USDA Natural Resources Conservation Service

Ecological site R053CY002SD
Linear Meadow

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General information

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

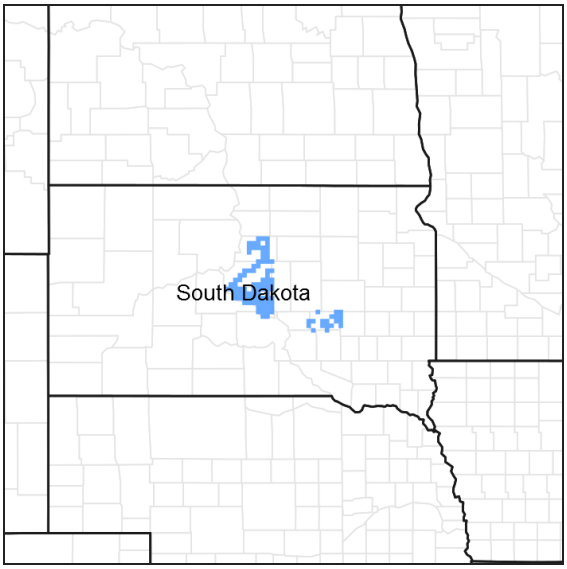


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 053C–Southern Dark Brown Glaciated Plains

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

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

Classification relationships

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

USFS Subregions: Northeastern Glaciated Plains Section (331E); Missouri Coteau Subsection (331Ea); Western Great Plains Section (331F); Missouri Breaks Subsection (331Fe); Western Glaciated Plains Section (332B); Southern Missouri Coteau Slope Subsection (332Bd, 332Be); North Central Great Plains Section (332D); Southern Missouri Coteau Slope Subsection (332Dd); Southern Missouri Coteau Subsection (332De) - (Cleland et al. 2007).

US EPA Level IV Ecoregion: Missouri Coteau (42a); Southern Missouri Coteau (42e); Southern Missouri Coteau Slope (42f) - (USEPA 2013)

Ecological site concept

The Linear Meadow ecological site typically occurs in drainageways which can receive excessive run off moisture from within the watershed. Soils are formed in local alluvium and 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.

Vegetation in the Reference State is typically co-dominated by cool-season grass and grass-like species and warm season grasses including: prairie cordgrass, reedgrasses, and a variety of sedges and rushes. Forbs include broadfruit bur-reed, giant goldenrod, Maximilian sunflower, and asters. Non-native species such as reed canarygrass and creeping meadow foxtail may invade the site due to change in disturbance regime or presence of a seed source.

Associated sites

R053CY003SD	**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 Crossplain, but other series are included.
R053CY004SD	**Wet Meadow** These sites occur in a basin or closed depression. Soils are poorly drained and the site ponds water for 4 to 8 weeks in the spring of the year or after a heavy rain. The central concept soil series is Tetonka, but other series are included.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Spartina pectinata* (2) *Calamagrostis stricta ssp. inexpansa*

Physiographic features

This site occurs on nearly level drainageways.

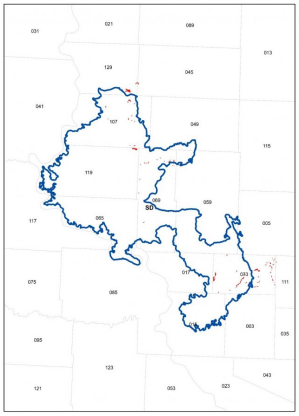


Figure 2. Distribution map

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Pothole
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	396–701 m
Slope	0–1%
Water table depth	0–61 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 53C is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 15 to 25 inches per year. The average annual temperature is about 45°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, South Dakota (SD)), to about 16°F (Onida 4 NW, SD). July is the warmest month with temperatures averaging from about 72°F (Stephan, SD), to about 74°F (Onida 4 NW, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 12 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 11 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

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

Table 3. Representative climatic features

Frost-free period (average)	141 days
Freeze-free period (average)	160 days
Precipitation total (average)	635 mm

Influencing water features

The Linear Meadow ecological site has a combination of physical and hydrological features that: 1) provide season-long ground water within two feet of the surface, 2) allows relatively free movement of water and air in the upper part of the soil, and 3) are occasionally or frequently flooded.

