

# United States Department of Agriculture Natural Resources Conservation Service

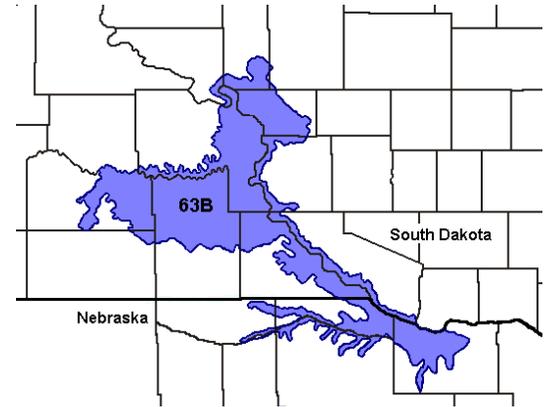
## Ecological Site Description

**Site Type:** Rangeland

**Site Name:** Clayey Overflow

**Site ID:** R063BY021SD

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



### Physiographic Features

This site occurs on nearly level swales and drainageways.

**Landform:** flood plain, plain, swale

**Aspect:** N/A

	<u>Minimum</u>	<u>Maximum</u>
<b>Elevation (feet):</b>	1,300	2,000
<b>Slope (percent):</b>	1	2
<b>Water Table Depth (inches):</b>	24	80
<b>Flooding:</b>		
<b>Frequency:</b>	Rare	Frequent
<b>Duration:</b>	Very brief	Brief
<b>Ponding:</b>		
<b>Depth (inches):</b>	None	None
<b>Frequency:</b>	None	None
<b>Duration:</b>	None	None
<b>Runoff Class:</b>	Medium	High

### 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. Green-up of cool-season plants may occur in September and October when adequate soil moisture is present.

	<u>Minimum</u>	<u>Maximum</u>
<b>Frost-free period (days):</b>	130	162
<b>Freeze-free period (days):</b>	148	180
<b>Mean Annual Precipitation (inches):</b>	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

No riparian areas or wetland features are typically associated with this site. However, in some areas, adjacent streams occur and would be classified as follows: **Stream Type:** B6, C6 (Rosgen System)

## Representative Soil Features

The soils in this site are well to somewhat poorly drained and formed in alluvium. The silty clay loam to clay surface layer is typically 5-11 inches thick but can be deeper on some soils. These soils have a very slow infiltration rate. When dry, these soils crack. When the soils are wet, surface compaction can occur with heavy traffic. This site typically 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. There are no root restrictive layers in these soils; however, the high shrink-swell potential can cause damage and/or inhibit root growth.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of 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  
**Parent Material Origin:** shale, clayey  
**Surface Texture:** silty clay, clay, silty clay loam  
**Surface Texture Modifier:** none  
**Subsurface Texture Group:** clayey  
**Surface Fragments ≤3" (% Cover):** 0  
**Surface Fragments >3" (%Cover):** 0  
**Subsurface Fragments ≤3" (% Volume):** 0  
**Subsurface Fragments >3" (% Volume):** 0

	<u>Minimum</u>	<u>Maximum</u>
<b>Drainage Class:</b>	somewhat poorly	well
<b>Permeability Class:</b>	very slow	very slow
<b>Depth (inches):</b>	80	80
<b>Electrical Conductivity (mmhos/cm)*:</b>	0	4
<b>Sodium Absorption Ratio*:</b>	0	4
<b>Soil Reaction (1:1 Water)*:</b>	6.6	8.4
<b>Soil Reaction (0.1M CaCl2)*:</b>	NA	NA
<b>Available Water Capacity (inches)*:</b>	4	6
<b>Calcium Carbonate Equivalent (percent)*:</b>	0	30

