USDA Natural Resources Conservation Service

Ecological site R102BY001SD
Shallow Marsh

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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 Shallow Marsh ecological site typically occurs in a basin or closed depression, and receives water directly from precipitation, surface overland flow, and groundwater discharge. Soils are formed in local alluvium and are very poorly drained, which have a water table within 0 to 1 foot of the soil surface. Permeability is very slow due to the clayey subsoil and the site will pond water until early summer in most years. Ponded water conditions and very slow permeability strongly influence the soil-water-plant relationship.

Vegetation in the Reference State is typically dominated by cool-season grass and grass-like species including Whitetop, slough sedge, woolly sedge, American mannagrass, prairie cordgrass, and spikerush. Forb species may include smartweeds, western dock, and white panicle aster. Non-native species such as quackgrass, creeping meadow foxtail, and Kentucky bluegrass may invade the site due to change 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.
R102BY004SD	**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.
R102BY020SD	**Loamy Overflow** These sites occur in upland swales. Soils are moderately well drained which have water flow into and over or through the site. The central concept soil series is Trent, but other series are included.
R102BY006SD	**Limy Subirrigated** These sites occur along the edges of drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. Soils will effervesce with acid at or near the surface. The central concept soil series are Davison and Wakonda, but other series are included.

Similar sites

R102BY004SD	**Wet Meadow** Wet Meadow is similar in landscape position, but the site ponds water only for 4 to 8 weeks in the spring of the year or after a heavy rain. The Wet Meadow site has more prairie cordgrass and is less productive than the Shallow Marsh site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Carex atherodes* (2) *Scolochloa festucacea*

Physiographic features

This site occurs on nearly level to concave depressions on uplands.

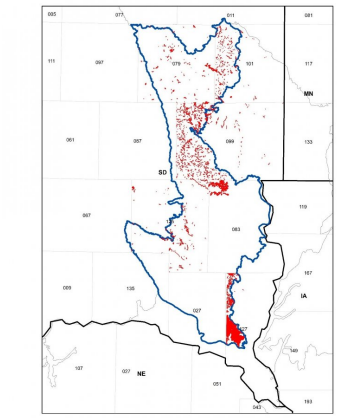


Figure 2. The Site Distribution map for the Shallow Marsh site in MLRA 102B.

Table 2. Representative physiographic features

Landforms	(1) Pothole
Flooding frequency	None
Ponding duration	Very long (more than 30 days)
Ponding frequency	Frequent
Elevation	335–579 m
Slope	0–1%
Ponding depth	0–61 cm
Water table depth	0–61 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) MONTROSE 8N [USC00395738], Montrose, SD
- (3) MADISON 2SE [USC00395090], Madison, SD
- (4) CANTON [USC00391392], Canton, SD
- (5) CENTERVILLE 6 SE [USC00391579], Beresford, SD

Influencing water features

The Shallow Marsh ecological site has a combination of physical and hydrological features that: 1) provide season-long ground water within at least one foot 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

Soil features

The common features of soils in this site are the silty clay loam to clay-textured subsoil and slopes of zero to one percent. The soils in this site are very poorly drained and formed in alluvium. The silty clay loam to silty clay surface layer is 10 to 19 inches thick. The soils have a very slow infiltration rate. 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. Ponded water conditions and very slow permeability strongly influences the soil-water-plant relationship.

The central concept soil series for this site is Worthing, but other series are included as well.

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) Silty clay loam (2) Silty clay
Family particle size	(1) Clayey
Drainage class	Very poorly drained
Permeability class	Very slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	15.24–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–25%
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)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
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 Shallow Marsh site, located in the Southern Black Glaciated Plains Region of the MLRA, developed under Northern Great Plains climatic conditions and included historic natural influence of large herding herbivores and occasional fire. Changes 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 Whitetop-Slough Sedge 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.

