

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Saline Subirrigated

Site ID: R102AY036SD

Major Land Resource Area (MLRA): 102A – Rolling Till Prairie

Physiographic Features

This site occurs on nearly level flood plains or swales.

Landform: swale, flood plain

Aspect: N/A

Elevation (feet):

Minimum

Maximum

1,000

2,000

Slope (percent):

1

2

Water Table Depth (inches):

12

60

Flooding:

Frequency:

None

Frequent

Duration:

None

Brief

Ponding:

Depth (inches):

None

None

Frequency:

None

None

Duration:

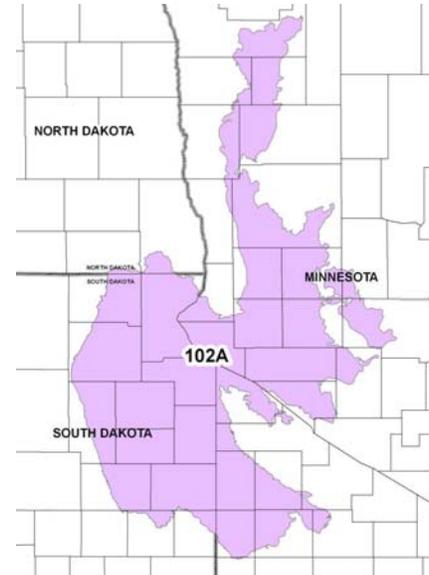
None

None

Runoff Class:

Negligible

Low



Climatic Features

MLRA 102A is considered to have a continental climate – 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 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 21 to 27 inches per year. The average annual temperature is about 43°F. January is the coldest month with average temperatures ranging from about 5°F (Mahnomen 1 W, Minnesota (MN)), to about 14°F (Tracy, MN). July is the warmest month with temperatures averaging from about 69°F (Mahnomen 1 W, MN), to about 73°F (Tracy, MN). The range of normal average monthly temperatures between the coldest and warmest months is about 62°F. This large annual range attests to the continental nature of this area's climate. 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. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

	<u>Minimum</u>	<u>Maximum</u>
Frost-free period (days):	121	152
Freeze-free period (days):	145	174
Mean Annual Precipitation (inches):	21	27

Average Monthly Precipitation (inches) and Temperature (°F):

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.50	0.78	-5.9	23.1
February	0.50	0.76	1.1	27.8
March	0.86	1.46	15.0	39.4
April	2.00	2.52	30.5	56.5
May	2.93	3.14	42.5	70.0
June	3.67	4.14	52.0	79.4
July	3.17	3.66	56.3	84.7
August	2.64	3.60	54.2	82.3
September	1.98	2.83	44.6	73.6
October	1.52	2.14	34.1	60.8
November	0.74	1.23	18.4	41.9
December	0.45	0.76	2.8	27.9

Climate Stations		Period	
Station ID	Location or Name	From	To
SD0281	Arlington 1 W, SD	1928	2009
MN0667	Benson, MN	1952	2009
SD1739	Clark, SD	1893	2009
MN5012	Mahnomen 1 W, MN	1927	1998
MN8323	Tracy, MN	1912	2009
SD8980	Waubay National Wildlife Refuge, SD	1952	2009

For local climate stations that may be more representative, refer to <http://www.wcc.nrcs.usda.gov>.

Riparian and Wetland Features

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

Representative Soil Features

The soils in this site are poorly to somewhat poorly drained and formed in alluvium and loamy till. The loam to silty clay loam surface layer is 4 to 11 inches thick and typically has a granular structure. Dark colors are very deep in these soils. The soils have a slow to moderately slow infiltration rate. This site should show no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer on this site can result in a shift in species composition and/or production.

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

Parent Material Kind: alluvium, till
Parent Material Origin:
Surface Texture: loam, silty clay loam
Surface Texture Modifier: none
Subsurface Texture Group: loamy
Surface Fragments ≤3” (% Cover): 0-2
Surface Fragments >3” (%Cover): 0
Subsurface Fragments ≤3” (% Volume): 0-5
Subsurface Fragments >3” (% Volume): 0

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	poorly	somewhat poorly
Permeability Class:	slow	moderately slow
Depth (inches):	80	80
Electrical Conductivity (mmhos/cm)*:	4	16
Sodium Absorption Ratio*:	2	10
Soil Reaction (1:1 Water)*:	7.4	9.0
Soil Reaction (0.1M CaCl₂)*:	NA	NA
Available Water Capacity (inches)*:	6	7
Calcium Carbonate Equivalent (percent)*:	5	35

*These attributes represent from 0-40 inches or to the first restrictive layer.