Wetland description

Cowardin, et. al., 1979
System: Palustrine
Subsystem: N/A
Class: Persistent Emergent Wetland
Subclass: Semi-permanently, or Seasonally Flooded, or Saturated

Soil features

These are very deep, poorly to very poorly drained, fine textured soils. Salinity and sodicity are none to slight. Water tables on this site range from about 9 to 24 inches below the surface during most of the growing season. This site occurs mainly along flood plains and in potholes. Slope ranges from zero to one percent. 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 nonrestrictive to water movement and root penetration. These soils are not susceptible to water erosion. The high water table and slow permeability strongly influences the soil-water-plant relationship. The central concept soil series for this site include Clamo and Lawet, but others are included as well.

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

Table 4. Representative soil features

Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Very poorly drained
Permeability class	Slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	17.78 cm
Calcium carbonate equivalent (0-101.6cm)	5–45%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
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.

This site developed under Southern Dark Brown Glaciated Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), fluctuating water tables and flooding events, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition that may not be described within this document.

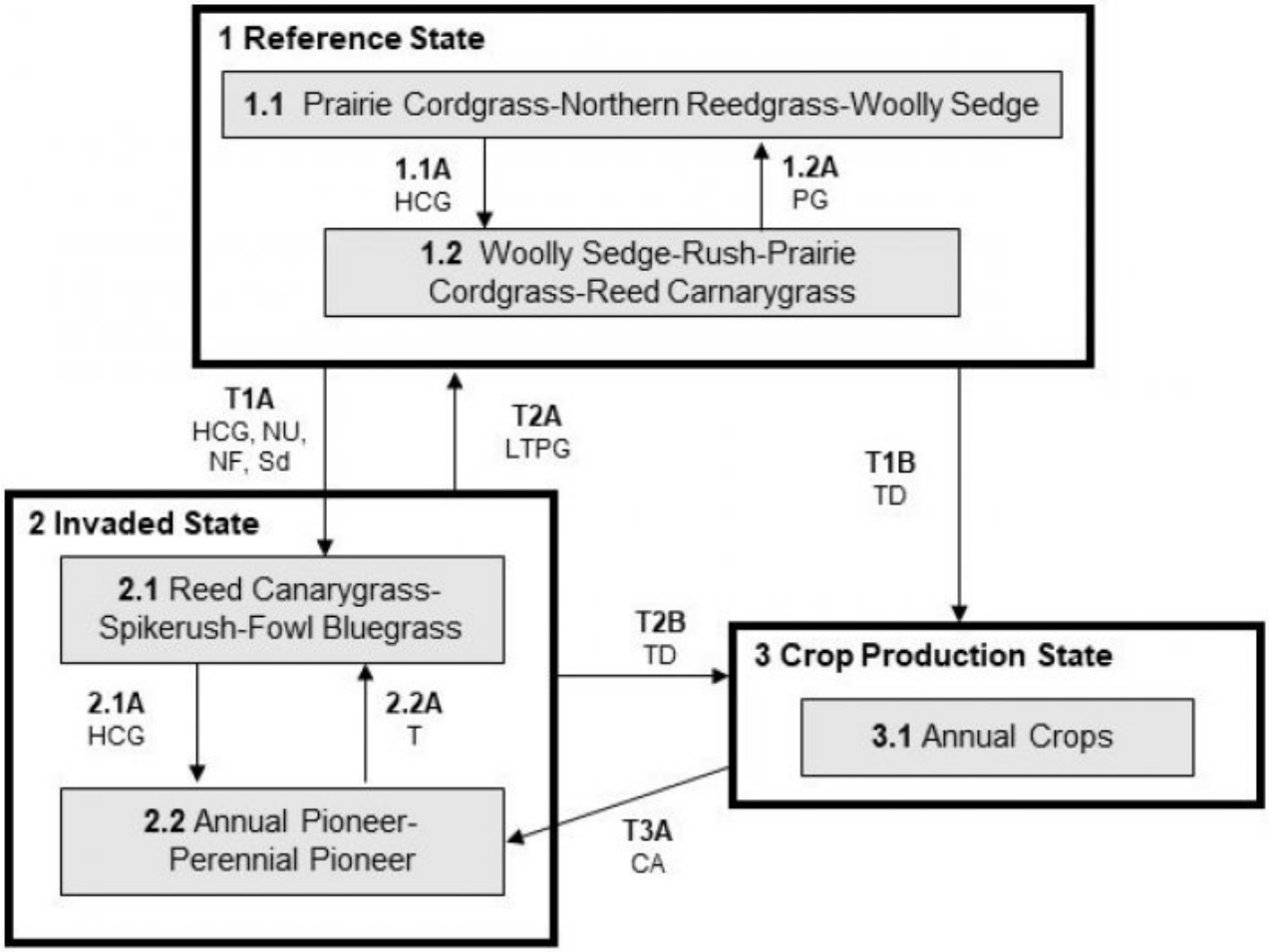
Heavy continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the interpretive plant community. Species such as fowl bluegrass (*Poa palustris*), spikerush (Eleocharis), and rush (Juncus) will initially increase. Prairie cordgrass and northern reedgrass will decrease in frequency and production. Heavy continuous grazing causes reed canarygrass (*Phalaris arundinacea*) to increase and eventually dominate the site. Extended periods of nonuse and no fire will result in a plant community having high litter levels, which also favors an increase in reed canarygrass, spikerush, and fowl bluegrass.