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

## Plant Communities

### Ecological Dynamics of the Site

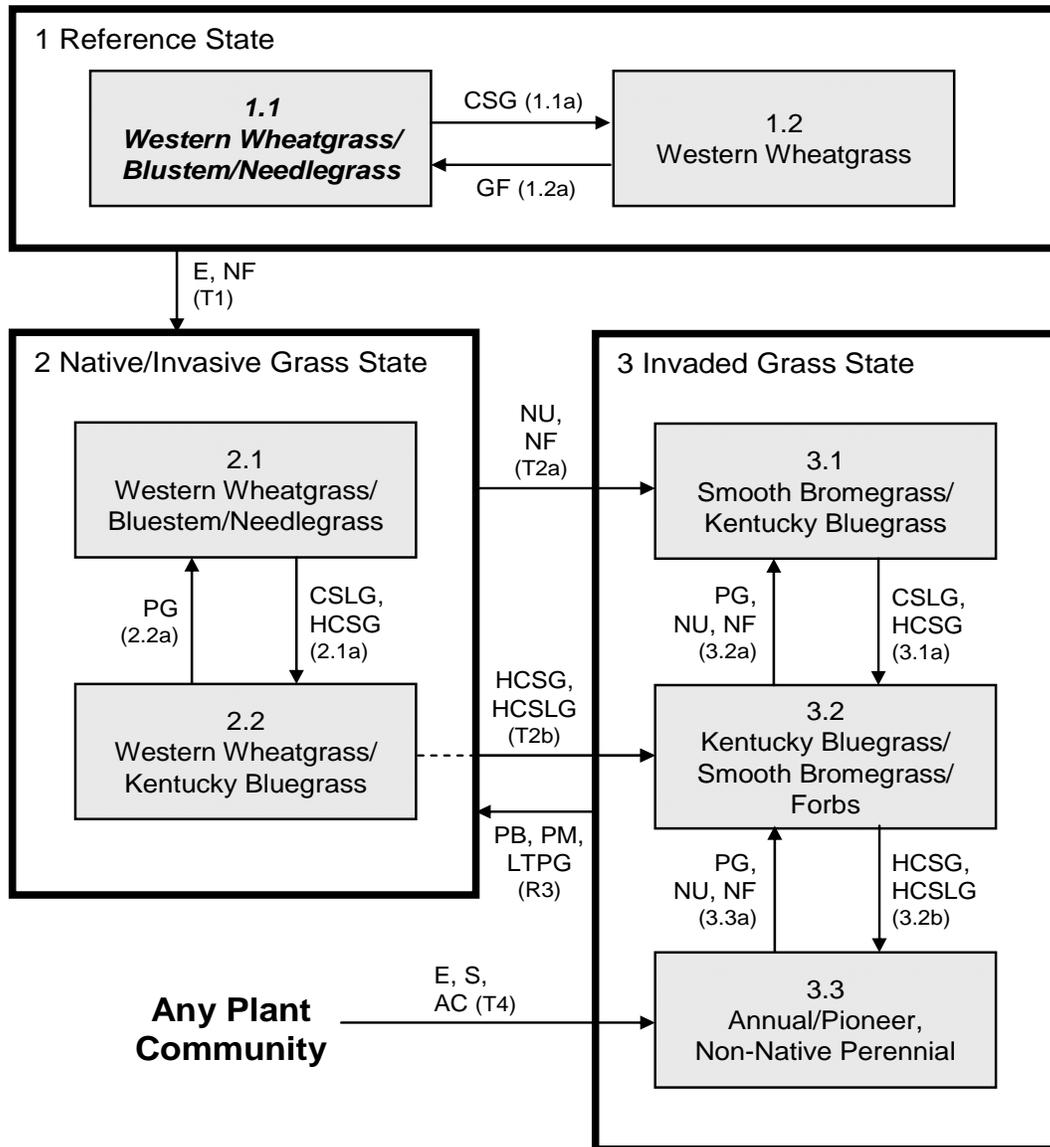
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur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

Continuous season-long grazing (during the typical growing season of May through October) and/or heavy continuous seasonal grazing (i.e., grazing at the same time of year every year) without adequate recovery periods following each grazing occurrence causes this site to depart from the Western Wheatgrass/Bluestem/Needlegrass Plant Community. Western wheatgrass increases initially and will eventually decrease with continuous grazing. Grasses such as green needlegrass, big bluestem and switchgrass will decrease in frequency and production. With continued disturbance, this site is susceptible to invasion of nonnative species such as Kentucky bluegrass and smooth brome grass. These species can become dominant and alter the ecological processes drastically.

Interpretations are primarily based on the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community. 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



Refer to plant community phase narratives for details on pathways: **AC** – Abandonment of cropping; **CSG** – Continuous seasonal grazing; **CSLG** – Continuous season-long grazing; **E** – Encroachment of non-native species; **GF** – Grazing and fire returned to normal disturbance regimes; **HCSG** – Heavy continuous seasonal grazing; **HCSLG** – Heavy continuous season-long grazing; **LTPG** – Long-term prescribed grazing; **NF** – No fire; **NU** – Non-use; **PB** – Prescribed burning; **PG** – Prescribed grazing; **PM** – Pest management (herbicide); **S** – Seeding.

