United States Department of Agriculture
Natural Resources Conservation Service

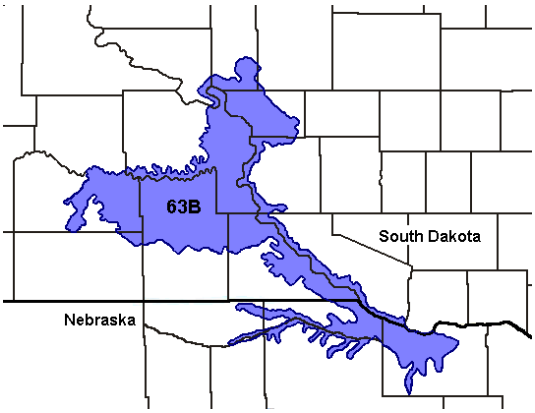
Ecological Site Description

Site Type: Rangeland

Site Name: Saline Lowland

Site ID: R063BY007SD

Major Land Resource Area (MLRA): 63B – Southern Rolling Pierre Shale Plains



Physiographic Features

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

Landform: drainageway

Aspect: N/A

	Minimum	Maximum
Elevation (feet):	1,300	2,000
Slope (percent):	0	1
Water Table Depth (inches):	9	30
Flooding:		
Frequency:	None	Occasional
Duration:	None	Brief
Ponding:		
Depth (inches):	None	None
Frequency:	None	None
Duration:	None	None
Runoff Class:	Low	Low

Climatic Features

MLRA 63B is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 19 to 24 inches per year. The average annual temperature is about 48°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, South Dakota (SD)), to about 22°F (Winner, SD). July is the warmest month with temperatures averaging from about 73°F (Stephan, SD), to about 76°F (Winner, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 56°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):	130	162
Freeze-free period (days):	148	180
Mean Annual Precipitation (inches):	19	24

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.39	0.45	3.1	33.0
February	0.54	0.71	8.9	38.7
March	1.11	1.59	18.7	47.5
April	1.90	2.72	31.4	62.0
May	2.80	3.40	42.7	73.1
June	3.05	3.60	53.0	82.6
July	2.70	3.16	58.5	89.9
August	2.03	2.69	56.2	88.4
September	1.76	2.51	45.8	78.9
October	1.47	1.55	33.2	65.7
November	0.59	0.94	19.2	47.8
December	0.35	0.62	8.1	36.5

Climate Stations		Period	
Station ID	**Location or Name**	**From**	**To**
NE5040	Lynch	1948	2007
NE5960	Niobrara	1948	2005
SD7992	Stephan	1948	2007
SD9367	Winner	1948	2007

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	Subclass
Cowardin, et. al., 1979	Palustrine	N/A	Emergent Wetland	Persistent

Representative Soil Features

The common features of soils in this site are the 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. The silt loam surface layer is one to three 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 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
Parent Material Origin: shale, clayey
Surface Texture: silt loam
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments ≤3" (% Cover): 0
Surface Fragments >3" (%Cover): 0
Subsurface Fragments ≤3" (% Volume): 0-4
Subsurface Fragments >3" (% Volume): 0

	Minimum	Maximum
Drainage Class:	poorly	poorly
Permeability Class:	very slow	very slow
Depth (inches):	80	80
Electrical Conductivity (mmhos/cm)*:	4	16
Sodium Absorption Ratio*:	0	25
Soil Reaction (1:1 Water)*:	6.1	9.6
Soil Reaction (0.1M CaCl2)*:	NA	NA
Available Water Capacity (inches)*:	5	5
Calcium Carbonate Equivalent (percent)*:	0	10

