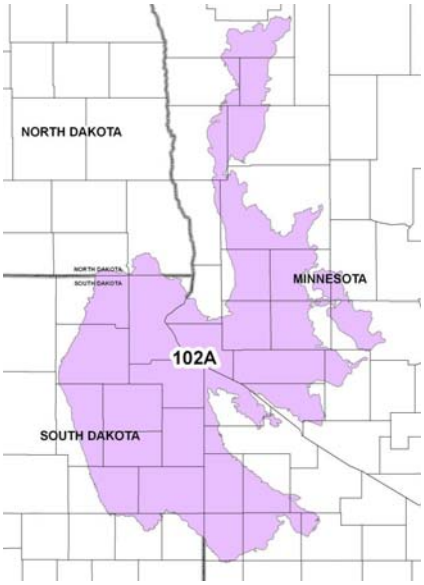
United States Department of Agriculture
Natural Resources Conservation Service

Ecological Site Description



Site Type: Rangeland

Site Name: Saline Lowland

Site ID: R102AY007SD

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

Physiographic Features

This site occurs on nearly level flood plains, flats, or depressions.

Landform: flat, pothole, flood plain **Aspect:** N/A

	Minimum	Maximum
Elevation (feet):	1,000	2,000
Slope (percent):	0	1
Water Table Depth (inches):	10	30
Flooding:		
Frequency:	None	Frequent
Duration:	None	Long
Ponding:		
Depth (inches):	0	12
Frequency:	None	Frequent
Duration:	None	Very long
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.

	Minimum	Maximum
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

Wetland Description:	System	Subsystem	Class	Sub-class
Cowardin, et al., 1979	Palustrine	N/A	Emergent Wetland	Persistent

Representative 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 poorly drained and formed in alluvium or glaciolacustrine deposits. The silty clay to silty clay loam surface layer is typically 8 to 10 inches thick. The soils have a very slow infiltration rate. Areas within this site can become nearly barren due to the accumulation of sodium at the surface. Where vegetation is present, this site should show no evidence of rills, wind scoured areas, or pedestalled plants. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive to water movement and root penetration. These soils are somewhat susceptible to water erosion. Slow permeability and salt accumulation strongly influences the soil-water-plant relationship.

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

Parent Material Kind: alluvium, glaciolacustrine deposits
Parent Material Origin:
Surface Texture: silty clay, silty clay loam
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments ≤3" (% Cover): 0-3
Surface Fragments >3" (%Cover): 0-1
Subsurface Fragments ≤3" (% Volume): 0-5
Subsurface Fragments >3" (% Volume): 0-2

	Minimum	Maximum
Drainage Class:	poorly	poorly
Permeability Class:	very slow	slow
Depth (inches):	80	80
Electrical Conductivity (mmhos/cm)*:	4	16
Sodium Absorption Ratio*:	0	5
Soil Reaction (1:1 Water)*:	6.6	8.4
Soil Reaction (0.1M CaCl2)*:	NA	NA
Available Water Capacity (inches)*:	4	7
Calcium Carbonate Equivalent (percent)*:	5	30