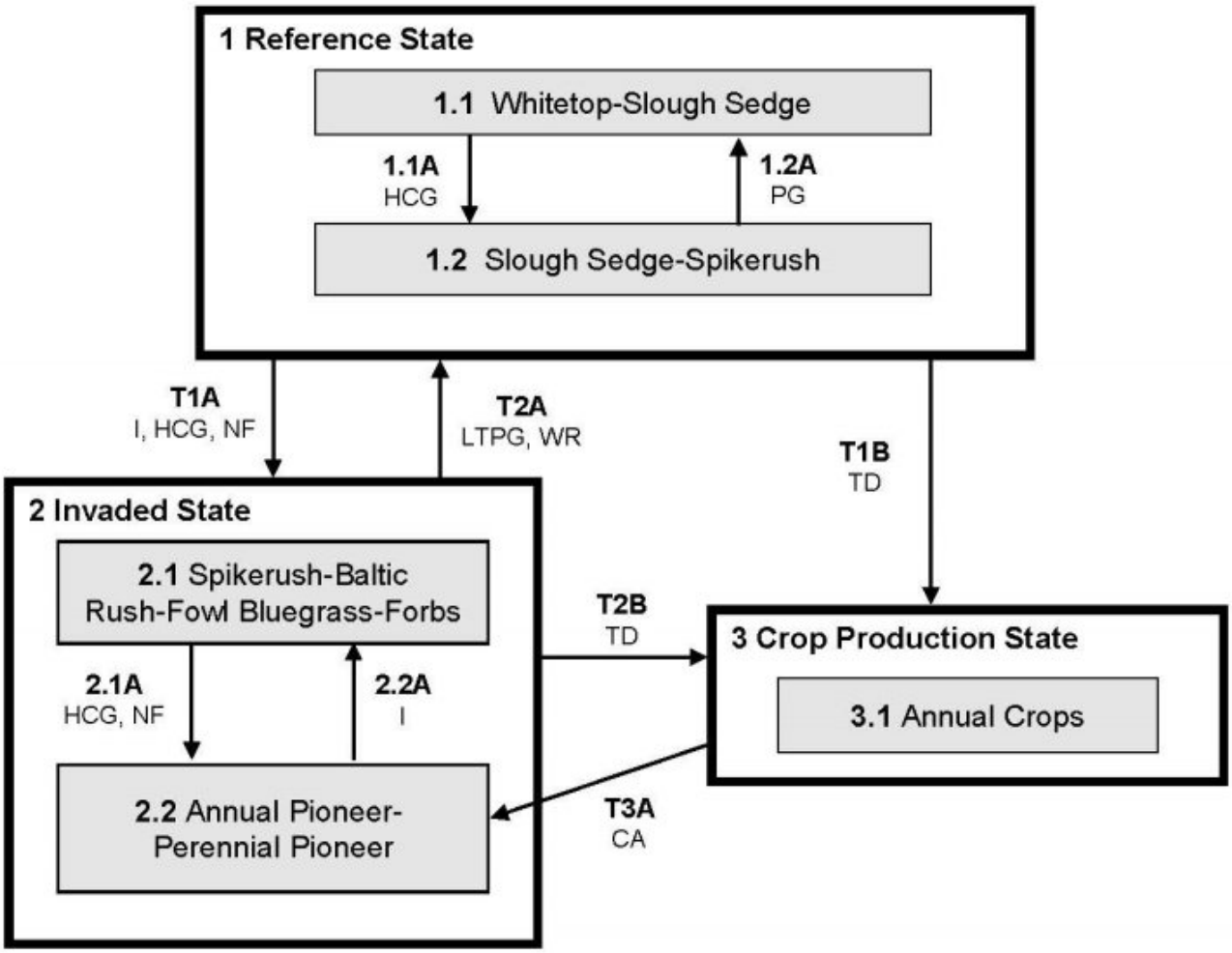
This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dynamics of this site. Heavy, continuous grazing without adequate recovery periods following each grazing occurrence causes this site to depart from the Reference State due to the compaction and overgrazing. Species such as fowl bluegrass (*Poa palustris*), spikerush (Eleocharis), and Baltic rush (Juncus balticus) will initially increase. Whitetop and slough sedge will decrease in frequency and production. Continued heavy grazing eventually causes a dominance by spikerush, rushes (Juncus), and unpalatable forbs such as curly dock (*Rumex crispus*).