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

Plant Communities

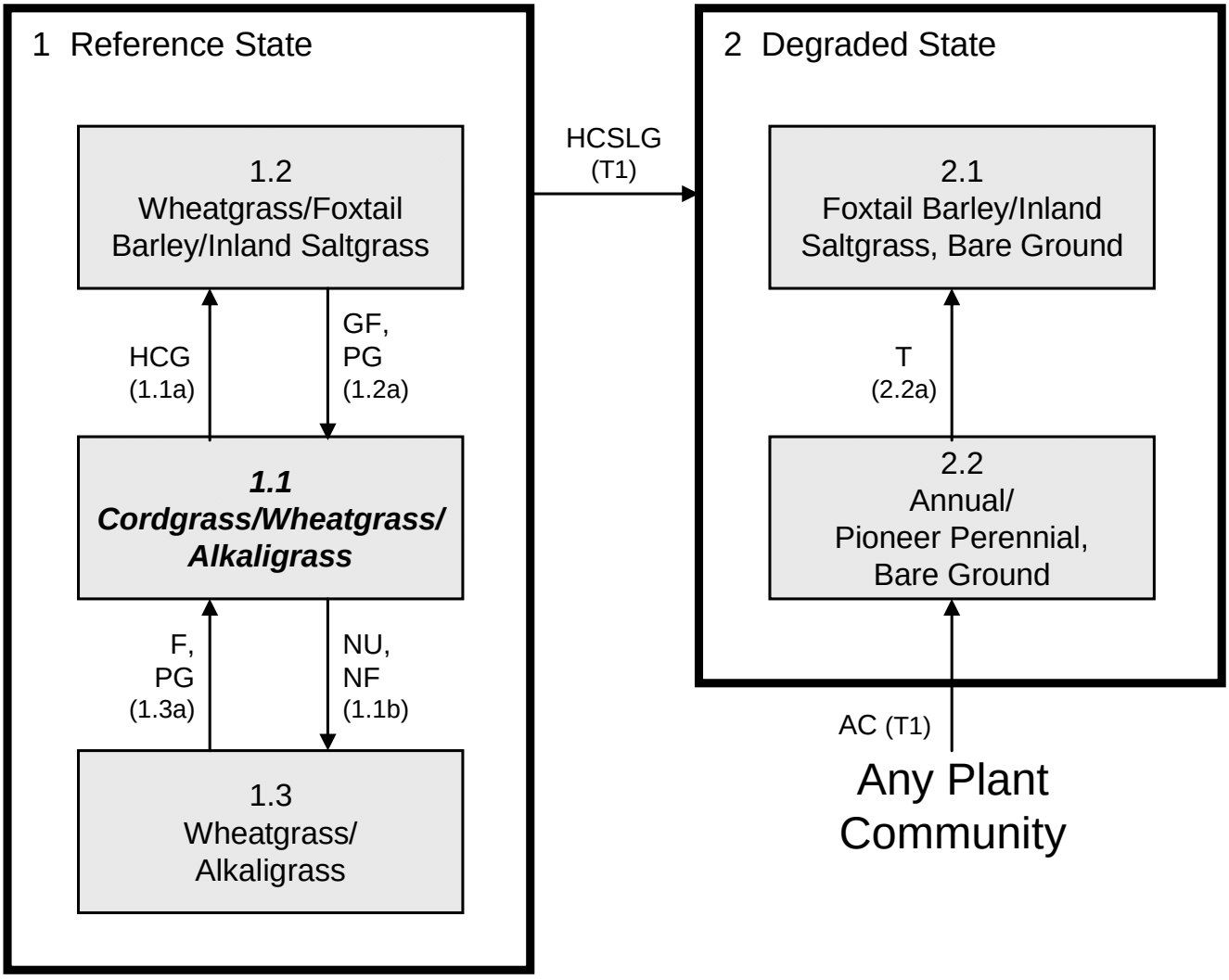
Ecological Dynamics of the Site
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site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



Refer to narrative for details on pathways: **AC** – Abandonment of cropping; **F** – Fire, including either typical wildfires or prescribed burning; **GF** – Grazing and fire returned to normal disturbance regime levels and frequencies; **HCG** – Heavy continuous grazing; **NU, NF** – Non-use and no fire for extended periods; **PG** – Prescribed grazing; **T** - Time.