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

Plant Communities

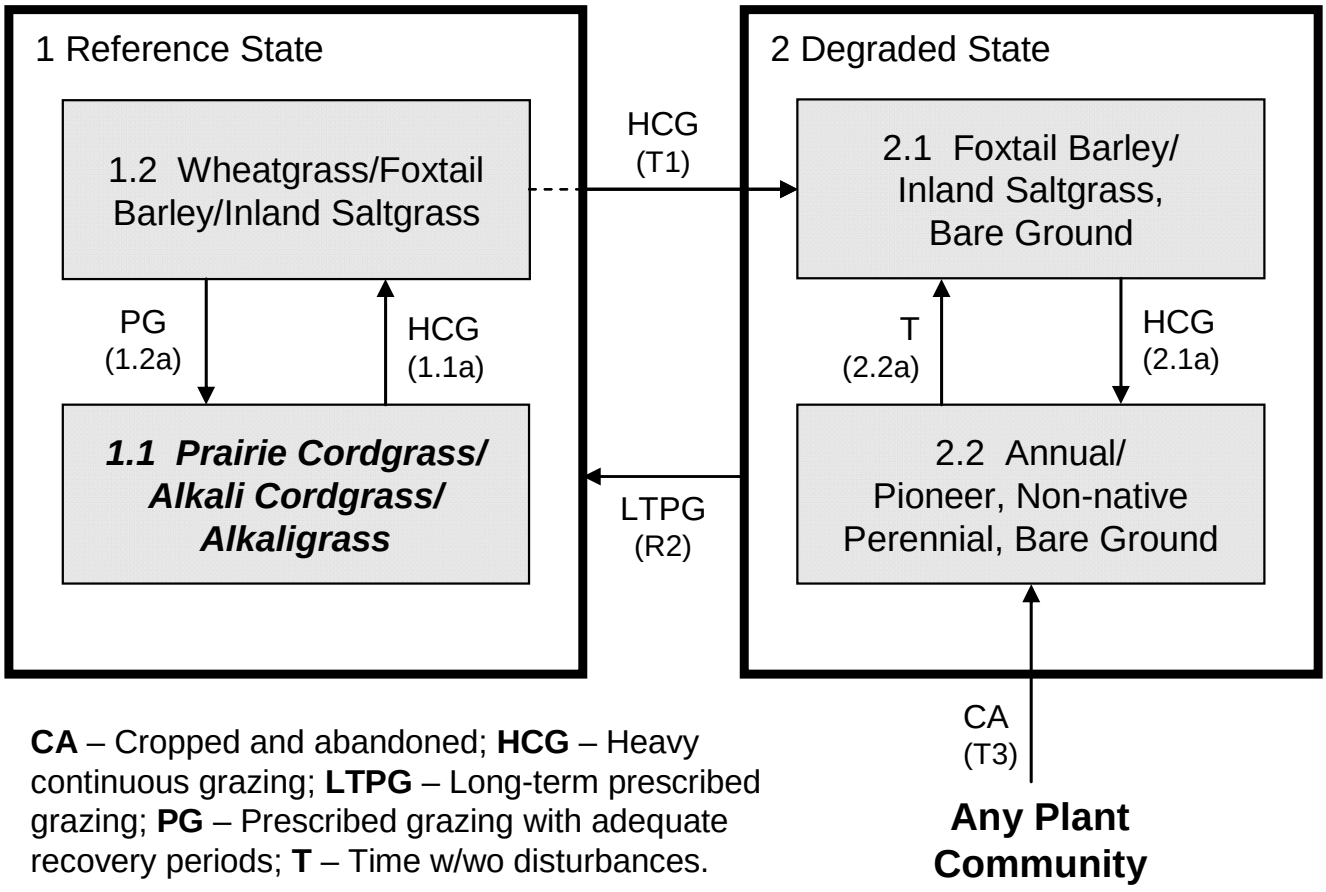
Ecological Dynamics of the Site:
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site 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.

As this site deteriorates, species such as inland saltgrass and foxtail barley increase and annual species may invade the site. Grasses such as alkali sacaton, western wheatgrass, slender wheatgrasses, and Nuttall's alkaligrass will decrease in frequency and production. The high sodium content of the soils greatly influences the plant species present. Plant vigor can vary on a year-to-year basis in relation to current precipitation amounts, which influences the translocation of salts in the soil profile. Typically, only salt tolerant plants are found on this site.

The Cordgrass/Wheatgrass/Alkaligrass Plant Community Phase is the plant community upon which interpretations are primarily based. This plant community has been determined by studying 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 communities, 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



CA – Cropped and abandoned; **HCG** – Heavy continuous grazing; **LTPG** – Long-term prescribed grazing; **PG** – Prescribed grazing with adequate recovery periods; **T** – Time w/wo disturbances.