Interpretations are primarily based on the 1.1 Prairie Cordgrass-Northern Reedgrass-Woolly Sedge Plant Community Phase. It has 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 used. Plant community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

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

Linear Meadow – R053CY002SD



LEGEND
Linear Meadow – R053CY002SD

CA – Cropped and abandoned
HCG – Heavy continuous grazing
LTPG – Long-term prescribed grazing
NU – Non-use
NF – No fire
PG – Prescribed grazing
Sd – Sedimentation
T – Time w/wo disturbances
TD – Tillage, Artificial drainage

Figure 5. State-And-Transition model

Code	Process
T1A	Heavy continuous grazing, sedimentation, non-use and no fire
T1B	Tillage, artificial drainage (surface and subsurface)
T2A	Long term prescribed grazing
T2B	Tillage, artificial drainage (surface and subsurface)
T3A	Abandonment of cropping
1.1A	Heavy continuous grazing
1.2A	Prescribed grazing with recovery periods
2.1A	Heavy continuous grazing
2.2A	Time w/wo disturbance

Figure 6. Matrix

State 1
Reference State

The Linear Meadow 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 central concept soil series is Clamo and Lawet, but others are included. This state represents the natural range of variability that dominates the dynamics of this ecological site (ES). This state is typically codominated by cool-season grass and grass-like species, and warm-season grasses. Before European settlement, the primary disturbance mechanisms for this site in the reference condition included sporadic fire and grazing by large herding ungulates. Frequent surface fires (3 to 5 years) and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Today the primary disturbance is from a lack of fire and concentrated livestock grazing. Grasses that are desirable for livestock and wildlife can decline and a corresponding increase in less desirable grasses will occur.

Community 1.1
Prairie Cordgrass-Northern Reedgrass-Woolly Sedge

This community evolved with grazing by large herbivores, frequent surface fires and relatively frequent flooding 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 65 percent grasses, 20 percent grass-like species, 10 percent forbs, and 5 percent shrubs by air-dry weight. Prairie cordgrass is the dominant tall warm-season grass occupying this plant community. Reedgrasses (Calamagrostis) are the dominant tall cool-season species. A variety of sedges (Cyperacease) and rushes (Juncaceae) occur throughout this community as well as fowl mannagrass (*Glyceria striata*), switchgrass (*Panicum virgatum*), reed canarygrass, plains bluegrass (*Poa arida*), and fowl bluegrass (*Poa palustris*). Key forbs include broadfruit bur-reed (*Sparganium eurycarpum*), giant goldenrod (*Solidago gigantea*), New England aster (*Symphyotrichum novae-angliae*), Maximilian sunflower (*Helianthus maximiliani*), white panicle aster (*Symphyotrichum lanceolatum*), and cinquefoil (Potentilla). This plant community phase is diverse, stable, and productive, and is well adapted to the Northern Great Plains. The high-water table supplies much of the moisture for plant growth. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. The diversity in plant species allows for the variability of both the fluctuations of water table and reoccurring flooding. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	5257	6019	6652
Forb	286	504	807
Shrub/Vine	62	202	387
Total	**5605**	**6725**	**7846**

