
Community 1.3 to 1.1

Prescribed grazing, and/or prescribed burning occurring at relatively frequent intervals (every 3 to 5 years), a return to normal disturbance regime levels and frequencies, or periodic light to moderate grazing (possibly including periodic rest) would have converted this plant community to the 1.1 Prairie Cordgrass-Alkali Cordgrass-Nuttail's Alkaligrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 2
Degraded State

The Degraded State is characterized by the dominance of the shorter-statured, more saline tolerant species such as foxtail barley and inland saltgrass, the increase in bare ground, and the increased presence of salt accumulations on the soil surface. Infiltration is reduced, which allows the moisture and the salts carried by the moisture to be wicked up to the soil surface. The short-statured and shallow-rooted species are more capable of withstanding the higher concentrations of salts in the soil surface. As the disturbance level increases, plant density decreases even more, giving way to annual species and invasive perennial species, as well as, a further increase in bare ground.

Community 2.1
Foxtail Barley-Inland Saltgrass/Bare Ground

This plant community developed with heavy, continuous season-long grazing where adequate recovery periods between grazing events were not allowed. Patches of inland saltgrass sod are typical and foxtail barley is well distributed throughout the community. Nuttall's alkaligrass and western wheatgrass have been greatly reduced and may persist in remnant amounts, though reduced in vigor. Bare ground may develop in micro lows where salt concentrations are highest. A white salt crust is common on the surface. Only a few very salt tolerant annuals such as silverscale saltbush (*Atriplex argentea*) and seepweed can survive. This plant community is resistant to change due to the grazing

tolerance of inland saltgrass and increased surface salts. A significant amount of production and diversity has been lost when compared to 1.1 Prairie Cordgrass-Alkali Cordgrass-Nuttall's Alkaligrass Plant Community Phase. Loss of key warm-season grasses and increased bare ground has negatively impacted energy flow and nutrient cycling. Water infiltration is reduced significantly due to the shallow rooting depth of inland saltgrass and increased bare ground.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	935	1520	1815
Forb	165	380	685
Total	**1100**	**1900**	**2500**

Figure 18. Plant community growth curve (percent production by month). SD5508, Southern Black Glaciated Plains, lowland cool-season/warm-season codominant.. Cool-season, warm-season codominant, lowland..

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

Community 2.2
Annual Pioneer-Perennial Pioneer/Bare Ground

This plant community developed under continuous, heavy grazing or other excessive disturbances. The species present in this phase are highly variable, but often include nonnative invasive and early seral species. Plant diversity is low (plant richness may be high, but areas are often dominated by a few species). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include foxtail barley which will dominate along with plains bluegrass (*Poa arida*), Nuttall's alkaligrass, annual brome (*Bromus tectorum*), and western wheatgrass. The dominant forbs include kochia (*Bassia scoparia*), curly dock (*Rumex crispus*), and other early successional salt tolerant species. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to invasion of non-native species due to severe soil disturbances and a relatively high percentage of bare ground. 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.

Figure 19. Plant community growth curve (percent production by month). SD5506, Southern Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

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

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 grazing during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites) will shift this community to the 2.2 Annual Pioneer-Perennial Pioneer/*Bare Ground* Plant Community Phase.

Pathway 2.2A
Community 2.2 to 2.1

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 2.1 Foxtail Barley-Inland Saltgrass/*Bare Ground* Plant Community Phase

Transition T1A
State 1 to 2

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest), prescribed burning occurring at relatively frequent intervals (every 3 to 5 years), and a return to normal disturbance regime levels may lead this Degraded State (State 2) over a threshold to the Reference State (State 1).

Restoration pathway T2A
State 2 to 1

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest), prescribed burning occurring at relatively frequent intervals (every 3 to 5 years), and a return to normal disturbance regime levels may lead this Degraded State (State 2) over a threshold to the Reference State (State 1).

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	**Warm-Season Grasses**			600–1400	
	alkali cordgrass	SPGR	*Spartina gracilis*	200–1200	–
	prairie cordgrass	SPPE	*Spartina pectinata*	200–1200	–
	alkali sacaton	SPAI	*Sporobolus airoides*	80–400	–
	switchgrass	PAVI2	*Panicum virgatum*	0–200	–
2	**Wheatgrass**			400–1000	
	western wheatgrass	PASM	*Pascopyrum smithii*	200–800	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	200–600	–
3	**Cool-Season Grasses**			400–800	
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	400–800	–
	foxtail barley	HOJU	*Hordeum jubatum*	40–200	–
	plains bluegrass	POAR3	*Poa arida*	40–200	–
4	**Short Warm-Season Grasses**			120–400	
	saltgrass	DISP	*Distichlis spicata*	80–400	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	40–120	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–120	–
5	**Grass-likes**			200–600	
	sedge	CAREX	*Carex*	80–400	–
	spikerush	ELEOC	*Eleocharis*	40–200	–
	rush	JUNCU	*Juncus*	40–200	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–120	–
Forb					
6	**Forbs**			200–600	
	Forb, native	2FN	*Forb, native*	40–160	–
	aster	ASTER	*Aster*	40–120	–
	annual marsh elder	IVAN2	*Iva annua*	0–120	–
	povertyweed	IVAX	*Iva axillaris*	0–80	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	40–80	–