**Plant Community Composition and Group Annual Production**

COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	1.1 Western Wheatgrass/ Bluestem/Needlegrass		
			Group	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>				2550 - 2850	85 - 95
<b>WHEATGRASS</b>			1	750 - 1350	25 - 45
western wheatgrass	Pascopyrum smithii	PASM	1	750 - 1350	25 - 45
slender wheatgrass	Elymus trachycaulus	ELTR7	1	0 - 150	0 - 5
<b>TALL WARM-SEASON GRASSES</b>			2	300 - 750	10 - 25
big bluestem	Andropogon gerardii	ANGE	2	300 - 750	10 - 25
switchgrass	Panicum virgatum	PAVI2	2	30 - 240	1 - 8
tall dropseed	Sporobolus compositus var. compositus	SPCOC2	2	0 - 150	0 - 5
Indiangrass	Sorghastrum nutans	SONU2	2	0 - 150	0 - 5
<b>COOL-SEASON BUNCHGRASSES</b>			3	150 - 450	5 - 15
green needlegrass	Nassella viridula	NAVI4	3	150 - 450	5 - 15
foxtail barley	Hordeum jubatum	HOJU	3	30 - 150	1 - 5
Canada wildrye	Elymus canadensis	ELCA4	3	0 - 150	0 - 5
<b>MID WARM-SEASON GRASSES</b>			4	30 - 300	1 - 10
little bluestem	Schizachyrium scoparium	SCSC	4	30 - 240	1 - 8
sideoats grama	Bouteloua curtipendula	BOCU	4	0 - 150	0 - 5
<b>SHORT WARM-SEASON GRASSES</b>			5	0 - 150	0 - 5
blue grama	Bouteloua gracilis	BOGR2	5	0 - 150	0 - 5
buffalograss	Bouteloua dactyloides	BODA2	5	0 - 150	0 - 5
inland saltgrass	Distichlis spicata	DISP	5	0 - 90	0 - 3
<b>OTHER NATIVE GRASSES</b>			6	30 - 150	1 - 5
prairie junegrass	Koeleria macrantha	KOMA	6	30 - 90	1 - 3
Scribner panicum	Dichanthelium oligosanthes var. scribnerianum	DIOLS	6	0 - 60	0 - 2
other grasses		2GRAM	6	0 - 150	0 - 5
<b>GRASS-LIKES</b>			7	30 - 150	1 - 5
sedge	Carex spp.	CAREX	7	30 - 150	1 - 5
other grass-likes		2GL	7	0 - 90	0 - 3
<b>FORBS</b>			9	150 - 300	5 - 10
American licorice	Glycyrrhiza lepidota	GLLE3	9	0 - 60	0 - 2
American vetch	Vicia americana	VIAM	9	30 - 60	1 - 2
annual sunflower	Helianthus annuus	HEAN3	9	0 - 60	0 - 2
blue verbena	Verbena hastata	VEHA2	9	0 - 30	0 - 1
Carolina geranium	Geranium carolinianum var. carolinianum	GECAC4	9	0 - 30	0 - 1
cudweed sagewort	Artemisia ludoviciana	ARLU	9	30 - 60	1 - 2
false boneset	Brickellia eupatorioides	BREU	9	0 - 60	0 - 2
goldenrod	Solidago spp.	SOLID	9	30 - 60	1 - 2
heath aster	Symphotrichum ericoides	SYER	9	30 - 60	1 - 2
Indianhemp	Apocynum cannabinum	APCA	9	0 - 60	0 - 2
Maximilian sunflower	Helianthus maximiliani	HEMA2	9	30 - 60	1 - 2
northern bedstraw	Galium boreale	GABO2	9	0 - 30	0 - 1
prairie coneflower	Ratibida columnifera	RACO3	9	30 - 60	1 - 2
rush skeletonweed	Lygodesmia juncea	LYJU	9	0 - 30	0 - 1
scarlet gaura	Gaura coccinea	GACO5	9	30 - 60	1 - 2
slimflower scurfpea	Psoraleidum tenuiflorum	PSTE5	9	30 - 60	1 - 2
western ragweed	Ambrosia psilostachya	AMPS	9	0 - 30	0 - 1
western yarrow	Achillea millefolium var. occidentalis	ACMIO	9	30 - 60	1 - 2
wild bergamot	Monarda fistulosa	MOFI	9	0 - 30	0 - 1
wild parsley	Musineon divaricatum	MUDI	9	30 - 60	1 - 2
woolly verbena	Verbena stricta	VEST	9	0 - 30	0 - 1
native forbs		2FN	9	0 - 90	0 - 3
<b>SHRUBS</b>			10	30 - 150	1 - 5
leadplant	Amorpha canescens	AMCA6	10	30 - 60	1 - 2
poison ivy	Toxicodendron rydbergii	TORY	10	0 - 30	0 - 1
rose	Rosa spp.	ROSA5	10	30 - 60	1 - 2
silver sagebrush	Artemisia cana	ARCA13	10	0 - 60	0 - 2
snowberry	Symphoricarpos spp.	SYMPH	10	30 - 60	1 - 2
other shrubs		2SHRUB	10	0 - 60	0 - 2