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 plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and 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

Shallow Marsh – R102BY001SD



LEGEND
Shallow Marsh – R102BY001SD

CA – Cropped and abandoned
HCG – Heavy, continuous grazing
I – Inundation
LTPG – Long-term prescribed grazing
NF – No fire
PG – Prescribed grazing
TD – Tillage, Artificial drainage
WR – Wetland restoration

Figure 9. The State-And-Transition model and Legend for the Shallow Marsh Ecological Site in MLRA 102B.

Code	Process
T1A	Heavy, continuous grazing, inundation, no fire
T1B	Tillage, artificial drainage (surface and subsurface)
T2A	Long term prescribed grazing, wetland restoration
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, no fire
2.2A	Inundation

Figure 10. The Matrix for the Shallow Marsh Ecological Site in MLRA 102B.

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 cool-season grass and grass-like species. Before Europeans arrived in North America, the primary disturbance mechanisms for this site in the Reference condition included periodic fire, grazing by large herding ungulates, and fluctuations in the water table, which influences ponding frequency and duration. Frequent surface fires (occurring every 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, 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
Reference or Whitetop-Slough Sedge Community

Figure 11. Typical vegetative community associated with the Reference Community of the Shallow Marsh site in MLRA 102B.

Interpretations are based primarily on the 1.1 Whitetop-Slough Sedge Plant Community Phase. This plant community evolved with grazing by large herbivores, frequent surface fires, and periodic flooding events and is suited for grazing by domestic livestock. The Reference plant community can be found on areas that are grazed and where the grazed plants receive adequate periods of rest during the growing season in order to recover. The potential vegetation is about 45 percent grasses, 40 percent grass-likes, and 15 percent forbs. The major grasses and grass-likes include whitetop, slough sedge, woolly sedge (*Carex pellita*), American mannagrass (*Glyceria grandis*), prairie cordgrass, Sartwell's sedge (*Carex sartwellii*), Nebraska sedge (*Carex nebrascensis*), and spikerush. Key forbs include smartweeds (Polygonum), western dock (*Rumex aquaticus*), and white panicle aster (*Symphyotrichum lanceolatum*). The Reference plant community 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 variability of both the fluctuations of water table and re-occurring ponding allows for the diversity in plant species. 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	6400	6865	7342
Forb	325	981	1625
Total	**6725**	**7846**	**8967**

Figure 13. Plant community growth curve (percent production by month). SD0216, Till 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 1.2
Slough Sedge-Spikerush

This plant community will slowly develop from the adverse effects of continuous grazing without adequate recovery periods between each grazing event during the growing season. When compared to the 1.1 Whitetop-Slough Sedge Plant Community Phase, whitetop, prairie cordgrass, American mannagrass, and reedgrasses (Calamagrostis) have decreased. The grass-like species, such as slough sedge, spikerush, woolly sedge, Sartwell's sedge, Nebraska sedge, and rushes have increased, and tend to be dominant.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	5100	5787	6467
Forb	280	827	1379
Total	**5380**	**6614**	**7846**

Figure 15. Plant community growth curve (percent production by month). SD0216, Till 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 Slough Sedge-Spikerush 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 including periodic rest will convert this plant community to the 1.1 Whitetop-Slough Sedge Plant Community Phase. This pathway could also occur with a return to more normal precipitation levels and frequencies.

Conservation practices

Prescribed Grazing

State 2
Invaded State

This state is characterized by the increase in bare ground due to trampling caused by excessive use or by inundation for extended periods, which causes a temporary shift in the plant composition and cover. This allows for the invasion of non-native species, which, with continued heavy grazing, can increase to their eventual dominance. Loss or reduction of native cool- and warm-season species can negatively impacted energy flow and nutrient cycling. Infiltration will be reduced and native plant mortality will increase. As the disturbance level increases, native plant density decreases even more, giving way to annual and invasive perennial species, and a further increase in bare ground.