Plant Communities

Ecological Dynamics of the Site

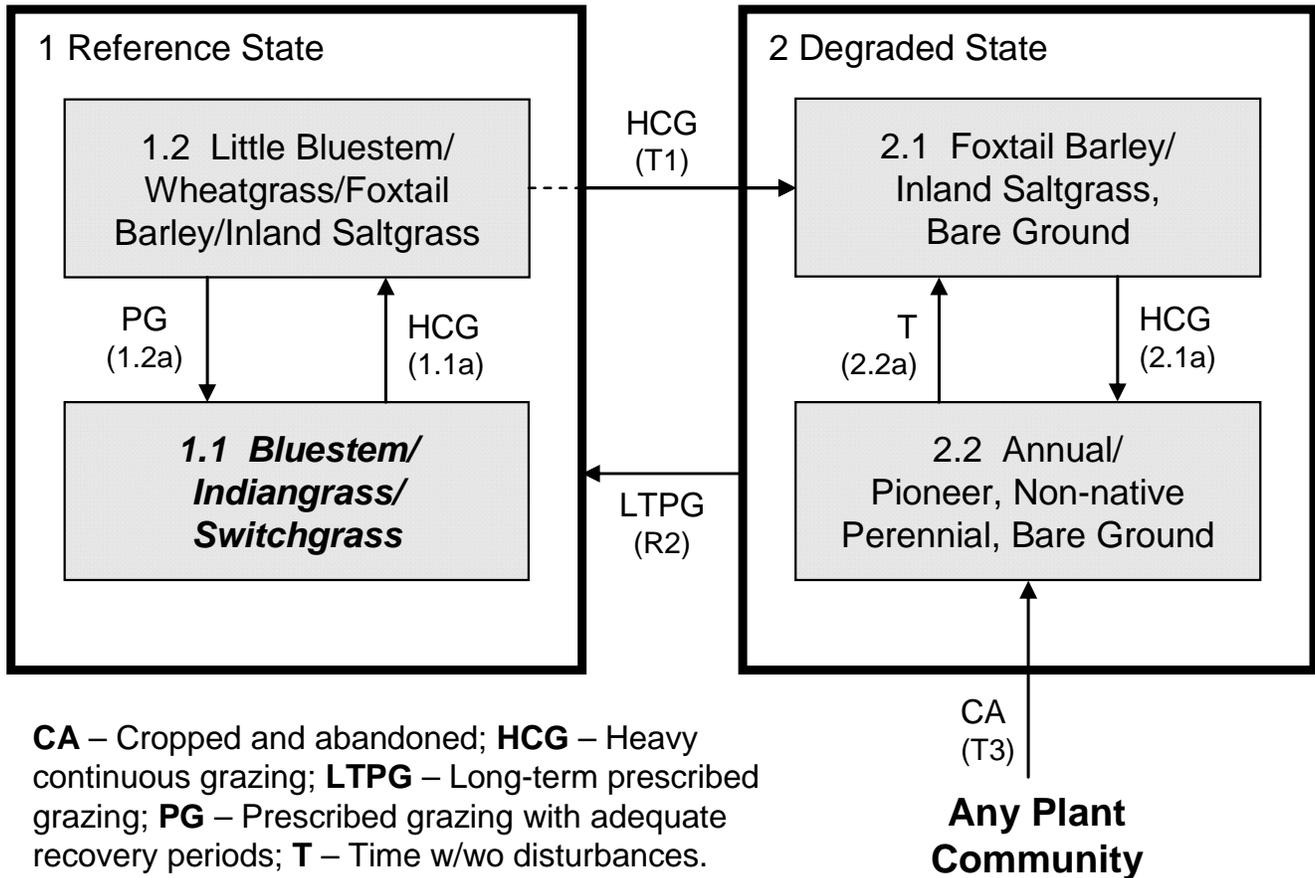
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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 little bluestem and sedge will initially increase. Big bluestem, Indiangrass, and switchgrass will decrease in frequency and production. Heavy, continuous grazing causes inland saltgrass to increase and eventually develop into a sod condition. Extended periods of nonuse and no fire will result in a plant community having high litter levels which favors an increase in species such as spikerush, sedge, foxtail barley, and prairie cordgrass. Grazing, especially if adequate recovery periods are not allowed may be more detrimental on this site than haying. Biotic integrity on this site may be maintained more readily through periodic haying than through grazing.