Figure 8. Plant community growth curve (percent production by month). SD5309, Southern Dark Brown Glaciated Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	16	22	23	14	7	5	0	0

Community 1.2
Woolly Sedge-Rush-Prairie Cordgrass-Reed Canarygrass

This plant community will slowly develop from the adverse effects of continuous grazing, without adequate recovery periods during the growing season following periods of below normal precipitation. Lack of litter and reduced plant heights result in higher soil temperatures and reduced water infiltration rates. Recognition of this plant community will enable the land user to implement key management decisions before a significant ecological threshold is crossed. When compared to the 1.1 Prairie Cordgrass-Northern Reedgrass-Woolly Sedge Plant Community Phase, prairie cordgrass has decreased. Sedge (Carex), rush, and other grass-like species are dominant. The grass-like species have increased while the reedgrass species have been significantly reduced. Switchgrass may be removed at this stage. Reed canarygrass may begin to increase significantly. Forb species would include asters (Aster), goldenrod (Solidago), and cinquefoil, as well as, a possible invasion of Canada thistle (*Cirsium arvense*). Plant production and frequency have been reduced. The water cycle, nutrient cycle, and energy flow are slightly reduced but continue to function adequately.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	4192	4876	5397
Forb	241	560	1009
Shrub/Vine	50	168	319
Total	**4483**	**5604**	**6725**

Figure 10. Plant community growth curve (percent production by month). SD5307, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, lowland..

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

Pathway 1.1A
Community 1.1 to 1.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 1.2 Woolly Sedge-Rush-Prairie Cordgrass-Reed Canarygrass 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 will convert this plant community to the 1.1 Prairie Cordgrass-Northern Reedgrass-Woolly Sedge Plant Community Phase. This pathway could also occur with a return to more normal precipitation levels and frequencies.

Conservation practices

State 2
Degraded State

This state is characterized by the degradation of the biotic integrity of the site due to excessive disturbance resulting in dominance by highly competitive species such as reed canarygrass, and possibly the invasion of nonnative species. Loss of diversity and reduction of plant vigor and production have negatively impacted energy flow and nutrient cycling. Infiltration is reduced and native plant mortality is increased. As the disturbance level increases, native plant density decreases even more, giving way to annual species and invasive perennial species, as well as, an increase in bare ground.

Community 2.1
Reed Canarygrass-Spikerush-Fowl Bluegrass

This plant community phase develops either with increased sedimentation, heavy continuous grazing, or with a long-term lack of grazing and/or no surface fire. In each case, native plant vigor is reduced allowing the increase of competitive species and eventually the introduction of nonnative species. Spikerush and other grass-like species, as well as, bluegrasses will increase. The more competitive forbs will also increase. Reed canarygrass often will increase to the point of dominance while prairie cordgrass will diminish significantly. Other invasive plants such as creeping meadow foxtail (*Alopecurus arundinaceus*) or Canada thistle may become prevalent if a seed source is present or nearby. Nutrient cycling will be greatly diminished and the energy flow will shift significantly and be reduced as well. Infiltration will be reduced somewhat compared to the Reference State. This plant community is somewhat resistant to change. The combination of both grazing and fire is most effective in moving this plant community towards the Reference State.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3166	3968	4652
Forb	196	448	807
Shrub/Vine	–	67	146
Total	**3362**	**4483**	**5605**

Figure 12. Plant community growth curve (percent production by month). SD5306, Southern Dark Brown Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

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

Community 2.2
Annual Pioneer-Pioneer Perennial

This plant community developed with heavy continuous grazing without adequate recovery periods between grazing events or abandonment after cropping. The dominant vegetation includes pioneer annual or perennial grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include inland saltgrass (*Distichlis spicata*), foxtail barley (*Hordeum jubatum*), barnyardgrass (*Echinochloa crus-galli*), quackgrass (*Elymus repens*), fowl bluegrass, Kentucky bluegrass (*Poa pratensis*), Baltic rush (Juncus balticus), and sedges. The dominant forbs may include cocklebur (Xanthium), Canada thistle, and other early successional species. The community is susceptible to invasion of nonnative species due to severe soil disturbances and relatively high percent of bare ground. This plant community is resistant to change as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Significant economic inputs, management, and time would be required to move this plant community toward a higher successional stage. Secondary succession is highly variable, depending upon availability and diversity of a viable reproductive source of

higher successional species. This plant community may be renovated to improve the production capability, but management changes would be needed to maintain the new plant community.