Annual Production lbs./acre	LOW	RV	HIGH
<b>GRASSES &amp; GRASS-LIKES</b>	2140 -	2685	-3290
<b>FORBS</b>	135 -	225	-345
<b>SHRUBS</b>	25 -	90	-165
<b>TOTAL</b>	2300 -	3000	-3800

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 Western Wheatgrass/ Bluestem/Needlegrass			2.2 Western Wheatgrass/ Kentucky Bluegrass			3.1 Smooth Bromegrass/ Kentucky Bluegrass			3.2 Kentucky Bluegrass/ Smooth Bromegrass/Forbs		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>													
<b>WHEATGRASS</b>													
western wheatgrass	PASM	1	750 - 1350	25 - 45	1	690 - 1265	30 - 55	1	56 - 420	2 - 15	1	36 - 360	2 - 20
slender wheatgrass	ELTR7	1	0 - 150	0 - 5									
<b>TALL WARM-SEASON GRASSES</b>													
big bluestem	ANGE	2	300 - 750	10 - 25	2	23 - 230	1 - 10	2	0 - 56	0 - 2	2	0 - 90	0 - 5
switchgrass	PAW2	2	30 - 240	1 - 8	2	0 - 92	0 - 4						
tall dropseed	SPOC2	2	0 - 150	0 - 5	2	0 - 138	0 - 6	2	0 - 56	0 - 2	2	0 - 90	0 - 5
Indiangrass	SONU2	2	0 - 150	0 - 5									
<b>COOL-SEASON BUNCHGRASSES</b>													
green needlegrass	NAV4	3	150 - 450	5 - 15	3	0 - 69	0 - 3	3	0 - 140	0 - 5	3	0 - 36	0 - 2
foxtail barley	HOJU	3	30 - 150	1 - 5	3	23 - 230	1 - 10	3	28 - 140	1 - 5	3	36 - 270	2 - 15
Canada wildrye	ELCA4	3	0 - 150	0 - 5				3	0 - 84	0 - 3			
<b>MID WARM-SEASON GRASSES</b>													
little bluestem	SCSC	4	30 - 240	1 - 8	4	0 - 46	0 - 2						
sideoats grama	BOCU	4	0 - 150	0 - 5	4	0 - 46	0 - 2						
<b>SHORT WARM-SEASON GRASSES</b>													
blue grama	BOGR2	5	0 - 150	0 - 5	5	0 - 69	0 - 3				5	0 - 54	0 - 3
buffalograss	BODA2	5	0 - 150	0 - 5	5	0 - 46	0 - 2				5	0 - 18	0 - 1
inland saltgrass	DISP	5	0 - 90	0 - 3	5	0 - 115	0 - 5	5	0 - 28	0 - 1	5	0 - 90	0 - 5
<b>OTHER NATIVE GRASSES</b>													
prairie junegrass	KOMA	6	30 - 90	1 - 3	6	23 - 46	1 - 2	6	0 - 28	0 - 1	6	0 - 18	0 - 1
Scribner panicum	DIOL8	6	0 - 60	0 - 2	6	0 - 23	0 - 1	6	0 - 28	0 - 1	6	0 - 18	0 - 1
other grasses	2GRAM	6	0 - 150	0 - 5	6	0 - 115	0 - 5	6	0 - 140	0 - 5	6	0 - 90	0 - 5
<b>GRASS-LIKES</b>													
sedge	CAREX	7	30 - 150	1 - 5	7	23 - 115	1 - 5	7	0 - 84	0 - 3	7	18 - 90	1 - 5
other grass-likes	2GL	7	0 - 90	0 - 3	7	0 - 69	0 - 3	7	0 - 56	0 - 2	7	0 - 54	0 - 3
<b>NON-NATIVE GRASSES</b>													
annual bromegrass	BROMU				8	0 - 161	0 - 7	8	0 - 140	0 - 5		18 - 270	1 - 15
Kentucky bluegrass	POPR				8	115 - 345	5 - 15	8	280 - 840	10 - 30		270 - 720	15 - 40
smooth bromegrass	BRIN2				8	0 - 115	0 - 5	8	560 - 1960	20 - 70		90 - 450	5 - 25
<b>FORBS</b>													