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				*2975 - 3325*	*85 - 95*
WARM-SEASON GRASSES			**1**	**525 - 1225**	**15 - 35**
prairie cordgrass	Spartina pectinata	SPPE	1	175 - 1050	5 - 30
alkali cordgrass	Spartina gracilis	SPGR	1	175 - 1050	5 - 30
alkali sacaton	Sporobolus airoides	SPAI	1	70 - 350	2 - 10
switchgrass	Panicum virgatum	PAVI2	1	0 - 175	0 - 5
WHEATGRASS			**2**	**350 - 875**	**10 - 25**
western wheatgrass	Pascopyrum smithii	PASM	2	175 - 700	5 - 20
slender wheatgrass	Elymus trachycaulus	ELTR7	2	175 - 525	5 - 15
COOL-SEASON GRASSES			**3**	**350 - 700**	**10 - 20**
Nuttall's alkaligrass	Puccinellia nuttalliana	PUNU2	3	350 - 700	10 - 20
foxtail barley	Hordeum jubatum	HOJU	3	35 - 175	1 - 5
plains bluegrass	Poa arida	POAR3	3	35 - 175	1 - 5
SHORT WARM-SEASON GRASSES			**4**	**105 - 350**	**3 - 10**
inland saltgrass	Distichlis spicata	DISP	4	70 - 350	2 - 10
alkali muhly	Muhlenbergia asperifolia	MUAS	4	35 - 105	1 - 3
blue grama	Bouteloua gracilis	BOGR2	4	0 - 105	0 - 3
GRASS-LIKES			**5**	**175 - 525**	**5 - 15**
sedge	Carex spp.	CAREX	5	70 - 350	2 - 10
rush	Juncus spp.	JUNCU	5	35 - 175	1 - 5
spikerush	Eleocharis spp.	ELEOC	5	35 - 175	1 - 5
other grass-likes		2GL	5	0 - 105	0 - 3
FORBS			*6*	*175 - 350*	*5 - 10*
alkali plantain	Plantago eriopoda	PLER	6	35 - 70	1 - 2
annual marshelder	Iva annua	IVAN2	6	0 - 105	0 - 3
aster	Aster spp.	ASTER	6	35 - 105	1 - 3
Flodman's thistle	Cirsium flodmanii	CIFL	6	0 - 70	0 - 2
giant sumpweed	Iva xanthifolia	IVXA	6	0 - 70	0 - 2
lambsquarters	Chenopodium album	CHAL7	6	35 - 70	1 - 2
mealy goosefoot	Chenopodium incanum	CHIN2	6	35 - 70	1 - 2
povertyweed	Iva axillaris	IVAX	6	0 - 70	0 - 2
Pursh seepweed	Suaeda calceoliformis	SUCA2	6	35 - 70	1 - 2
red saltwort	Salicornia rubra	SARU	6	0 - 35	0 - 1
rush skeletonweed	Lygodesmia juncea	LYJU	6	0 - 35	0 - 1
scouringrush	Equisetum hyemale	EQHY	6	0 - 35	0 - 1
silverleaf cinquefoil	Potentilla argentea	POAR8	6	35 - 70	1 - 2
silverscale saltbush	Atriplex argentea	ATAR2	6	0 - 35	0 - 1
western dock	Rumex aquaticus	RUAQ	6	35 - 70	1 - 2
western ragweed	Ambrosia psilostachya	AMPS	6	35 - 70	1 - 2
native forbs		2FN	6	35 - 140	1 - 4
SHRUBS			*7*	*35 - 175*	*1 - 5*
Gardner's saltbush	Atriplex gardneri	ATGA	7	0 - 140	0 - 4
rubber rabbitbrush	Ericameria nauseosa	ERNA10	7	0 - 140	0 - 4
other shrubs		2SHRUB	7	0 - 105	0 - 3

Annual Production lbs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	2515 -	3133	- 3695
FORBS	155 -	263	- 410
SHRUBS	30 -	105	- 195
TOTAL	2700 -	3500	- 4300