Interpretations are primarily based on the 1.1 Bluestem/Indiangrass/Switchgrass 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 pathways between communities. These are the most common plant community phases based on current knowledge and experience, and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

Plant Communities and Transitional Pathways



Plant Community Composition and Group Annual Production

			1.1 Bluestem/Indiangrass/Switchgrass			
COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Group	lbs./acre	% Comp	
GRASSES & GRASS-LIKES				3740 - 4180	85 - 95	
TALL WARM-SEASON GRASSES			1	1100 - 2420	25 - 55	
big bluestem	Andropogon gerardii	ANGE	1	440 - 1320	10 - 30	
Indiangrass	Sorghastrum nutans	SONU2	1	220 - 660	5 - 15	
switchgrass	Panicum virgatum	PAV12	1	220 - 660	5 - 15	
prairie cordgrass	Spartina pectinata	SPPE	1	44 - 440	1 - 10	
MID WARM-SEASON GRASSES			2	660 - 1320	15 - 30	
little bluestem	Schizachyrium scoparium	SCSC	2	660 - 1320	15 - 30	
sideoats grama	Bouteloua curtipendula	BOCU	2	0 - 220	0 - 5	
alkali sacaton	Sporobolus airoides	SPAI	2	0 - 220	0 - 5	
COOL-SEASON GRASSES			3	220 - 440	5 - 10	
slender wheatgrass	Elymus trachycaulus	ELTR7	3	44 - 440	1 - 10	
western wheatgrass	Pascopyrum smithii	PASM	3	44 - 440	1 - 10	
plains bluegrass	Poa arida	POAR3	3	44 - 220	1 - 5	
foxtail barley	Hordeum jubatum	HOJU	3	0 - 44	0 - 1	
SHORT WARM-SEASON GRASSES			4	44 - 88	1 - 2	
inland saltgrass	Distichlis spicata	DISP	4	44 - 88	1 - 2	
mat muhly	Muhlenbergia richardsonis	MURI	4	0 - 44	0 - 1	
OTHER NATIVE GRASSES			5	44 - 220	1 - 5	
prairie junegrass	Koeleria macrantha	KOMA	5	44 - 132	1 - 3	
Scribner panicum	Dichanthelium oligosanthes var. scribnerianum	DIOLS	5	0 - 44	0 - 1	
other grasses		2GRAM	5	0 - 220	0 - 5	
GRASS-LIKES			6	88 - 352	2 - 8	
sedge	Carex spp.	CAREX	6	44 - 352	1 - 8	
spikerush	Eleocharis spp.	ELEOC	6	0 - 132	0 - 3	
other grass-like		2GL	6	0 - 88	0 - 2	
FORBS			7	220 - 660	5 - 15	
alkali plantain	Plantago eriopoda	PLER	7	0 - 44	0 - 1	
American licorice	Glycyrrhiza lepidota	GLLE3	7	44 - 88	1 - 2	
annual marshelder	Iva annua	IVAN2	7	0 - 44	0 - 1	
bluebell bellflower	Campanula rotundifolia	CARO2	7	0 - 44	0 - 1	
cudweed sagewort	Artemisia ludoviciana	ARLU	7	44 - 132	1 - 3	
false gromwell	Onosmodium bejariense var. occidentale	ONBEO	7	44 - 88	1 - 2	
Flodman's thistle	Cirsium flodmanii	CIFL	7	44 - 88	1 - 2	
goldenrod	Solidago spp.	SOLID	7	44 - 132	1 - 3	
heartleaf Alexanders	Zizia aptera	ZIAP	7	0 - 44	0 - 1	
heath aster	Symphotrichum ericoides	SYER	7	44 - 88	1 - 2	
horsetail	Equisetum laevigatum	EQLA	7	0 - 44	0 - 1	
Indianhemp	Apocynum cannabinum	APCA	7	44 - 88	1 - 2	
Maximilian sunflower	Helianthus maximiliani	HEMA2	7	44 - 132	1 - 3	
meadow anemone	Anemone canadensis	ANCA8	7	0 - 44	0 - 1	
Norwegian cinquefoil	Potentilla norvegica	PONO3	7	0 - 44	0 - 1	
palespike lobelia	Lobelia spicata	LOSP	7	0 - 44	0 - 1	
prairie coneflower	Ratibida columnifera	RACO3	7	44 - 88	1 - 2	
prairie violet	Viola pedatifida	VIPE2	7	0 - 44	0 - 1	
Pursh seepweed	Suaeda calceoliformis	SUCA2	7	0 - 44	0 - 1	
rough bugleweed	Lycopus asper	LYAS	7	0 - 44	0 - 1	
silverleaf cinquefoil	Potentilla argentea	POAR8	7	44 - 88	1 - 2	
tall gayfeather	Liatris aspera	LIAS	7	44 - 88	1 - 2	
western dock	Rumex aquaticus	RUAQ	7	0 - 44	0 - 1	
western ragweed	Ambrosia psilostachya	AMPS	7	44 - 88	1 - 2	
western yarrow	Achillea millefolium var. occidentalis	ACMIO	7	44 - 88	1 - 2	
native forbs		2FN	7	44 - 220	1 - 5	
Annual Production lbs./acre				LOW	RV	HIGH
GRASSES & GRASS-LIKES				3210 -	3960 -	4410
FORBS				190 -	440 -	790
TOTAL				3400 -	4400 -	5200