Pathway 2.1A
Community 2.1 to 2.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 2.2 Annual Pioneer-Perennial Pioneer 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 Reed Canarygrass-Spikerush-Fowl Bluegrass Plant Community Phase.

State 3
Crop Production State

Community 3.1
Annual Crops

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

Transition T1A
State 1 to 2

Sedimentation beyond normal levels due to increased flooding or non-use and 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, or heavy continuous grazing will likely lead this state over a threshold resulting in the 2.1 Reed Canarygrass-Spikerush-Fowl Bluegrass Plant Community Phase within the Invaded State (State 2).

Transition T1B
State 1 to 3

Tillage, artificial drainage (surface and subsurface) will cause a shift over a threshold leading to the 3.1 Annual Crops Plant Community Phase within the Crop Production State (State 3).

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) may lead this plant community phase over a threshold to the Reference State (State 1). Wetland restoration techniques may be necessary to restore biotic integrity and plant diversity and productivity.

Conservation practices

Prescribed Grazing
Wetland Restoration

Transition T2B

State 2 to 3

Tillage, artificial drainage (surface and subsurface) will cause a shift over a threshold leading to the 3.1 Annual Crops Plant Community Phase within the Crop Production State (State 3).

Restoration pathway T3A
State 3 to 2

Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 2) and more specifically to the 2.2 Annual Pioneer-Perennial Pioneer Plant Community Phase.

Additional community tables

Table 8. 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**			1345–3363	
	prairie cordgrass	SPPE	*Spartina pectinata*	1345–3026	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	0–336	–
	switchgrass	PAVI2	*Panicum virgatum*	0–336	–
2	**Cool-Season Grasses**			673–1681	
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	269–807	–
	bluejoint	CACA4	*Calamagrostis canadensis*	202–673	–
	slimstem reedgrass	CASTS5	*Calamagrostis stricta ssp. stricta*	67–538	–
	fowl mannagrass	GLST	*Glyceria striata*	67–336	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	67–336	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–202	–
3	**Grass-likes**			673–1345	
	woolly sedge	CAPE42	*Carex pellita*	135–673	–
	fox sedge	CAVU2	*Carex vulpinoidea*	135–673	–
	bottlebrush sedge	CAHY4	*Carex hystericina*	67–336	–
	smoothcone sedge	CALA12	*Carex laeviconica*	67–336	–
	rush	JUNCU	*Juncus*	67–336	–
	bulrush	SCHOE6	*Schoenoplectus*	0–202	–
	yellow nutsedge	CYES	*Cyperus esculentus*	0–202	–
	spikerush	ELEOC	*Eleocharis*	67–202	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–202	–
4	**Other Native Grasses**			67–673	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–336	–
	Canada wildrye	ELCA4	*Elymus canadensis*	67–336	–
	plains bluegrass	POAR3	*Poa arida*	0–202	–
	fowl bluegrass	POPA2	*Poa palustris*	0–202	–
Forb					
5	**Forbs**			336–673	
	Forb, native	2FN	*Forb, native*	67–269	–
	giant goldenrod	SOGI	*Solidago gigantea*	67–202	–