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 Cordgrass/Wheatgrass/ Alkaligrass			1.2 Wheatgrass/Foxtail Barley/ Inland Saltgrass			1.3 Wheatgrass/Alkaligrass			2.1 Foxtail Barley/Inland Saltgrass, Bare Ground		
COMMON/GROUP NAME	**SYMBOL**	**Grp**	**lbs./acre**	**% Comp**	**Grp**	**lbs./acre**	**% Comp**	**Grp**	**lbs./acre**	**% Comp**	**Grp**	**lbs./acre**	**% Comp**
GRASSES & GRASS-LIKES			*2975 - 3325*	*85 - 95*		*2000 - 2250*	*80 - 90*		*2550 - 2850*	*85 - 95*		*1120 - 1360*	*70 - 85*
WARM-SEASON GRASSES		**1**	**525 - 1225**	**15 - 35**	**1**	**0 - 250**	**0 - 10**	**1**	**150 - 450**	**5 - 15**	**1**		
prairie cordgrass	SPPE	1	175 - 1050	5 - 30	1	0 - 250	0 - 10	1	60 - 450	2 - 15			
alkali cordgrass	SPGR	1	175 - 1050	5 - 30	1	0 - 250	0 - 10	1	60 - 450	2 - 15			
alkali sacaton	SPAI	1	70 - 350	2 - 10	1	0 - 125	0 - 5	1	0 - 90	0 - 3			
switchgrass	PAVI2	1	0 - 175	0 - 5				1	0 - 60	0 - 2			
WHEATGRASS		**2**	**350 - 875**	**10 - 25**	**2**	**375 - 750**	**15 - 30**	**2**	**600 - 1050**	**20 - 35**	**2**	**0 - 160**	**0 - 10**
western wheatgrass	PASM	2	175 - 700	5 - 20	2	375 - 750	15 - 30	2	450 - 900	15 - 30	2	0 - 160	0 - 10
slender wheatgrass	ELTR7	2	175 - 525	5 - 15	2	0 - 250	0 - 10	2	150 - 600	5 - 20			
COOL-SEASON GRASSES		**3**	**350 - 700**	**10 - 20**	**3**	**125 - 625**	**5 - 25**	**3**	**300 - 750**	**10 - 25**	**3**	**240 - 720**	**15 - 45**
Nuttall's alkaligrass	PUNU2	3	350 - 700	10 - 20	3	0 - 250	0 - 10	3	300 - 750	10 - 25	3	0 - 80	0 - 5
foxtail barley	HOJU	3	35 - 175	1 - 5	3	125 - 375	5 - 15	3	30 - 90	1 - 3	3	240 - 720	15 - 45
plains bluegrass	POAR3	3	35 - 175	1 - 5	3	25 - 200	1 - 8	3	30 - 150	1 - 5	3	0 - 80	0 - 5
SHORT WARM-SEASON GRASSES		**4**	**105 - 350**	**3 - 10**	**4**	**125 - 500**	**5 - 20**	**4**	**30 - 150**	**1 - 5**	**4**	**160 - 480**	**10 - 30**
inland saltgrass	DISP	4	70 - 350	2 - 10	4	125 - 500	5 - 20	4	30 - 150	1 - 5	4	160 - 480	10 - 30
alkali muhly	MUAS	4	35 - 105	1 - 3	4	25 - 150	1 - 6	4	30 - 60	1 - 2	4	16 - 80	1 - 5
blue grama	BOGR2	4	0 - 105	0 - 3	4	0 - 125	0 - 5	4	0 - 60	0 - 2	4	0 - 80	0 - 5
GRASS-LIKES		**5**	**175 - 525**	**5 - 15**	**5**	**125 - 375**	**5 - 15**	**5**	**300 - 600**	**10 - 20**	**5**	**16 - 80**	**1 - 5**
sedge	CAREX	5	70 - 350	2 - 10	5	25 - 175	1 - 7	5	60 - 300	2 - 10	5	0 - 48	0 - 3