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon precipitation or other climatic factors. RV = Representative value.

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	1.1 Bluestem/Indiangrass/ Switchgrass			1.2 Little Bluestem/Wheatgrass/ Foxtail Barley/Inland Saltgrass			2.1 Foxtail Barley/Inland Saltgrass, Bare Ground		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES			3740 - 4180	85 - 95		3240 - 3420	90 - 95		1800 - 1900	90 - 95
TALL WARM-SEASON GRASSES			1100 - 2420	25 - 55		72 - 540	2 - 15		0 - 100	0 - 5
big bluestem	ANGE	1	440 - 1320	10 - 30	1	36 - 360	1 - 10			
Indiangrass	SONU2	1	220 - 660	5 - 15	1	0 - 108	0 - 3			
switchgrass	PAV12	1	220 - 660	5 - 15	1	0 - 180	0 - 5			
prairie cordgrass	SPPE	1	44 - 440	1 - 10	1	0 - 252	0 - 7	1	0 - 100	0 - 5
MID WARM-SEASON GRASSES			660 - 1320	15 - 30		180 - 1260	5 - 35		0 - 100	0 - 5
little bluestem	SCSC	2	660 - 1320	15 - 30	2	180 - 1260	5 - 35	2	0 - 100	0 - 5
sideoats grama	BOCU	2	0 - 220	0 - 5						
alkali sacaton	SPAI	2	0 - 220	0 - 5	2	0 - 108	0 - 3	2	0 - 40	0 - 2
COOL-SEASON GRASSES			220 - 440	5 - 10		360 - 1080	10 - 30		200 - 700	10 - 35
slender wheatgrass	ELTR7	3	44 - 440	1 - 10	3	72 - 540	2 - 15	3	0 - 100	0 - 5
western wheatgrass	PASM	3	44 - 440	1 - 10	3	180 - 720	5 - 20	3	0 - 160	0 - 8
plains bluegrass	POAR3	3	44 - 220	1 - 5	3	0 - 144	0 - 4	3	0 - 60	0 - 3
foxtail barley	HOJU	3	0 - 44	0 - 1	3	36 - 360	1 - 10	3	200 - 700	10 - 35
SHORT WARM-SEASON GRASSES			44 - 88	1 - 2		180 - 540	5 - 15		600 - 1100	30 - 55
inland saltgrass	DISP	4	44 - 88	1 - 2	4	180 - 540	5 - 15	4	500 - 1000	25 - 50
mat muhly	MURI	4	0 - 44	0 - 1	4	0 - 108	0 - 3	4	20 - 160	1 - 8
OTHER NATIVE GRASSES			44 - 220	1 - 5		0 - 180	0 - 5		0 - 40	0 - 2
prairie junegrass	KOMA	5	44 - 132	1 - 3	5	0 - 36	0 - 1			
Scribner panicum	DIOLS	5	0 - 44	0 - 1						
other grasses	2GRAM	5	0 - 220	0 - 5	5	0 - 144	0 - 4	5	0 - 40	0 - 2
GRASS-LIKES			88 - 352	2 - 8		180 - 720	5 - 20		20 - 160	1 - 8
sedge	CAREX	6	44 - 352	1 - 8	6	108 - 540	3 - 15	6	0 - 100	0 - 5