	giant goldenrod	SOGI	*Solidago gigantea*	67–202	
	broadfruit bur-reed	SPEU	*Sparganium eurycarpum*	0–202	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–202	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–135	–
	prairie ironweed	VEFA2	*Vernonia fasciculata*	67–135	–
	meadow zizia	ZIAP	*Zizia aptera*	67–135	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	67–135	–
	marsh skullcap	SCGA	*Scutellaria galericulata*	67–135	–
	Canadian anemone	ANCA8	*Anemone canadensis*	67–135	–
	nodding beggartick	BICE	*Bidens cernua*	67–135	–
	spotted water hemlock	CIMA2	*Cicuta maculata*	0–135	–
	wild mint	MEAR4	*Mentha arvensis*	67–135	–
	water knotweed	POAM8	*Polygonum amphibium*	0–135	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–135	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	67–135	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	67–135	–
	Macoun's buttercup	RAMA2	*Ranunculus macounii*	0–135	–
	western dock	RUAQ	*Rumex aquaticus*	0–67	–
	rough bugleweed	LYAS	*Lycopus asper*	0–67	–
	brook cinquefoil	PORI3	*Potentilla rivalis*	0–67	–
	common boneset	EUPE3	*Eupatorium perfoliatum*	0–67	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–67	–
	silverweed cinquefoil	ARAN7	*Argentina anserina*	0–67	–
	northern water plantain	ALTR7	*Alisma triviale*	0–67	–
	marsh fleabane	SECO2	*Senecio congestus*	0–67	–
	hemlock waterparsnip	SISU2	*Sium suave*	0–67	–
Shrub/Vine					
6	**Shrubs**			67–336	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–202	–
	false indigo bush	AMFR	*Amorpha fruticosa*	67–202	–
	Missouri River willow	SAER	*Salix eriocephala*	0–202	–
	sandbar willow	SAIN3	*Salix interior*	0–202	–
	meadow willow	SAPE5	*Salix petiolaris*	0–202	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			280–1401	
	prairie cordgrass	SPPE	*Spartina pectinata*	280–1401	–
	switchgrass	PAVI2	*Panicum virgatum*	0–112	–
2	**Cool-Season Grasses**			280–841	
	reed canarygrass	PHAR3	*Phalaris arundinacea*	11–673	–
	fowl mannagrass	GLST	*Glyceria striata*	0–560	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp.*	0–280	–

			inexpansa		
	bluejoint	CACA4	*Calamagrostis canadensis*	0–224	–
	slimstem reedgrass	CASTS5	*Calamagrostis stricta ssp. stricta*	0–168	–
3	**Grass-likes**			841–2522	
	woolly sedge	CAPE42	*Carex pellita*	56–841	–
	fox sedge	CAVU2	*Carex vulpinoidea*	56–841	–
	rush	JUNCU	*Juncus*	112–841	–
	bottlebrush sedge	CAHY4	*Carex hystericina*	56–560	–
	smoothcone sedge	CALA12	*Carex laeviconica*	56–560	–
	spikerush	ELEOC	*Eleocharis*	112–448	–
	bulrush	SCHOE6	*Schoenoplectus*	0–224	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–168	–
	yellow nutsedge	CYES	*Cyperus esculentus*	0–56	–
4	**Other Native Grasses**			224–673	
	plains bluegrass	POAR3	*Poa arida*	56–448	–
	fowl bluegrass	POPA2	*Poa palustris*	56–448	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–280	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–112	–
Forb					
5	**Forbs**			280–841	
	giant goldenrod	SOGI	*Solidago gigantea*	56–336	–
	broadfruit bur-reed	SPEU	*Sparganium eurycarpum*	0–280	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	56–280	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–224	–
	Forb, introduced	2FI	*Forb, introduced*	56–224	–
	Forb, native	2FN	*Forb, native*	0–168	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	56–168	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	56–168	–
	water knotweed	POAM8	*Polygonum amphibium*	0–112	–
	spotted water hemlock	CIMA2	*Cicuta maculata*	0–112	–
	brook cinquefoil	PORI3	*Potentilla rivalis*	0–56	–
	Macoun's buttercup	RAMA2	*Ranunculus macounii*	0–56	–
	marsh skullcap	SCGA	*Scutellaria galericulata*	0–56	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–56	–
	silverweed cinquefoil	ARAN7	*Argentina anserina*	0–56	–
	nodding beggartick	BICE	*Bidens cernua*	0–56	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–56	–
	wild mint	MEAR4	*Mentha arvensis*	0–56	–
	prairie ironweed	VEFA2	*Vernonia fasciculata*	0–56	–
	meadow zizia	ZIAP	*Zizia aptera*	0–56	–
Shrub/Vine					
6	**Shrubs**			56–280	
	false indigo bush	AMFR	*Amorpha fruticosa*	56–280	–