rush	JUNCU	5	35 - 175	1 - 5	5	25 - 125	1 - 5	5	30 - 150	1 - 5	5	0 - 64	0 - 4
spikerush	ELEOC	5	35 - 175	1 - 5	5	25 - 200	1 - 8	5	60 - 360	2 - 12	5	16 - 80	1 - 5
other grass-likes	2GL	5	0 - 105	0 - 3	5	0 - 75	0 - 3	5	0 - 90	0 - 3	5	0 - 32	0 - 2
FORBS		*6*	*175 - 350*	*5 - 10*	*6*	*125 - 375*	*5 - 15*	*6*	*150 - 300*	*5 - 10*	*6*	*160 - 480*	*10 - 30*
alkali plantain	PLER	6	35 - 70	1 - 2	6	25 - 50	1 - 2	6	0 - 30	0 - 1			
annual marshelder	IVAN2	6	0 - 105	0 - 3	6	0 - 25	0 - 1	6	0 - 60	0 - 2			
aster	ASTER	6	35 - 105	1 - 3	6	25 - 75	1 - 3	6	30 - 120	1 - 4	6	0 - 32	0 - 2
cocklebur	XANTH2				6	0 - 50	0 - 2	6	0 - 30	0 - 1	6	0 - 160	0 - 10
curly dock	RUCR				6	0 - 50	0 - 2	6	0 - 60	0 - 2	6	16 - 160	1 - 10
Flodman's thistle	CIFL	6	0 - 70	0 - 2	6	0 - 25	0 - 1	6	0 - 60	0 - 2			
giant sumpweed	IVXA	6	0 - 70	0 - 2	6	0 - 25	0 - 1	6	0 - 60	0 - 2			
kochia	KOSC				6	0 - 50	0 - 2				6	32 - 400	2 - 25
lambsquarters	CHAL7	6	35 - 70	1 - 2	6	25 - 75	1 - 3	6	30 - 60	1 - 2	6	16 - 48	1 - 3
mealy goosefoot	CHIN2	6	35 - 70	1 - 2	6	25 - 50	1 - 2	6	0 - 30	0 - 1	6	0 - 32	0 - 2
povertyweed	IVAX	6	0 - 70	0 - 2	6	0 - 50	0 - 2	6	0 - 30	0 - 1	6	0 - 48	0 - 3
prickly lettuce	LASE				6	0 - 50	0 - 2	6	0 - 30	0 - 1	6	0 - 80	0 - 5
Pursh seepweed	SUCA2	6	35 - 70	1 - 2	6	25 - 75	1 - 3	6	0 - 30	0 - 1	6	16 - 80	1 - 5
red saltwort	SARU	6	0 - 35	0 - 1	6	0 - 25	0 - 1				6	0 - 32	0 - 2
redroot pigweed	AMRE				6	0 - 50	0 - 2				6	0 - 128	0 - 8
rush skeletonweed	LYJU	6	0 - 35	0 - 1				6	0 - 30	0 - 1			
scouringrush	EQHY	6	0 - 35	0 - 1	6	0 - 50	0 - 2	6	0 - 30	0 - 1			
silverleaf cinquefoil	POAR8	6	35 - 70	1 - 2	6	0 - 25	0 - 1	6	0 - 30	0 - 1			
silverscale saltbush	ATAR2	6	0 - 35	0 - 1	6	0 - 25	0 - 1	6	0 - 30	0 - 1	6	0 - 32	0 - 2
western dock	RUAQ	6	35 - 70	1 - 2	6	0 - 25	0 - 1	6	0 - 60	0 - 2			
western ragweed	AMPS	6	35 - 70	1 - 2	6	25 - 50	1 - 2	6	30 - 90	1 - 3	6	0 - 32	0 - 2
native forbs	2FN	6	35 - 140	1 - 4	6	25 - 125	1 - 5	6	30 - 90	1 - 3	6	0 - 48	0 - 3
introduced forbs	2FI				6	0 - 125	0 - 5	6	0 - 120	0 - 4	6	0 - 160	0 - 10
SHRUBS		*7*	*35 - 175*	*1 - 5*	*7*	*0 - 125*	*0 - 5*	*7*	*30 - 150*	*1 - 5*	*7*	*0 - 32*	*0 - 2*
Gardner's saltbush	ATGA	7	0 - 140	0 - 4	7	0 - 25	0 - 1	7	0 - 60	0 - 2			
rubber rabbitbrush	ERNA10	7	0 - 140	0 - 4	7	0 - 125	0 - 5	7	0 - 150	0 - 5	7	0 - 32	0 - 2
other shrubs	2SHRUB	7	0 - 105	0 - 3	7	0 - 100	0 - 4	7	0 - 150	0 - 5	7	0 - 32	0 - 2