	redwool plantain	PLER	*Plantago eriopoda*	40–80	–
	silver cinquefoil	POAR8	*Potentilla argentea*	40–80	–
	western dock	RUAQ	*Rumex aquaticus*	40–80	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	40–80	–
	lambsquarters	CHAL7	*Chenopodium album*	40–80	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	40–80	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–80	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	0–40	–
	silverscale saltbush	ATAR2	*Atriplex argentea*	0–40	–
	red swampfire	SARU	*Salicornia rubra*	0–40	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–40	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Grasses**			0–300	
	alkali cordgrass	SPGR	*Spartina gracilis*	0–300	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–300	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–150	–
2	**Wheatgrass**			450–900	
	western wheatgrass	PASM	*Pascopyrum smithii*	450–900	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–300	–
3	**Cool-Season Grasses**			150–750	
	foxtail barley	HOJU	*Hordeum jubatum*	150–450	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	0–300	–
	plains bluegrass	POAR3	*Poa arida*	30–240	–
4	**Short Warm-Season Grasses**			150–600	
	saltgrass	DISP	*Distichlis spicata*	150–600	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	30–180	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–150	–
5	**Grass-likes**			150–450	

	spikerush	ELEOC	*Eleocharis*	30–240	–
	sedge	CAREX	*Carex*	30–210	–
	rush	JUNCU	*Juncus*	30–150	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
Forb					
6	**Forbs**			150–600	
	Forb, introduced	2FI	*Forb, introduced*	0–150	–
	Forb, native	2FN	*Forb, native*	30–150	–
	lambsquarters	CHAL7	*Chenopodium album*	30–90	–
	aster	ASTER	*Aster*	30–90	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	30–90	–
	cocklebur	XANTH2	*Xanthium*	0–60	–
	curly dock	RUCR	*Rumex crispus*	0–60	–
	burningbush	BASC5	*Bassia scoparia*	0–60	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	0–60	–
	povertyweed	IVAX	*Iva axillaris*	0–60	–
	prickly lettuce	LASE	*Lactuca serriola*	0–60	–
	redwool plantain	PLER	*Plantago eriopoda*	30–60	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	30–60	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	30–60	–
	redroot amaranth	AMRE	*Amaranthus retroflexus*	0–60	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–30	–
	silver cinquefoil	POAR8	*Potentilla argentea*	0–30	–
	western dock	RUAQ	*Rumex aquaticus*	0–30	–
	annual marsh elder	IVAN2	*Iva annua*	0–30	–
	silverscale saltbush	ATAR2	*Atriplex argentea*	0–30	–
	red swampfire	SARU	*Salicornia rubra*	0–30	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)

Grass/Grasslike					
1	**Warm-Season Grasses**			175–525	
	alkali cordgrass	SPGR	*Spartina gracilis*	70–525	–
	prairie cordgrass	SPPE	*Spartina pectinata*	70–525	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–105	–
	switchgrass	PAVI2	*Panicum virgatum*	0–70	–
2	**Wheatgrass**			700–1225	
	western wheatgrass	PASM	*Pascopyrum smithii*	525–1050	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	175–700	–
3	**Cool-Season Grasses**			350–875	
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	350–875	–
	plains bluegrass	POAR3	*Poa arida*	35–175	–
	foxtail barley	HOJU	*Hordeum jubatum*	35–105	–
4	**Short Warm-Season Grasses**			35–175	
	saltgrass	DISP	*Distichlis spicata*	35–175	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	35–70	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–70	–
5	**Grass-likes**			350–700	
	spikerush	ELEOC	*Eleocharis*	70–420	–
	sedge	CAREX	*Carex*	70–350	–
	rush	JUNCU	*Juncus*	35–175	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–105	–
Forb					
6	**Forbs**			175–525	
	Forb, introduced	2FI	*Forb, introduced*	0–140	–
	aster	ASTER	*Aster*	35–140	–
	Forb, native	2FN	*Forb, native*	35–105	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	35–105	–
	lambsquarters	CHAL7	*Chenopodium album*	35–70	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–70	–
	annual marsh elder	IVAN2	*Iva annua*	0–70	–
	western dock	RUAQ	*Rumex aquaticus*	0–70	–