	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–112	–
	Missouri River willow	SAER	*Salix eriocephala*	0–56	–
	sandbar willow	SAIN3	*Salix interior*	0–56	–
	meadow willow	SAPE5	*Salix petiolaris*	0–56	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			0–224	
	prairie cordgrass	SPPE	*Spartina pectinata*	0–224	–
2	**Cool-Season Grasses**			673–1569	
	fowl mannagrass	GLST	*Glyceria striata*	673–2690	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	673–1569	–
3	**Grass-likes**			673–2018	
	spikerush	ELEOC	*Eleocharis*	448–1121	–
	rush	JUNCU	*Juncus*	224–897	–
	yellow nutsedge	CYES	*Cyperus esculentus*	0–448	–
	bottlebrush sedge	CAHY4	*Carex hystericina*	0–224	–
	woolly sedge	CAPE42	*Carex pellita*	0–224	–
	fox sedge	CAVU2	*Carex vulpinoidea*	0–224	–
	smoothcone sedge	CALA12	*Carex laeviconica*	0–135	–
	bulrush	SCHOE6	*Schoenoplectus*	0–90	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–45	–
4	**Other Native Grasses**			224–673	
	plains bluegrass	POAR3	*Poa arida*	90–448	–
	fowl bluegrass	POPA2	*Poa palustris*	90–448	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–224	–
Forb					
5	**Forbs**			224–673	
	giant goldenrod	SOGI	*Solidago gigantea*	45–359	–
	Forb, introduced	2FI	*Forb, introduced*	45–314	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	45–269	–
	broadleaf cattail	TYLA	*Typha latifolia*	45–269	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	45–179	–
	Forb, native	2FN	*Forb, native*	0–90	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–90	–
	water knotweed	POAM8	*Polygonum amphibium*	0–45	–
	spotted water hemlock	CIMA2	*Cicuta maculata*	0–45	–
	broadfruit bur-reed	SPEU	*Sparganium eurycarpum*	0–45	–
Shrub/Vine					
6	**Shrubs**			0–135	
	false indigo bush	AMFR	*Amorpha fruticosa*	0–135	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–45	–

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.

Prairie Cordgrass/Reedgrass/Sedge (1.1)
Average Annual Production (lbs./acre, air-dry): 6,000
Stocking Rate* (AUM/acre): 1.65

Sedge/Rush/Prairie Cordgrass/Reed Canarygrass (1.2)
Average Annual Production (lbs./acre, air-dry): 5,000
Stocking Rate* (AUM/acre): 1.37

Reed Canarygrass/Spikerush/Bluegrass (2.1)
Average Annual Production (lbs./acre, air-dry): 4,000
Stocking Rate* (AUM/acre): 1.09

Annual/Pioneer Perennial (2.2)
Average Annual Production (lbs./acre, air-dry): 2,000
Stocking Rate* (AUM/acre): 0.55

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

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Ecological Site Correlation Issues and Questions:

• SD059 Hand County, SD did not use the (Lc) Lawet loam (national symbol cw5j) as used in the adjoining SD069 Hyde 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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Approval

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Acknowledgments

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This Provisional Ecological Site concept has passed both Quality Control and Quality Assurance processes. Quality Assurance was approved by David Kraft, NRCS Regional Ecologist as of 11/12/2020.

Rangeland health reference sheet

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

Author(s)/participant(s)	Stan Boltz, Mitch Faulkner, Shane Deranleau
Contact for lead author	Stan Boltz, stanley.boltz@sd.usda.gov, 605-352-1236
Date	03/15/2011
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 or not present.

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

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

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

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

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

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability normally a 6 rating. Typically high root content and organic matter in the soil surface. Soil surface is very resistant to erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Structure is granular to friable fine, subangular blocky, and mollic (higher organic matter) colors of A-horizon down to about 10 inches.

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

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

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

    Dominant: Tall, warm-season grasses >

    Sub-dominant: Cool-season grasses (mid and tall) > grass-like species > forbs >

    Other: Shrubs

    Additional: Other native grasses occur in other functional groups.

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

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14. **Average percent litter cover (%) and depth (in):** 85-90 percent plant litter cover, roughly 1 to 2 1/2 inches in depth. Litter cover is in contact with the soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 6,000 pounds/acre (air-dry basis)

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

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