American licorice	GLLE3	9	0 - 60	0 - 2	9	0 - 69	0 - 3	9	0 - 28	0 - 1			
American yetch	VIAM	9	30 - 60	1 - 2	9	0 - 23	0 - 1						
annual sunflower	HEAN3	9	0 - 60	0 - 2	9	0 - 46	0 - 2				9	0 - 72	0 - 4
blue verbena	VEHA2	9	0 - 30	0 - 1									
Canada thistle	CIAR4				9	0 - 46	0 - 2	9	0 - 112	0 - 4	9	0 - 108	0 - 6
Carolina geranium	GECAC4	9	0 - 30	0 - 1									
cudweed sagewort	ARLU	9	30 - 60	1 - 2	9	23 - 69	1 - 3	9	28 - 84	1 - 3	9	18 - 54	1 - 3
curly dock	RUCR				9	0 - 23	0 - 1	9	0 - 84	0 - 3	9	0 - 72	0 - 4
false boneset	BREU	9	0 - 60	0 - 2									
goldenrod	SOLID	9	30 - 60	1 - 2	9	23 - 46	1 - 2	9	0 - 28	0 - 1	9	18 - 54	1 - 3
heath aster	SYER	9	30 - 60	1 - 2	9	23 - 46	1 - 2	9	0 - 28	0 - 1	9	18 - 36	1 - 2
Indianhemp	APCA	9	0 - 60	0 - 2	9	0 - 46	0 - 2	9	0 - 56	0 - 2	9	0 - 18	0 - 1
kochia	KOBC				9	0 - 23	0 - 1	9	0 - 84	0 - 3	9	0 - 180	0 - 10
Maximilian sunflower	HEMA2	9	30 - 60	1 - 2	9	0 - 23	0 - 1						
northern bedstraw	GABO2	9	0 - 30	0 - 1									
prairie coneflower	RACO3	9	30 - 60	1 - 2	9	0 - 23	0 - 1						
rush skeletonweed	LYJU	9	0 - 30	0 - 1	9	0 - 23	0 - 1						
scarlet gaura	GACO5	9	30 - 60	1 - 2	9	0 - 23	0 - 1						
slimflower scurpea	PSTE5	9	30 - 60	1 - 2	9	23 - 46	1 - 2	9	0 - 28	0 - 1			
sweetclover	MELIL				9	0 - 92	0 - 4	9	0 - 196	0 - 7	9	0 - 180	0 - 10
western ragweed	AMPS	9	0 - 30	0 - 1									
western yarrow	ACMIO	9	30 - 60	1 - 2	9	23 - 69	1 - 3	9	28 - 56	1 - 2	9	18 - 54	1 - 3
wild bergamot	MOFI	9	0 - 30	0 - 1									
wild parsley	MUDI	9	30 - 60	1 - 2	9	23 - 46	1 - 2	9	0 - 28	0 - 1			
woolly verbena	VEST	9	0 - 30	0 - 1	9	0 - 46	0 - 2	9	0 - 56	0 - 2	9	0 - 36	0 - 2
native forbs	2FN	9	0 - 90	0 - 3	9	0 - 69	0 - 3	9	0 - 56	0 - 2	9	0 - 36	0 - 2
introduced forbs	2FI				9	0 - 92	0 - 4	9	0 - 84	0 - 3	9	0 - 126	0 - 7
<b>SHRUBS</b>													
leadplant	AMCA6	10	30 - 60	1 - 2	10	0 - 23	0 - 1						
poison ivy	TORY	10	0 - 30	0 - 1	10	0 - 46	0 - 2	10	0 - 84	0 - 3	10	0 - 18	0 - 1
rose	ROSA5	10	30 - 60	1 - 2	10	23 - 46	1 - 2	10	0 - 28	0 - 1	10	0 - 18	0 - 1
silver sagebrush	ARCA13	10	0 - 60	0 - 2	10	0 - 23	0 - 1				10	0 - 18	0 - 1
snowberry	SYMPH	10	30 - 60	1 - 2	10	23 - 69	1 - 3	10	28 - 140	1 - 5	10	18 - 54	1 - 3
other shrubs	2SHRUB	10	0 - 60	0 - 2	10	0 - 46	0 - 2	10	0 - 28	0 - 1	10	0 - 36	0 - 2
<b>Annual Production lbs./acre</b>													
<b>GRASSES &amp; GRASS-LIKES</b>													
2140 - 2685 - 3290													
<b>FORBS</b>													
135 - 225 - 345													
<b>SHRUBS</b>													
25 - 90 - 165													
<b>TOTAL</b>													
2300 - 3000 - 3800													