Plant Community Composition and Group Annual Production

			1.1 Cordgrass/Wheatgrass/Alkaligrass		
COMMON/GROUP NAME	**SCIENTIFIC NAME**	**SYMBOL**	**Group**	**lbs./acre**	**% Comp**
GRASSES & GRASS-LIKES				*3740 - 4180*	*85 - 95*
WARM-SEASON GRASSES			**1**	**660 - 1980**	**15 - 45**
prairie cordgrass	Spartina pectinata	SPPE	1	220 - 1320	5 - 30
alkali cordgrass	Spartina gracilis	SPGR	1	220 - 1320	5 - 30
switchgrass	Panicum virgatum	PAVI2	1	0 - 440	0 - 10
WHEATGRASS			**2**	**440 - 880**	**10 - 20**
western wheatgrass	Pascopyrum smithii	PASM	2	220 - 660	5 - 15
slender wheatgrass	Elymus trachycaulus	ELTR7	2	220 - 440	5 - 10
COOL-SEASON GRASSES			**3**	**440 - 1100**	**10 - 25**
Nuttall's alkaligrass	Puccinellia nuttalliana	PUNU2	3	440 - 1100	10 - 25
foxtail barley	Hordeum jubatum	HOJU	3	44 - 220	1 - 5
plains bluegrass	Poa arida	POAR3	3	44 - 220	1 - 5
SHORT WARM-SEASON GRASSES			**4**	**132 - 440**	**3 - 10**
inland saltgrass	Distichlis spicata	DISP	4	88 - 440	2 - 10
alkali muhly	Muhlenbergia asperifolia	MUAS	4	44 - 132	1 - 3
GRASS-LIKES			**5**	**220 - 660**	**5 - 15**
sedge	Carex spp.	CAREX	5	88 - 440	2 - 10
rush	Juncus spp.	JUNCU	5	44 - 220	1 - 5
spikerush	Eleocharis spp.	ELEOC	5	44 - 220	1 - 5
other grass-likes		2GL	5	0 - 132	0 - 3
FORBS			*6*	*220 - 660*	*5 - 15*
alkali plantain	Plantago eriopoda	PLER	6	44 - 88	1 - 2
annual marshelder	Iva annua	IVAN2	6	0 - 132	0 - 3
aster	Aster spp.	ASTER	6	44 - 132	1 - 3
Flodman's thistle	Cirsium flodmanii	CIFL	6	0 - 88	0 - 2
giant sumpweed	Iva xanthifolia	IVXA	6	0 - 88	0 - 2
lambsquarters	Chenopodium album	CHAL7	6	44 - 88	1 - 2
mealy goosefoot	Chenopodium incanum	CHIN2	6	44 - 88	1 - 2
povertyweed	Iva axillaris	IVAX	6	0 - 88	0 - 2
Pursh seepweed	Suaeda calceoliformis	SUCA2	6	44 - 88	1 - 2
red saltwort	Salicornia rubra	SARU	6	0 - 44	0 - 1
rush skeletonweed	Lygodesmia juncea	LYJU	6	0 - 44	0 - 1
scouringrush	Equisetum hyemale	EQHY	6	0 - 44	0 - 1
silverleaf cinquefoil	Potentilla argentea	POAR8	6	44 - 88	1 - 2
silverscale saltbush	Atriplex argentea	ATAR2	6	0 - 44	0 - 1
western dock	Rumex aquaticus	RUAQ	6	44 - 88	1 - 2
western ragweed	Ambrosia psilostachya	AMPS	6	44 - 88	1 - 2
native forbs		2FN	6	44 - 176	1 - 4

Annual Production lbs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	3210 -	3960	- 4610
FORBS	190 -	440	- 790
TOTAL	3400 -	4400	- 5400