Community 2.1
Spikerush-Baltic Rush-Fowl Bluegrass-Forbs

This plant community developed with heavy, continuous grazing without adequate recovery periods between grazing events or inundation during periods of extended above-average precipitation. Spikerush, Baltic rush, bulrush (Schoenoplectus), and other less desirable grass-likes, along with grasses such as fowl bluegrass, and American sloughgrass (*Beckmannia syzigachne*), dominate the community. Quackgrass (*Elymus repens*), creeping meadow foxtail (*Alopecurus arundinaceus*), Kentucky bluegrass (*Poa pratensis*), and other non-native species can invade on drier portions of the community. Whitetop, slough sedge, other sedges, prairie cordgrass, and reedgrass will be virtually eliminated. Smartweed (Polygonum), dock (Rumex), and cinquefoil (Potentilla) have increased. Areas of bare ground can be present throughout the site. A significant amount of production and diversity has been lost when compared to the 1.1 Whitetop-Slough Sedge Plant Community Phase. Loss or reduction of native grasses, grass-likes, and forbs has negatively impacted energy flow and nutrient cycling. It will take a long time to restore this plant community with improved management or the return of more normal precipitation patterns.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2371	3049	3867
Total	**2371**	**3049**	**3867**

Figure 17. Plant community growth curve (percent production by month). SD0216, Till 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-Perennial Pioneer

This plant community developed with heavy, continuous grazing without adequate recovery periods between grazing events and no surface fire, or, abandonment after cropping. The dominant vegetation includes pioneer annual and/or perennial native and non-native grasses, grass-likes, forbs, and shrubs. Grasses may include foxtail barley (*Hordeum jubatum*), barnyard grass (*Echinochloa crus-galli*), quackgrass, fowl bluegrass, Kentucky bluegrass, Baltic rush, and sedges. The dominant forbs include knotweed (Polygonum), Canada thistle (*Cirsium arvense*), and other early successional species. 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. The community is susceptible to invasion of non-native species due to severe soil disturbances and the relatively high percent of bare ground. Significant economic inputs, management, and time would be required to move this plant community toward a higher ecological condition.

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; periods of below normal precipitation when grazing frequency and intensity increase on these sites; and no surface fire for extended periods of time (typically for 10 years or more) will shift this community to the 2.2 Annual Pioneer-Perennial Pioneer Plant Community Phase.

Pathway 2.2A
Community 2.2 to 2.1

Inundation for extended periods beyond normal ponding and drying patterns will convert this plant community to the 2.1 Spikerush-Baltic Rush-Fowl Bluegrass-Forbs Plant Community Phase within the Invaded State (State 2).

State 3
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 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 others.

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), no surface fire for extended periods of time (typically for 10 years or more), or inundation for extended periods beyond normal ponding and drying patterns will eventually cause a shift over a threshold leading to the 2.1 Spikerush-Baltic Rush-Fowl Bluegrass-Forbs Plant Community. Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

Transition T1B
State 1 to 3

Tillage and 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, or periodic light to moderate stocking levels 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 the biotic integrity and plant diversity and productivity.

Conservation practices

Prescribed Grazing

Transition T2B
State 2 to 3

Tillage and 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 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	**Grass-likes**			1961–4315	