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>

PI

## Reference State (State 1)

This state represents the natural range of variability that dominated the dynamics of this ecological site (ES). This state was dominated by cool-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included somewhat 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. A combination of disturbances such as fire followed by grazing during below average precipitation periods, or a severe single disturbance such as extended periods of below average precipitation would have caused a decline in tall warm-season grasses and green needlegrass. This would have resulted in a simplification of the plant community with dominance by western wheatgrass.

### 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase

Interpretations are based primarily on the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by cool-season grasses. The major grasses include western wheatgrass, big bluestem, and green needlegrass. Other grass and grass-like species include switchgrass, little bluestem, sideoats grama, Indiangrass, tall dropseed, blue grama, buffalograss, and sedges. 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: SD6302

Growth curve name: Pierre Shale Plains, cool-season dominant, warm-season subdominant.

Growth curve description: Cool-season dominant, warm-season subdominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	23	34	15	6	5	4	0	0

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

- 1.1a – Continuous seasonal grazing which includes grazing at moderate to heavy stocking levels at the same time of year each year, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the *1.2 Western Wheatgrass Plant Community Phase*.

### 1.2 Western Wheatgrass Plant Community Phase

This plant community evolved under continuous seasonal grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. The dominant grass was western wheatgrass. Grass and grass-like species of secondary importance included big bluestem, tall dropseed, foxtail barley, and sedge. Forbs commonly found in this plant community included American licorice, cudweed sagewort, western yarrow, and woolly verbena. This plant community will have similar plant composition to the 2.2 Western Wheatgrass/Kentucky Bluegrass Plant Community Phase (refer to the plant composition tables). The main difference is that nonnative species such as Kentucky bluegrass and smooth brome grass would not have been present in this plant community phase.

When compared to the Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase (1.1), big bluestem and green needlegrass decreased significantly, while western wheatgrass would have

increased. Production and litter cover would have decreased as well and bare ground would have increased. The site would have been the most susceptible to erosion and gully formation during this phase. However, once conditions became more favorable, this plant community phase would have readily shifted back to the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase.

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: SD6301

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

Growth curve description: Cool-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	4	12	25	36	10	5	4	4	0	0

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

- 1.2a – Grazing and fire returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the *1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase*.
- T1 – Encroachment of non-native grasses such as Kentucky bluegrass and smooth bromegrass, and disruption of natural disturbance regimes such as periodic fire followed by short-term high intensity grazing will lead this plant community phase over a threshold to the *Native/Invasive Grass State (State 2)*. This occurs as natural and/or management actions (altered grazing and/or fire regime) favor a decline in the composition of the native species and an increase in cool-season sod grasses. Chronic season-long or heavy continuous grazing facilitates this transition. Complete rest from grazing and no fire events could also have accelerated this transition.

### Native/Invasive Grass State (State 2)

This state is similar to the reference state in terms dominant plant composition and production. However, the invasion of introduced cool-season sod grasses alters the natural range of variability for this ES. This state is still dominated by mid- and tall native warm- and cool-season grasses, but invasive introduced cool-season sod grasses are now present in all community phases of this state. The primary disturbance mechanisms for this state include grazing by domestic livestock and infrequent fires. Timing and intensity of grazing events coupled with weather dictate the dynamics that occur within this state. The cool-season native grass can decline and an increase in introduced sod grasses will occur. Many times, this state appears as a mosaic of community phases caused primarily by continuous season-long grazing.

This state represents the more common range of variability that exists with higher levels of grazing management but in the absence of periodic fire followed by short-term intensive grazing. This state is dominated by cool-season grasses, with warm-season grasses being subdominant. It 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.

### 2.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase

This plant community phase is similar to the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase, but it also contains minor amounts of nonnative invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 15 percent by air-dry weight). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by cool-season grasses with warm-season grasses being subdominant.