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

		1.1 Prairie Cordgrass/Alkali Cordgrass/Alkaligrass			1.2 Wheatgrass/Foxtail Barley/ Inland Saltgrass			2.1 Foxtail Barley/Inland Saltgrass, Bare Ground		
COMMON/GROUP NAME	**SYMBOL**	**Grp**	**lbs./acre**	**% Comp**	**Grp**	**lbs./acre**	**% Comp**	**Grp**	**lbs./acre**	**% Comp**
GRASSES & GRASS-LIKES			*3740 - 4180*	*85 - 95*		*2640 - 3135*	*80 - 95*		*1540 - 1870*	*70 - 85*
WARM-SEASON GRASSES		**1**	**660 - 1980**	**15 - 45**	**1**	**0 - 330**	**0 - 10**	**1**		
prairie cordgrass	SPPE	1	220 - 1320	5 - 30	1	0 - 330	0 - 10			
alkali cordgrass	SPGR	1	220 - 1320	5 - 30	1	0 - 330	0 - 10			
switchgrass	PAVI2	1	0 - 440	0 - 10						
WHEATGRASS		**2**	**440 - 880**	**10 - 20**	**2**	**495 - 990**	**15 - 30**	**2**	**0 - 220**	**0 - 10**
western wheatgrass	PASM	2	220 - 660	5 - 15	2	330 - 825	10 - 25	2	0 - 220	0 - 10
slender wheatgrass	ELTR7	2	220 - 440	5 - 10	2	66 - 330	2 - 10			
COOL-SEASON GRASSES		**3**	**440 - 1100**	**10 - 25**	**3**	**165 - 825**	**5 - 25**	**3**	**330 - 990**	**15 - 45**
Nuttall's alkaligrass	PUNU2	3	440 - 1100	10 - 25	3	0 - 330	0 - 10	3	0 - 110	0 - 5
foxtail barley	HOJU	3	44 - 220	1 - 5	3	165 - 660	5 - 20	3	330 - 990	15 - 45
plains bluegrass	POAR3	3	44 - 220	1 - 5	3	33 - 165	1 - 5	3	0 - 110	0 - 5
SHORT WARM-SEASON GRASSES		**4**	**132 - 440**	**3 - 10**	**4**	**165 - 660**	**5 - 20**	**4**	**220 - 660**	**10 - 30**
inland saltgrass	DISP	4	88 - 440	2 - 10	4	165 - 660	5 - 20	4	220 - 660	10 - 30
alkali muhly	MUAS	4	44 - 132	1 - 3	4	33 - 198	1 - 6	4	22 - 110	1 - 5
GRASS-LIKES		**5**	**220 - 660**	**5 - 15**	**5**	**165 - 495**	**5 - 15**	**5**	**22 - 110**	**1 - 5**
sedge	CAREX	5	88 - 440	2 - 10	5	33 - 231	1 - 7	5	0 - 66	0 - 3
rush	JUNCU	5	44 - 220	1 - 5	5	33 - 165	1 - 5	5	0 - 88	0 - 4
spikerush	ELEOC	5	44 - 220	1 - 5	5	33 - 264	1 - 8	5	22 - 110	1 - 5
other grass-likes	2GL	5	0 - 132	0 - 3	5	0 - 99	0 - 3	5	0 - 44	0 - 2
FORBS		*6*	*220 - 660*	*5 - 15*	*6*	*165 - 660*	*5 - 20*	*6*	*220 - 660*	*10 - 30*
alkali plantain	PLER	6	44 - 88	1 - 2	6	33 - 66	1 - 2			
annual marshelder	IVAN2	6	0 - 132	0 - 3	6	0 - 33	0 - 1			
aster	ASTER	6	44 - 132	1 - 3	6	33 - 99	1 - 3	6	0 - 44	0 - 2
cocklebur	XANTH2				6	0 - 66	0 - 2	6	0 - 220	0 - 10
curly dock	RUCR				6	0 - 66	0 - 2	6	22 - 220	1 - 10
Flodman's thistle	CIFL	6	0 - 88	0 - 2	6	0 - 33	0 - 1			
giant sumpweed	IVXA	6	0 - 88	0 - 2	6	0 - 33	0 - 1			
kochia	KOSC				6	0 - 66	0 - 2	6	44 - 550	2 - 25
lambsquarters	CHAL7	6	44 - 88	1 - 2	6	33 - 99	1 - 3	6	22 - 66	1 - 3
mealy goosefoot	CHIN2	6	44 - 88	1 - 2	6	33 - 66	1 - 2	6	0 - 44	0 - 2
povertyweed	IVAX	6	0 - 88	0 - 2	6	0 - 66	0 - 2	6	0 - 66	0 - 3
prickly lettuce	LASE				6	0 - 66	0 - 2	6	0 - 110	0 - 5
Pursh seepweed	SUCA2	6	44 - 88	1 - 2	6	33 - 99	1 - 3	6	22 - 110	1 - 5
red saltwort	SARU	6	0 - 44	0 - 1	6	0 - 33	0 - 1	6	0 - 44	0 - 2
redroot pigweed	AMRE				6	0 - 66	0 - 2	6	0 - 176	0 - 8
rush skeletonweed	LYJU	6	0 - 44	0 - 1						
scouringrush	EQHY	6	0 - 44	0 - 1	6	0 - 66	0 - 2			
silverleaf cinquefoil	POAR8	6	44 - 88	1 - 2	6	0 - 33	0 - 1			
silverscale saltbush	ATAR2	6	0 - 44	0 - 1	6	0 - 33	0 - 1	6	0 - 44	0 - 2
western dock	RUAQ	6	44 - 88	1 - 2	6	0 - 33	0 - 1			
western ragweed	AMPS	6	44 - 88	1 - 2	6	33 - 66	1 - 2	6	0 - 44	0 - 2
native forbs	2FN	6	44 - 176	1 - 4	6	33 - 165	1 - 5	6	0 - 66	0 - 3
introduced forbs	2FI				6	0 - 165	0 - 5	6	0 - 220	0 - 10

Annual Production lbs./acre	LOW RV HIGH	LOW RV HIGH	LOW RV HIGH
GRASSES & GRASS-LIKES	3210 · 3960 · 4610	2255 · 2888 · 3410	1010 · 1760 · 2210
FORBS	190 · 440 · 790	145 · 413 · 790	190 · 440 · 790
TOTAL	3400 · 4400 · 5400	2400 · 3300 · 4200	1200 · 2200 · 3000

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 codominated by cool- and warm-season grasses. Pre-European settlement, the primary disturbance mechanisms for this site in the reference condition included frequent fire and grazing by large herding ungulates. Timing of fires 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.