	wheat sedge	CAAT2	*Carex atherodes*	785–2354	–
	bottlebrush sedge	CAHY4	*Carex hystericina*	157–785	–
	smoothcone sedge	CALA12	*Carex laeviconica*	78–785	–
	woolly sedge	CAPE42	*Carex pellita*	157–785	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–785	–
	spikerush	ELEOC	*Eleocharis*	157–785	–
	green bulrush	SCAT2	*Scirpus atrovirens*	78–628	–
	rush	JUNCU	*Juncus*	0–392	–
	flatsedge	CYPER	*Cyperus*	0–392	–
2	**Tall Cool-season Grasses**			392–1569	
	American mannagrass	GLGR	*Glyceria grandis*	157–1177	–
	common rivergrass	SCFE	*Scolochloa festucacea*	157–1177	–
3	**Tall Warm-season Grasses**			157–785	
	prairie cordgrass	SPPE	*Spartina pectinata*	157–785	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	0–392	–
4	**Reedgrasses**			0–392	
	bluejoint	CACA4	*Calamagrostis canadensis*	0–392	–
	awlfruit sedge	CAST5	*Carex stipata*	0–392	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–392	–
5	**Other Native Grasses**			392–785	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	157–628	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	157–628	–
Forb					
6	**Forbs**			392–1569	
	bur-reed	SPARG	*Sparganium*	78–785	–
	Forb, native	2FN	*Forb, native*	78–314	–
	northern water plantain	ALTR7	*Alisma triviale*	78–157	–
	Canadian anemone	ANCA8	*Anemone canadensis*	78–157	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	78–157	–
	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	0–157	–
	knotweed	POLYG4	*Polygonum*	78–157	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	78–157	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	78–157	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–157	–
	pale dock	RUAL4	*Rumex altissimus*	0–157	–
	western dock	RUAQ	*Rumex aquaticus*	78–157	–
	giant goldenrod	SOGI	*Solidago gigantea*	78–157	–
	hemlock waterparsnip	SISU2	*Sium suave*	0–78	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–78	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	0–78	–
	cinquefoil	POTEN	*Potentilla*	0–78	–
	Macoun's buttercup	RAMA2	*Ranunculus macounii*	0–78	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–78	–

	smooth horsetail	EQLA	*Equisetum laevigatum*	0–79	

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass-likes**			2645–4960	
	wheat sedge	CAAT2	*Carex atherodes*	992–2645	–
	spikerush	ELEOC	*Eleocharis*	661–1984	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	331–992	–
	woolly sedge	CAPE42	*Carex pellita*	331–992	–
	flatsedge	CYPER	*Cyperus*	0–661	–
	rush	JUNCU	*Juncus*	0–661	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–661	–
	bottlebrush sedge	CAHY4	*Carex hystericina*	0–661	–
	smoothcone sedge	CALA12	*Carex laeviconica*	0–661	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–529	–
2	**Tall Cool-season Grasses**			0–529	
	common rivergrass	SCFE	*Scolochloa festucacea*	0–331	–
	American mannagrass	GLGR	*Glyceria grandis*	0–198	–
3	**Tall Warm-season Grasses**			0–331	
	prairie cordgrass	SPPE	*Spartina pectinata*	0–331	–
4	**Reedgrasses**			0–132	
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–132	–
	slimstem reedgrass	CASTS5	*Calamagrostis stricta ssp. stricta*	0–132	–
5	**Other Native Grasses**			0–331	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–331	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	0–331	–
6	**Non-Native Grasses**			66–331	
	barnyardgrass	ECCR	*Echinochloa crus-galli*	66–331	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–198	–
Forb					
7	**Forbs**			331–1323	
	broadleaf cattail	TYLA	*Typha latifolia*	66–265	–
	Forb, introduced	2FI	*Forb, introduced*	0–265	–
	Forb, native	2FN	*Forb, native*	66–265	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	66–265	–
	giant goldenrod	SOGI	*Solidago gigantea*	66–198	–
	bur-reed	SPARG	*Sparganium*	0–198	–
	curly dock	RUCR	*Rumex crispus*	66–198	–
	knotweed	POLYG4	*Polygonum*	66–198	–
	narrowleaf cattail	TYAN	*Typha angustifolia*	66–198	–
	hemlock waterparsnip	SISU2	*Sium suave*	0–132	–