The major grasses include western wheatgrass, big bluestem, and green needlegrass. Other grass and grass-like species include switchgrass, little bluestem, sideoats grama, Indiangrass, tall dropseed, blue grama, buffalograss, and sedges. Major forbs and shrubs include American licorice, sunflower, goldenrod, and western snowberry. 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. Refer to the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase for details of the plant composition for this community phase.

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: SD6302

Growth curve name: Pierre Shale Plains, cool-season dominant, warm-season subdominant.

Growth curve description: Cool-season dominant, warm-season subdominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	23	34	15	6	5	4	0	0

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

- 2.1a – Continuous season-long grazing (grazing at light to moderate stocking levels for a majority of or the entire growing season), heavy continuous seasonal grazing (grazing at moderate to heavy stocking levels for extended portions of the growing season at the same time each year), or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the *2.2 Western Wheatgrass/Kentucky Bluegrass Plant Community Phase*.

## 2.2 Western Wheatgrass/Kentucky Bluegrass Plant Community Phase

This phase is characterized by a shift to mid-cool-season rhizomatous grasses with lesser amounts of tall warm-season and mid-cool-season bunchgrasses. The vegetation is about 85 percent grasses and grass-like plants, 10 percent forbs, and 5 percent shrubs. Dominant grasses would include western wheatgrass and Kentucky bluegrass with minor amounts of needlegrasses, big bluestem, and switchgrass. Major forbs are western ragweed, goldenrods, and western yarrow. Snowberry would be the dominant shrub. Energy capture by this plant community phase has shifted from late spring and summer to early spring through early summer. 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.

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: SD6301

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

Growth curve description: Cool-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	4	12	25	36	10	5	4	4	0	0

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

- 2.2a – 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 *2.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase*.

**Transitions from the Native/Invasive Grass State (State 2) to the Invaded State (State 3)**

- T2a – Non-use and no fire for extended periods of time (typically for 10 or more years) will likely lead this state over a threshold resulting in the *3.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase* within the *Invaded Grass State (State 3)*.
- T2b – Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year) or heavy continuous season-long grazing will convert this plant community to the *3.2 Kentucky Bluegrass/Smooth Bromegrass/Forbs Plant Community Phase* in the *3 Invaded Grass State*.

**3.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase**

This plant community phase is a result of extended periods of nonuse and no fire. It is characterized by a dominance of smooth bromegrass and Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface. Nutrient cycling is greatly reduced, and native plants have great difficulty becoming established. When dominated by smooth bromegrass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short, as these cool-season species mature rapidly. Energy capture is also reduced.

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: SD6301

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

Growth curve description: Cool-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	4	12	25	36	10	5	4	4	0	0

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

- 3.1a – Continuous season-long grazing (grazing at light to moderate stocking levels for a majority of or the entire growing season), heavy continuous seasonal grazing (grazing at moderate to heavy stocking levels for extended portions of the growing season at the same time each year), or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the *3.2 Kentucky Bluegrass/Smooth Bromegrass/Forbs Plant Community Phase*.

**3.2 Kentucky Bluegrass/Smooth Bromegrass/Forbs Plant Community Phase**

This plant community phase is a result of continuous season-long grazing or heavy, continuous seasonal grazing. It is characterized by a dominance of Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high.

Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short, as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

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: SD6301

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

Growth curve description: Cool-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	4	12	25	36	10	5	4	4	0	0

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

- 3.2a – Prescribed grazing (alternating season of use and providing adequate recovery periods), extended periods of nonuse and no fire, or periodic light to moderate grazing possibly including periodic rest may convert this plant community to the *3.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase*.
- 3.2b – Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year) or heavy continuous season-long grazing will convert this plant community to the *3.3 Annual/Pioneer, Non-Native Perennial Plant Community Phase*.

### 3.3 Annual/Pioneer, Non-Native Perennial Plant Community Phase

This plant community evolved under heavy continuous season-long grazing, heavy continuous seasonal grazing, or from over utilization during extended drought periods. The potential plant community is made up of approximately 50 to 80 percent grasses and grass-like species, 10 to 25 percent forbs, and 5 to 25 percent shrubs and trees. The dominant species are highly variable in this phase, often consisting of invasive species such as annual bromegrass, Kentucky bluegrass, and invasive forbs. Other plant species, from adjacent ESs, can become minor components of this plant community. This plant community is susceptible to invasion of Canada thistle and other nonnative species because of the relatively high percent of bare ground. This plant community phase may also be made up of seeded species such as legumes and intermediate wheatgrass. Refer to the corresponding Forage Suitability Group for production and species adaptation.