1.1 Prairie Cordgrass/Alkali Cordgrass/Alkaligrass Plant Community Phase

This community evolved with grazing by large herbivores, occasional prairie fires, and periodic flooding events and can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. The potential vegetation is about 85 percent grasses and grass-like plants and 15 percent forbs. The major grasses include prairie cordgrass, alkali cordgrass, Nuttall's alkaligrass, and western wheatgrass. Other grass and grass-like species present include slender wheatgrass, inland saltgrass, switchgrass, sedge, and foxtail barley. Salt tolerant forbs such as alkali plantain, western dock, and seepweed are common. Interpretations are based primarily on this plant community phase.

This community phase is diverse, stable, productive, and well adapted to both saline soils and the Northern Great Plains climatic conditions. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Litter is properly distributed with very little movement offsite and natural plant mortality is very low. This community is resistant to many disturbances except continuous grazing, tillage, and/or development into urban or other uses. The diversity in plant species allows for both the fluctuation of flooding, as well as, large variations in climate.

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:

- 1.1a – 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 *1.2 Wheatgrass/Foxtail Barley/Inland Saltgrass Plant Community Phase*. In pre-European times, this transition would have occurred following multiple disturbances such as extended periods of below average precipitation followed by heavy concentrations of large ungulate herbivory.

1.2 Wheatgrass/Foxtail Barley/Inland Saltgrass Plant Community Phase

This community develops with heavy continuous grazing with lack of adequate recovery periods during the growing season, and/or annual, early spring seasonal grazing. Lack of litter and reduced

plant heights result in higher soil temperatures, poor water infiltration rates, high evapotranspiration, and increased percolation of the high water table, which increases salt concentrations on the surface.

This gives inland saltgrass and other salt tolerant species a competitive advantage over less tolerant species. Nuttall's alkaligrass, slender wheatgrass, prairie cordgrass, and alkali cordgrass have decreased while western wheatgrass and inland saltgrass will initially increase in composition. Alkali muhly, foxtail barley, silverleaf cinquefoil, dock, and plantain will also increase in composition. As long as the herbaceous component remains intact, the plant community tends to be resilient. However, species composition can be further altered through long-term heavy continuous grazing. With loss of Nuttall alkaligrass, cordgrasses, slender wheatgrass, and much of the western wheatgrass, inland saltgrass, and foxtail barley will eventually become the dominant species.

This plant community is relatively stable and well adapted to increased salinity. Plant vigor, litter, plant density, and production have decreased. The biological integrity, water, and nutrient cycles of this plant community are becoming impaired.

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: SD0207
Growth curve name: Rolling Till Prairie, cool-season dominant, warm-season subdominant.
Growth curve description: 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

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 Prairie Cordgrass/Alkali Cordgrass/Alkaligrass 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 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 Pursh 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 --

Prairie Cordgrass/Alkali Cordgrass/Alkaligrass Plant Community Phase (1.1):

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 cordgrass	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
alkali muhly	U U D U	U U D U	U U D U	N N N N	N N N N	U U D U	U U D U
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
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
Nuttall's alkaligrass	U P D D	P P P P	U P D D	P P P P	P P P P	U P D D	U P D D
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
rush	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
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
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
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
aster	U U D U	U U D U	U U D U	U U D U	U U D U	U U D U	U U D U
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
giant sumpweed	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
lambsquarters	U U D U	N D U N	U U D U	N D U N	N D U N	U U D U	N D U N
mealy goosefoot	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
povertyweed	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
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
red saltwort	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
rush skeletonweed	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
scouringrush	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
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
silverscale saltbush	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
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

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)
Prairie Cordgrass/Alkali Cordgrass/Alkaligrass (1.1)	4,400	1.21
Wheatgrass/Foxtail Barley/Inland Saltgrass (1.2)	3,300	0.90
Foxtail Barley/Inland Saltgrass, Bare Ground (2.1)	2,200	0.60
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 slow to very 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 inland saltgrass and/or foxtail barley 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), Saline Subirrigated (R102AY036SD),

Similar Sites
(R102AY006SD) – Saline Subirrigated [less prairie cordgrass, more big bluestem & Indiangrass]

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

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