spikerush	ELEOC	6	0 - 132	0 - 3	6	36 - 360	1 - 10	6	20 - 140	1 - 7
other grass-likes	2GL	6	0 - 88	0 - 2	6	0 - 108	0 - 3	6	0 - 40	0 - 2
FORBS			220 - 660	5 - 15		180 - 360	5 - 10		40 - 200	2 - 10
alkali plantain	PLER	7	0 - 44	0 - 1	7	0 - 72	0 - 2	7	20 - 60	1 - 3
American licorice	GLLE3	7	44 - 88	1 - 2	7	0 - 36	0 - 1			
annual marshelder	IVAN2	7	0 - 44	0 - 1	7	0 - 72	0 - 2	7	0 - 60	0 - 3
bluebell bellflower	CARO2	7	0 - 44	0 - 1						
cudweed sagewort	ARLU	7	44 - 132	1 - 3	7	0 - 72	0 - 2			
false gromwell	ONBEO	7	44 - 88	1 - 2	7	0 - 36	0 - 1			
Flodman's thistle	CIFL	7	44 - 88	1 - 2	7	0 - 36	0 - 1	7	0 - 20	0 - 1
goldenrod	SOLID	7	44 - 132	1 - 3	7	0 - 72	0 - 2	7	0 - 20	0 - 1
heartleaf Alexanders	ZIAP	7	0 - 44	0 - 1						
heath aster	SYER	7	44 - 88	1 - 2	7	0 - 36	0 - 1			
horsetail	EQLA	7	0 - 44	0 - 1	7	0 - 36	0 - 1	7	0 - 20	0 - 1
Indianhemp	APCA	7	44 - 88	1 - 2	7	0 - 36	0 - 1			
Maximilian sunflower	HEMA2	7	44 - 132	1 - 3	7	0 - 36	0 - 1			
meadow anemone	ANCA8	7	0 - 44	0 - 1						
Norwegian cinquefoil	PONO3	7	0 - 44	0 - 1	7	0 - 36	0 - 1	7	0 - 20	0 - 1
palespike lobelia	LOSP	7	0 - 44	0 - 1						
prairie coneflower	RACO3	7	44 - 88	1 - 2	7	0 - 36	0 - 1			
prairie violet	VIPE2	7	0 - 44	0 - 1						
Pursh seepweed	SUCA2	7	0 - 44	0 - 1	7	36 - 108	1 - 3	7	20 - 100	1 - 5
rough bugleweed	LYAS	7	0 - 44	0 - 1						
silverleaf cinquefoil	POAR8	7	44 - 88	1 - 2	7	36 - 72	1 - 2	7	20 - 60	1 - 3
tall gayfeather	LIAS	7	44 - 88	1 - 2	7	0 - 36	0 - 1			
western dock	RUAQ	7	0 - 44	0 - 1	7	0 - 36	0 - 1			
western ragweed	AMPS	7	44 - 88	1 - 2	7	36 - 72	1 - 2	7	0 - 20	0 - 1
western yarrow	ACMIO	7	44 - 88	1 - 2	7	0 - 108	0 - 3	7	0 - 20	0 - 1
native forbs	2FN	7	44 - 220	1 - 5	7	36 - 108	1 - 3	7	20 - 60	1 - 3
introduced forbs	2FI				7	0 - 72	0 - 2	7	0 - 60	0 - 3
Annual Production lbs./acre			LOW RV HIGH			LOW RV HIGH			LOW RV HIGH	
GRASSES & GRASS-LIKES			3210 - 3960 - 4410			2540 - 3330 - 3980			1365 - 1880 - 2375	
FORBS			190 - 440 - 790			160 - 270 - 420			35 - 120 - 225	
TOTAL			3400 - 4400 - 5200			2700 - 3600 - 4400			1400 - 2000 - 2600	