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. This community can be renovated to improve the production capability; however, if management changes are not made the vegetation could revert back to a threeawn/annual community.

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

- 3.3a – Prescribed grazing (alternating season of use and providing adequate recovery periods), extended periods of nonuse and no fire, or periodic light to moderate grazing possibly including periodic rest may convert this plant community to the *3.2 Kentucky Bluegrass/Smooth Bromegrass/Forbs Plant Community Phase*.

### **Transition from Any Plant Community to the Invaded Grass State (State 3)**

- T4 – Encroachment of highly competitive nonnative species (e.g., Canada thistle, diffuse knapweed, leafy spurge, etc.) seeding with improved native or nonnative forage species, or abandonment after cropping will shift any plant community to the *3.3 Annual/Pioneer, Non-Native Perennial Plant Community Phase* within the *Invaded Grass State (State 3)*.

### **Restoration Pathway from the Invaded Grass State (State 3) to the Native/Invasive Grass State (State 2)**

- R3 - 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) coupled with prescribed burning and/or pest management (herbicide) may lead this plant community phase over a threshold to the *Native/Invasive Grass State (State 2)*. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable. Success depends on whether native reproductive propagules remain intact on the site.

## **Ecological Site Interpretations**

### **Animal Community – Wildlife Interpretations**

-- Under Development --

**Western Wheatgrass/Bluestem/Needlegrass Plant Community Phases (1.1 & 2.1):**

**Western Wheatgrass/Kentucky Bluegrass Plant Community Phase (2.2):**

**Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase (3.1):**

**Kentucky Bluegrass/Smooth Bromegrass/Forbs Plant Community Phase (3.2):**

**Annual/Pioneer, Non-Native Perennial Plant Community Phase (3.3):**

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
<b>Grasses and Grass-likes</b>							
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
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
buffalograss	U U D U	N U D U	U U D U	N U D U	N U D U	U U D U	U U D U
Canada wildrye	U D U U	N U N N	U D U U	N U N N	N U N N	U D U U	U D U 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
green needlegrass	U P U D	N P N P	U P U D	N P N P	N P N P	U P U D	U P U D
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
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
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
tall dropseed	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 N
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
<b>Forbs</b>							
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
American vetch	U D P U	U P P U	U D P U	U P P U	U P P U	U D P U	U P P U
annual sunflower	U U D U	U D U U	U U D U	U D U U	U D U U	U U D U	U D U U
blue verbena	N N N N	N U D N	N N N N	N U D N	N U D N	N N N N	N N N N
Carolina geranium	N N N N	N U D N	N N N N	N U D N	N U D N	N N N N	N N N N
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 boneset	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
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
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
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
northern bedstraw	N N N N	N U D N	N N N N	N U D N	N U D N	N N N N	N N N N
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
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
scarlet gaura	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
slimflower scurfpea	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
wild bergamot	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
wild parsley	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
woolly verbena	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
<b>Shrubs</b>							
leadplant	U P D U	U P D U	U P D U	U P D U	U P D U	U P D U	U P D U
poison ivy	N N N N	U U U U	N N N N	U U U U	U U U U	N N N N	U U U U
rose	U D D U	U D D U	U D D U	U D D U	U D D U	U D D U	U D D U
silver sagebrush	D U U D	D U U D	D U U D	P D D P	P P P P	D U U D	D U U D
snowberry	U U U U	U U U U	U U U U	D U D D	U U U U	U U U U	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)
Western Wheatgrass/Bluestem/Needlegrass (1.1 & 2.1)	3,000	0.82
Western Wheatgrass/Kentucky Bluegrass (2.2)	2,300	0.63
Smooth Bromegrass/Kentucky Bluegrass (3.1)	2,800	0.77
Kentucky Bluegrass/Smooth Bromegrass/Forbs (3.2)	1,800	0.49

\*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 and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by Kentucky bluegrass and/or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

## Recreational Uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide 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

Loamy (R063BY010SD), Clayey (R063BY011SD)

### Similar Sites

(R063BY011SD) – Clayey [less big bluestem; more needlegrass; lower 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.

<u>Data Source</u>	<u>Number of Records</u>	<u>Sample Period</u>	<u>State</u>	<u>County</u>
SCS-RANGE-417	5	2004	SD	Gregory

### 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