	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	0–132	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–132	–
	pale dock	RUAL4	*Rumex altissimus*	0–132	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–132	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–132	–
	splitlip hempnettle	GABI3	*Galeopsis bifida*	0–132	–
	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	0–66	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–66	–
	northern water plantain	ALTR7	*Alisma triviale*	0–66	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–66	–
	western dock	RUAQ	*Rumex aquaticus*	0–66	–
	cinquefoil	POTEN	*Potentilla*	0–66	–
	marsh arrowgrass	TRPA28	*Triglochin palustris*	0–66	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass-likes**			953–2096	
	spikerush	ELEOC	*Eleocharis*	381–1143	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	191–762	–
	wheat sedge	CAAT2	*Carex atherodes*	191–572	–
	rush	JUNCU	*Juncus*	0–381	–
	woolly sedge	CAPE42	*Carex pellita*	0–305	–
	flatsedge	CYPER	*Cyperus*	0–305	–
	bottlebrush sedge	CAHY4	*Carex hystericina*	0–191	–
	smoothcone sedge	CALA12	*Carex laeviconica*	0–191	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–191	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–114	–
2	**Other Native Grasses**			0–381	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–381	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	0–381	–
3	**Non-Native Grasses**			76–572	
	creeping meadow foxtail	ALAR	*Alopecurus arundinaceus*	0–381	–
	barnyardgrass	ECCR	*Echinochloa crus-galli*	38–305	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–305	–
	quackgrass	ELRE4	*Elymus repens*	0–229	–
Forb					
4	**Forbs**			381–1143	
	Forb, introduced	2FI	*Forb, introduced*	38–381	–
	curly dock	RUCR	*Rumex crispus*	76–381	–
	narrowleaf cattail	TYAN	*Typha angustifolia*	38–305	–
	broadleaf cattail	TYLA	*Typha latifolia*	38–305	–

	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	38–305	–
	giant goldenrod	SOGI	*Solidago gigantea*	38–267	–
	Forb, native	2FN	*Forb, native*	38–229	–
	knotweed	POLYG4	*Polygonum*	38–229	–
	splitlip hempnettle	GABI3	*Galeopsis bifida*	0–152	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	0–152	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–152	–
	hemlock waterparsnip	SISU2	*Sium suave*	0–114	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–114	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–76	–
	cinquefoil	POTEN	*Potentilla*	0–76	–
	bur-reed	SPARG	*Sparganium*	0–76	–
	marsh arrowgrass	TRPA28	*Triglochin palustris*	0–38	–
	pale dock	RUAL4	*Rumex altissimus*	0–38	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	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.

Slough Sedge/Whitetop (1.1)
Average Annual Production (lbs./acre, air-dry): 7,000
Stocking Rate* (AUM/acre): 1.92

Slough Sedge/Spikerush (1.2)
Average Annual Production (lbs./acre, air-dry): 5,900
Stocking Rate* (AUM/acre): 1.62

Spikerush/Baltic Rush/Fowl Bluegrass/Forbs (2.1)
Average Annual Production (lbs./acre, air-dry): 3,400
Stocking Rate* (AUM/acre): 0.93

Annual/Pioneer, Non-Native Perennial (2.2)
Average Annual Production (lbs./acre, air-dry): 1,600
Stocking Rate* (AUM/acre): 0.44

*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 and runoff potential for this site vary 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 in an area where shortgrasses form a strong sod and dominate the site. Dominance by bluegrass, 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:

• SD027 Clay County, SD did not use the (Wa) Wakonda-Worthing-Chancellor complex (national symbol h749) as used in the adjoining SD127 Union County, SD.
• SD027 Clay County, SD did not use the (Wc) Wentworth-Worthing silty clay loams (national symbol h74d) as used in the adjoining SD127 Union County, SD.
• SD027 Clay County, SD did not use the (Ws) Worthing-Chancellor silty clay loams (national symbol h74h) as used in the adjoining SD127 Union County, SD.
• SD087 McCook County, SD did not use the (Ba) Baltic silty clay loam, 0 to 1 percent slopes (national symbol h74h) (R102BY001SD ESD) as used in the adjoining SD099 Minnehaha County. SD087 McCook County, SD (Ba) Baltic silty clay loam (national symbol g0z0) (R55CBY001SD ESD) will need to be split correlated to match SD099 Minnehaha County, SD ESD.
• SD0135 Yankton County, SD did not use the (Ba) Baltic silty clay loam (national symbol g15f) as used in the adjoining SD125 Turner 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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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. 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 6. Typically high root content, and organic matter. Soil surface is very resistant to erosion.

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

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

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

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

    Dominant: Mid and tall grass-like species >>

    Sub-dominant: Tall cool-season grasses = forbs >

    Other: Tall warm-season grasses > mid cool-season rhizomatous grasses

    Additional:

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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 1-2 inches. 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 6,000-8,000 lbs./acre (air-dry weight). Reference value production is 7,000 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 reed canarygrass.

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