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon precipitation or other climatic factors. RV = Representative value. Refer to PLANTS database for scientific names and codes: <http://plants.usda.gov>

Plant Community and Vegetation State Narratives

Reference State (State 1)

This state represents the natural range of variability that dominates the dynamics of this ecological site (ES). This state is dominated by warm-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periods of below and/or above average precipitation, periodic fire, and herbivory by insects and large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined, and shorter-statured grass and grass-like species would have increased. Today, this state 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.

1.1 Bluestem/Indiangrass/Switchgrass Plant Community Phase

Interpretations are based primarily on the Bluestem/Indiangrass/Switchgrass Plant Community Phase (this is also considered to be climax). The potential vegetation is about 85 percent grasses or grass-like plants and 15 percent forbs. The community is dominated by warm-season grasses. The major grasses include big bluestem, little bluestem, Indiangrass, and switchgrass. Other grass or grass-like species include prairie cordgrass, slender wheatgrass, western wheatgrass, sideoats grama, alkali sacaton, plains bluegrass, and sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:

Growth curve number: SD0210

Growth curve name: Rolling Till Prairie, lowland warm-season dominant.

Growth curve description: Warm-season dominant, lowland.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	2	8	15	21	26	15	8	5	0	0

Transitions or pathways leading to other plant communities were as follows:

- 1.1a – Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic or chronic heavy grazing will shift this community to the *1.2 Little Bluestem/Wheatgrass/Foxtail Barley/Inland Saltgrass Plant Community Phase*.

1.2 Little Bluestem/Wheatgrass/Foxtail Barley/Inland Saltgrass Plant Community Phase

This plant community evolves under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 90 percent grasses and grass-like species and 10 percent forbs. Dominant grass and grass-like species include little bluestem, western wheatgrass, slender wheatgrass, inland saltgrass, and foxtail barley. Grass and grass-like species of secondary importance include big bluestem, sedge, spikerush, plains bluegrass, prairie cordgrass, and switchgrass. Forbs commonly found in this plant community include Pursue seepweed, goldenrod, cudweed sagewort, silverleaf cinquefoil, alkali plantain, western ragweed, and annual marshelder.

When compared to the Bluestem/Indiangrass/Switchgrass Plant Community Phase (1.1), slender wheatgrass, western wheatgrass, foxtail barley, inland saltgrass, sedge, and grass-like species increase. Production of tall warm-season grasses is reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. Most of the components of the ecological processes will be functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses will be reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allows for an increase in shorter-statured (and shallower rooted) species.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:

Growth curve number: SD0208

Growth curve name: Rolling Till Prairie, lowland cool-season/warm-season codominant.

Growth curve description: 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

Transitions or pathways leading to other plant communities are as follows:

- 1.2a – 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 Bluestem/Indiangrass/Switchgrass Plant Community Phase*.

Transition from the Reference State (State 1) to the Degraded State (State 2)

- 1.1a – Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods or a combination of disturbances such as extended periods of below average precipitation coupled with periodic or chronic heavy grazing will shift this community to the *2.1 Foxtail Barley/Inland Saltgrass, Bare Ground Plant Community Phase* within the *Degraded State (State 2)*.

Degraded State (State 2)

This 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.

2.1 Foxtail Barley/Inland Saltgrass, Bare Ground Plant Community Phase

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. Tall warm-season grasses are nearly absent, and little bluestem, slender wheatgrass, and western wheatgrass have been greatly reduced and may persist in remnant amounts, reduced in vigor. Bare ground may develop in micro lows where salt concentrations are highest. A white salt crust may form on the soil surface. The forb component is comprised of salt tolerant species such as Pursue seepweed and silverleaf cinquefoil.

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 community phase 1.1. 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.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year:

Growth curve number: SD0208

Growth curve name: Rolling Till Prairie, lowland cool-season/warm-season codominant.