Annual Production lbs./acre	LOW RV HIGH	LOW RV HIGH	LOW RV HIGH	LOW RV HIGH
GRASSES & GRASS-LIKES	2515 · 3133 - 3695	1690 · 2188 - 2415	2040 - 2685 - 3090	855 · 1264 - 1395
FORBS	155 · 263 - 410	110 · 250 - 445	135 - 225 - 345	145 · 320 - 570
SHRUBS	30 · 105 - 195	0 · 63 - 140	25 - 90 - 165	0 · 16 - 35
TOTAL	2700 · 3500 - 4300	1800 · 2500 - 3000	2200 - 3000 - 3600	1000 · 1600 - 2000

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 cool-season grasses, while warm-season grasses are subdominant. 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 Cordgrass/Wheatgrass/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, 10 percent forbs, and 5 percent shrubs. The major grasses include western wheatgrass, Nuttall's alkaligrass, and alkali and prairie cordgrass. Other grasses present include slender wheatgrass, inland saltgrass, 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: SD6307
Growth curve name: Pierre Shale Plains, 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:

- 1.1a – 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.

- 1.1b – Non-use and no fire for extended periods of time will tend to favor the cool-season grasses and the warm-season grasses will decline causing a shift to the *1.3 Western Wheatgrass/Alkaligrass Plant Community Phase*.

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. Mat 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 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: SD6307
Growth curve name: Pierre Shale Plains, 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 – Grazing and fire returned to more normal disturbance regime levels and frequencies or prescribed grazing (moderate stocking levels with adequate recovery between grazing events) will allow the cordgrasses and Nuttall's alkaligrass to increase in vigor and production, and will cause a shift back to the *1.1 Cordgrass/Wheatgrass/Alkaligrass*. In pre-European times, this would have occurred where light to moderate disturbances from large ungulates occurred sporadically.

1.3 Wheatgrass/Alkaligrass Plant Community Phase

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

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: SD6306
Growth curve name: Pierre Shale Plains, lowland cool-season dominant.
Growth curve description: 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

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

- 1.3a – Prescribed grazing (stocking levels which match the animals to the forage resource and allow adequate recovery periods between grazing events) coupled with prescribed burning (typically spring burning, but fall burning may also be effective) is the most effective method of effecting this shift to the *1.1 Cordgrass/Wheatgrass/Alkaligrass Plant Community Phase*.

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

- T1 – Heavy continuous season-long grazing (stocking levels well above recommended rates, for the entire growing season or for extended portions of the growing season without adequate recovery periods) will cause this site to cross a threshold leading to the *Degraded State (State 2)*. Grazing pressure and physical impacts of livestock on the soil surface alter the plant community. The less grazing tolerant/more palatable plant species are reduced, while the grazing tolerant species increase. Physical impacts result in increased bare ground which increases surface salinity and further enhances the salt tolerant species. The physical impacts (i.e., compaction) are greater when the soil surface is wet from short-term flooding events.

Degraded State (State2)

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. Nuttall's alkaligrass 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 is common on the surface. Only a few very salt tolerant annuals, such as silverscale saltbush and seepweed, can survive.