	curly dock	RUCR	*Rumex crispus*	0–70	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–35	–
	cocklebur	XANTH2	*Xanthium*	0–35	–
	povertyweed	IVAX	*Iva axillaris*	0–35	–
	prickly lettuce	LASE	*Lactuca serriola*	0–35	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–35	–
	redwool plantain	PLER	*Plantago eriopoda*	0–35	–
	silver cinquefoil	POAR8	*Potentilla argentea*	0–35	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	0–35	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–35	–
	silverscale saltbush	ATAR2	*Atriplex argentea*	0–35	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			0–190	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–190	–
2	**Cool-Season Grasses**			285–855	
	foxtail barley	HOJU	*Hordeum jubatum*	285–855	–
	plains bluegrass	POAR3	*Poa arida*	0–95	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	0–95	–
3	**Short Warm-Season Grasses**			190–570	
	saltgrass	DISP	*Distichlis spicata*	190–570	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	19–95	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–95	–
4	**Grass-likes**			19–95	
	spikerush	ELEOC	*Eleocharis*	19–95	–
	rush	JUNCU	*Juncus*	0–76	–
	sedge	CAREX	*Carex*	0–57	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–38	–

5	**Non-Native Grasses**			0–190	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–152	–
	quackgrass	ELRE4	*Elymus repens*	0–95	–
	smooth brome	BRIN2	*Bromus inermis*	0–76	–
Forb					
6	**Forbs**			190–570	
	burningbush	BASC5	*Bassia scoparia*	38–475	–
	Forb, introduced	2FI	*Forb, introduced*	0–190	–
	curly dock	RUCR	*Rumex crispus*	19–190	–
	sleepydaisy	XANTH	*Xanthisma*	0–190	–
	redroot amaranth	AMRE	*Amaranthus retroflexus*	0–152	–
	prickly lettuce	LASE	*Lactuca serriola*	0–95	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	19–95	–
	povertyweed	IVAX	*Iva axillaris*	0–57	–
	lambsquarters	CHAL7	*Chenopodium album*	19–57	–
	Forb, native	2FN	*Forb, native*	0–57	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–38	–
	aster	ASTER	*Aster*	0–38	–
	silverscale saltbush	ATAR2	*Atriplex argentea*	0–38	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–38	–
	red swampfire	SARU	*Salicornia rubra*	0–38	–

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.

Cordgrass/Wheatgrass/Alkaligrass (1.1)
Average Annual Production (lbs./acre, air-dry): 4,000
Stocking Rate* (AUM/acre): 1.10

Wheatgrass/Foxtail Barley/Inland Saltgrass (1.2)
Average Annual Production (lbs./acre, air-dry): 3,000
Stocking Rate* (AUM/acre): 0.82

Wheatgrass/Alkaligrass (1.3)
Average Annual Production (lbs./acre, air-dry): 3,500
Stocking Rate* (AUM/acre): 0.96

Foxtail Barley/Inland Saltgrass, *Bare Ground* (2.1)
Average Annual Production (lbs./acre, air-dry): 1,900
Stocking Rate* (AUM/acre): 0.52

Bluegrass/Foxtail Barley/Saltgrass, *Bare Ground* (2.2)
Average Annual Production (lbs./acre, air-dry): 1,500
Stocking Rate* (AUM/acre): 0.41

*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 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 aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Ecological Site Correlation Issues and Questions:

• SD079 Lake County, SD did not use the (Sa) Salmo silty clay loam (national symbol g0zy) as used in the adjoining SD087 McCook 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

There is no NRCS clipping data and other inventory currently available for this site. Information presented here has been derived using field observations from range-trained personnel. 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

Other references

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Contributors

Stan Boltz

Approval

Suzanne Mayne-Kinney, 1/31/2024

Acknowledgments

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

(Steven.Winter@usda.gov), Soil Scientist, USDA-NRCS, Redfield, SD

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

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

Rangeland health reference sheet

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

Author(s)/participant(s)	David Schmidt, Tim Nordquist, Stan Boltz

Contact for lead author	david.schmidt@sd.usda.gov 605-352-1236
Date	12/07/2004
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class typically 5-6. Typically high root content. Soil surface is very resistant to erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.

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

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

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

    Dominant: Tall warm-season rhizomatous grass >>

    Sub-dominant: Mid cool-season bunch grass > mid cool-season rhizomatous grass = short warm-season grass >

    Other: Short cool-season grass = forb.

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

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.

14. **Average percent litter cover (%) and depth (in):** Litter cover is in contact with soil surface.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production,**

not just forage annual-production): 3,000–5,000 lbs./acre air-dry weight, average 4,000 lbs./acre air-dry weight.

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

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