Growth curve description: 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

Transitions or pathways leading to other plant communities are as follows:

- 2.1a – Heavy continuous grazing (stocking rates well above capacity for extended portions of the growing season without adequate recovery) or heavy seasonal grazing (stocking rates well above capacity for a portion of the growing season but at the same time of year every year and without adequate recovery) will shift the plant community phase to the *2.2 Annual/Pioneer, Non-Native Perennial, Bare Ground Plant Community Phase*.

Transition Pathway from Any Plant Community to the 2.2 Annual/Pioneer, Non-Native Perennial, Bare Ground Plant Community Phase within the Degraded State (State 2)

- T3 – Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the *Degraded State (State 2)* and more specifically to the *2.2 Annual/Pioneer, Non-native Perennial, Bare Ground Plant Community Phase*. In the case of a seeding, refer to the corresponding Forage Suitability Group (FSG) description for adapted species and expected production (production estimates in the FSG description may be unrealistically high due to the degraded condition of the site at this phase).

2.2 Annual/Pioneer, Non-Native Perennial, Bare Ground Plant Community Phase

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

Transitions or pathways leading to other states are as follows:

- 3.3a – 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*.

Restoration Pathway from Degraded State (State 2) to the Reference State (State 1)

- R2 – 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.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

Bluestem/Indiangrass/Switchgrass Plant Community Phase (1.1):

Little Bluestem/Wheatgrass/Foxtail Barley/Inland Saltgrass Plant Community Phase (1.2):

Foxtail Barley/Inland Saltgrass, Bare Ground Plant Community Phase (2.1):

Annual/Pioneer, Non-native Perennial, Bare Ground Plant Community Phase (2.2):

Animal Preferences (Quarterly – 1,2,3,4†)

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses and Grass-likes							
alkali sacaton	U D D U	N U N N	U D D U	N U N N	N U N N	U D D U	U D D U
big bluestem	U D P D	U D U U	U D P D	U D U U	U D U U	U D P D	U D P D
foxtail barley	U D N N	N P N N	U D N N	N P N N	N P N N	U D N N	U D N N
Indiangrass	U D P D	U D U U	U D P D	U D U U	U D U U	U D P D	U D P D
inland saltgrass	N U U N	N N N N	N U U N	N N N N	N N N N	N U U N	N U U N
little bluestem	U D D U	N D N N	U D D U	N D N N	N D N N	U D D U	U D D U
mat muhly	N U U N	U U D U	N U U N	U U U U	U U U U	N U U N	N U U N
plains bluegrass	U D U D	N D N U	U D U D	U P N D	U P N D	U D U D	U D U D
prairie cordgrass	U D D U	N N N N	U D D U	N N N N	N N N N	U D D U	U D D U
prairie junegrass	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
Scribner panicum	U U D U	N U N N	U U D U	N U N N	N U N N	U U D U	U U D U
sedge	U D U D	U P N D	U D U D	U D U D	U D U D	U D U D	U D U D
sideoats grama	U D P U	U P D U	U D P U	U P D U	U P D U	U D P U	U D P U
slender wheatgrass	U P U U	N D U N	U P U U	N D U N	N D U N	U P U U	U P U U
spikerush	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
switchgrass	U D D U	U D U U	U D D U	N N N N	N N N N	U D D U	U D D U
western wheatgrass	U P D U	N D N N	U P D U	N D N N	N D N N	U P D U	U P D U
Forbs							
alkali plantain	U D U U	N U U N	U D U U	N U U N	N U U N	U D U U	N U U N
American licorice	U U D U	N U U N	U U D U	N U U N	N U U N	U U D U	N U U N
annual marshelder	N N U N	N N U N	N N U N	N N U N	N N U N	N N U N	N N U N
bluebell bellflower	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U D U
cudweed sagewort	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U D U
false gromwell	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
Flodman's thistle	N U U N	N U U N	N U U N	N U U N	N U U N	N U U N	N U U N
goldenrod	U U D U	N U U N	U U D U	N U U N	N U U N	U U D U	N U U N
heartleaf Alexanders	U D P U	U D P U	U D P U	U D P U	U D P U	U D P U	U D P U
heath aster	U U D U	U U P U	U U D U	U U P U	U U P U	U U D U	U U P U
horsetail	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T
Indianhemp	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T
Maximilian sunflower	U D P U	U D P U	U D P U	U D P U	U D P U	U D P U	U D P U
meadow anemone	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U U U
Norwegian cinquefoil	U U D U	U U P U	U U D U	U U P U	U U P U	U U D U	U U P U
palespike lobelia	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U D U
prairie coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
prairie violet	N U U N	N U U N	N U U N	N U U N	N U U N	N U U N	N U U N
Pursh seepweed	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
rough bugleweed	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
silverleaf cinquefoil	U U D U	U U U U	U U D U	U U U U	U U U U	U U D U	U U U U
tall gayfeather	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
western dock	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
western ragweed	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
western yarrow	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N