This plant community is resistant to change due to the grazing tolerance of inland saltgrass and increased surface salts. A significant amount of production and diversity has been lost when compared to community phase 1.1. Loss of key cool-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: SD6308
Growth curve name: Pierre Shale Plains, 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

2.2 Annual/Pioneer Perennial, Bare Ground Plant Community Phase

This plant community develops under severe disturbance and/or excessive defoliation. This can result from heavy livestock or wildlife concentration and cropping abandonment (go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include foxtail barley, which will dominate along with plains bluegrass, Nuttall's alkaligrass, annual brome, and western wheatgrass. The dominant forbs include kochia, curly dock, and other early successional salt tolerant species. Plant species from adjacent ES may become minor components of this plant community. The community is susceptible to invasion of nonnative species due to severe soil disturbances and relatively high percent of bare ground.

This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Soil erosion is potentially high in this plant community. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased water infiltration, increased runoff, and accelerated erosion rates.

Significant economic inputs, management, and time would be required to move this plant community toward a higher successional stage and a more productive plant community. Secondary succession is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. This plant community can be renovated to improve the production capability, but management changes would be needed to maintain the new plant community. Due to the highly variable nature of the plant community that may exist, no growth curve has been assigned.

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

- 2.2a – This community pathway occurs with the passage of time as successional processes take place and native plant species gradually begin to establish on the site again.

Transition from Any Plant Community to Degraded State (State 2)

- T3 – Severe disturbance such as concentrated livestock areas (e.g., watering sources, calving or feeding areas) or cropping abandonment will cause any plant community to shift to the *2.2 Annual/Pioneer Perennial, Bare Ground Plant Community Phase*. Attempts to crop these areas often fail, resulting in bare ground and weedy species such as kochia.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

Cordgrass/Wheatgrass/Alkaligrass Plant Community (1.1):

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

Wheatgrass/Alkaligrass Plant Community (1.3):

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

Annual/Pioneer, Non-native Perennial, Bare Ground Plant Community (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
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
blue grama	U D P U	D P P D	U D P U	D P P D	D P P D	U D P U	U D P 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
Shrubs							
Gardner's saltbush	P D D P	P D D P	P D D P	P D D P	P D D P	P D D P	P D D P
rubber rabbitbrush	N N N N	D U U D	N N N N	D U U D	U D D U	N N N N	D U U U

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)
Cordgrass/Wheatgrass/Alkaligrass (1.1)	3,500	0.96
Wheatgrass/Foxtail Barley/Inland Saltgrass (1.2)	2,500	0.69
Wheatgrass/Alkaligrass (1.3)	3,000	0.82
Foxtail Barley/Inland Saltgrass, Bare Ground (2.1)	1,600	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.

Hydrology Functions
Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration is slow and runoff potential for this site is high. In many cases, areas with greater than 75 percent ground cover have the greatest potential for higher 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 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
Claypan (R063BY013SD), Wet Land (R063BY002SD), Thin Claypan (R063BY015SD).

Similar Sites
(R063BY019SD) – Closed Depression [more western wheatgrass, more dock and smartweed; higher production]

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: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; and Dana Larsen, RMS, NRCS.

State Correlation

This site has been correlated with Nebraska (NE) and SD in MLRA 63B.

Field Offices/Counties

Ainsworth, NE	Keya Paha/Rock	Highmore, SD	Hyde	Pierre, SD	Hughes
Bloomfield, NE	Knox	Kennebec, SD	Lyman	Spencer, NE	Boyd
Burke, SD	Gregory	Lake Andes, SD	Charles Mix	White River, SD	Todd/Mellette
Chamberlain, SD	Brule/Buffalo	O'Neill, NE	Holt		

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 42h - Southern River Breaks.

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://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://nasis.nrcs.usda.gov)
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

_____ _____
SD, State Range Management Specialist Date

_____ _____
NE, State Range Management Specialist Date