N = not used; **U** = undesirable; **D** = desirable; **P** = preferred; **T** = toxic

† Quarters: 1 – Jan., Feb., Mar.; 2 – Apr., May, Jun.; 3 – Jul., Aug., Sep.; 4 – Oct., Nov., Dec.

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.

Plant Community	Average Annual Production (lbs./acre, air-dry)	Stocking Rate* (AUM/acre)
Bluestem/Indiangrass/Switchgrass (1.1)	4,400	1.21
Little Bluestem/Wheatgrass/Foxtail Barley/Inland Saltgrass (1.2)	3,600	0.99
Foxtail Barley/Inland Saltgrass, Bare Ground (2.1)	2,000	0.55
Annual/Pioneer, Non-Native Perennial, Bare Ground (2.2)	1,200	0.33

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

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

Hydrology Functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups C and D. Infiltration is typically moderate to moderately slow and runoff potential for this site varies from negligible to low depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by Kentucky bluegrass and/or smooth brome grass 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 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.

Supporting Information

Associated Sites

Wet Meadow (R102AY004SD), Wet Land (R102AY002SD), Saline Lowland (R102AY007SD), Loamy (R102AY010SD), Clayey (R102AY011SD)

Similar Sites

(R102AY006SD) – Limy Subirrigated [less switchgrass & prairie cordgrass, more needlegrasses]

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.

State Correlation

This site has been correlated in MN, North Dakota (ND), and South Dakota (SD) in MLRA 102A.

Field Offices/Counties

Ada, MN/Norman	Forman, ND/Sargent	Olivia, MN/Renville
Alexandria, MN/Douglas	Glenwood, MN/Pope	Ortonville, MN/Big Stone
Benson, MN/Swift	Hayti, SD/Hamlin	Pipestone, MN/Pipestone
Breckenridge, MN/Wilkin	Ivanhoe, MN/Lincoln	Redwood Falls, MN/Redwood
Britton, SD/Marshall	Long Prairie, MN/Todd	Sisseton, SD/Roberts
Brookings, SD/Brookings	Madison, MN/Lac Qui Parle	Slayton, MN/Murray
Clark, SD/Clark	Madison, SD/Lake	Wahpeton, ND/Richland
Clarkfield, MN/Yellow Medicine	Mahnomen, MN/Mahnomen	Waite Park, MN/Stearns
Clear Lake, SD/Deuel	Marshall, MN/Lyon	Watertown, SD/Codington
De Smet, SD/Kingsbury	McIntosh, MN/Polk	Webster, SD/Day
Detroit Lakes, MN/Becker	Milbank, SD/Grant	Wheaton, MN/Traverse
Elbow Lake, MN/Grant	Montevideo, MN/Chippewa	Willmar, MN/Kandiyohi
Fergus Falls, MN/Otter Tail	Moorhead, MN/Clay	Windom, MN/Cottonwood
Flandreau, SD/Moody	Morris, MN/Stevens	

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 46e – Tewaukon Dead Ice Moraine, 46k – Prairie Coteau, 46l – Prairie Coteau Escarpment, 46m – Big Sioux Basin, 46o – Minnesota River Prairie, 47b – Des Moines Lobe, 48d – Lake Agassiz Plain, 51j – Alexandria Moraines and Detroit Lakes Outwash Plain.

Other References

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (<http://www.hprcc.unl.edu/>)

USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (<http://www.wcc.nrcs.usda.gov>)

USDA, NRCS. National Range and Pasture Handbook, September 1997

USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (<http://soils.usda.gov/technical/nasis/>)

USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Site Description Approval

MN, State Grazing Lands Specialist

Date

ND, State Range Management Specialist

Date

SD, State Range Management Specialist

Date