

## United States Department of Agriculture Natural Resources Conservation Service

### Ecological Site Description

**Site Type:** Rangeland

**Site Name:** Sandy

**Site ID:** R061XY009SD

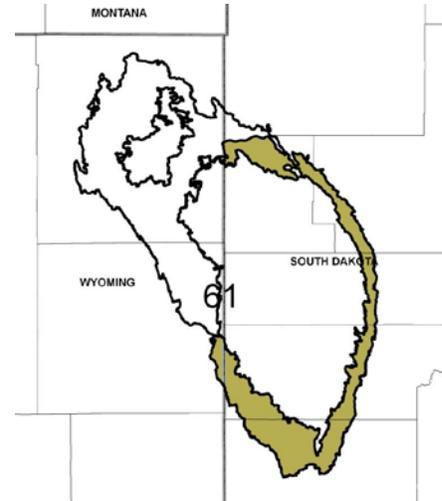
**Major Land Resource Area (MLRA):** 61 – Black Hills Foot Slopes

### Physiographic Features

This site occurs on gently sloping uplands.

**Landform:** terrace

**Aspect:** N/A



	<u>Minimum</u>	<u>Maximum</u>
<b>Elevation (feet):</b>	2,900	4,000
<b>Slope (percent):</b>	1	6
<b>Water Table Depth (inches):</b>	80	80
<b>Flooding:</b>		
<b>Frequency:</b>	None	None
<b>Duration:</b>	None	None
<b>Ponding:</b>		
<b>Depth (inches):</b>	None	None
<b>Frequency:</b>	None	None
<b>Duration:</b>	None	None
<b>Runoff Class:</b>	Negligible	Low

### Climatic Features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland steppes to the east. Annual precipitation ranges from 14 to 21 inches per year, with most occurring during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter but most severely affect ranch operations during late winter and spring.

The average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 20°F (Sundance, Wyoming (WY)), to about 26°F (Fort Meade, South Dakota (SD)). July is the warmest month with temperatures averaging from about 69°F (Sundance, WY), to about 73°F (Hot Springs, SD). The range of average monthly temperatures between the coldest and warmest months is about 49°F. 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 storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

	<u>Minimum</u>	<u>Maximum</u>
Frost-free period (days):	116	148
Freeze-free period (days):	143	168
Mean Annual Precipitation (inches):	14	21

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.32	0.74	8.6	37.9
February	0.36	0.72	12.6	41.9
March	0.77	1.33	18.9	49.9
April	1.77	2.38	29.0	61.0
May	2.73	4.15	38.9	70.7
June	3.20	3.47	47.7	80.9
July	2.00	2.69	54.6	89.3
August	1.43	2.21	52.8	88.0
September	1.25	1.45	43.0	78.4
October	0.98	1.68	32.6	65.5
November	0.42	0.87	20.9	49.6
December	0.33	0.74	12.3	39.9

Climate Stations		Period	
Station ID	Location or Name	From	To
SD3069	Fort Meade	1902	2008
SD3775	Hermosa 3 SSW	1906	2009
SD4007	Hot Springs	1894	2009
SD6947	Rapid City	1916	2009
SD7882	Spearfish	1893	2008
WY8705	Sundance	1915	2005
SD9347	Wind Cave	1948	2009

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

**Riparian and Wetland Features**

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

**Representative Soil Features**

The features common to soils in this site are the fine sandy loam textured surface layers and slopes of one to six percent. The soils in this site are well-drained and formed in alluvium. The surface layer is four to eight inches thick. The texture of the subsurface generally ranges from sandy loam to fine sandy loam. This site should show slight to 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. Subsurface soil layers are not restrictive to water movement and root penetration. These soils are somewhat susceptible to wind and water erosion when vegetative cover is not adequate. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production. Access Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>) for specific local soils information.

Parent Material Kind: alluvium  
Parent Material Origin:  
Surface Texture: fine sandy loam  
Surface Texture Modifier: none  
Subsurface Texture Group: sandy  
Surface Fragments ≤3” (% Cover): 0-2  
Surface Fragments >3” (%Cover): 0  
Subsurface Fragments ≤3” (% Volume): 0-2  
Subsurface Fragments >3” (% Volume): 0

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	well	well
Permeability Class:	moderate	moderately rapid
Depth (inches):	80	80
Electrical Conductivity (mmhos/cm)*:	0	2
Sodium Absorption Ratio*:	0	0
Soil Reaction (1:1 Water)*:	6.1	8.4
Soil Reaction (0.1M CaCl <sub>2</sub> )*:	NA	NA
Available Water Capacity (inches)*:	6	7
Calcium Carbonate Equivalent (percent)*:	0	15

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

## Plant Communities

### Ecological Dynamics of the Site:

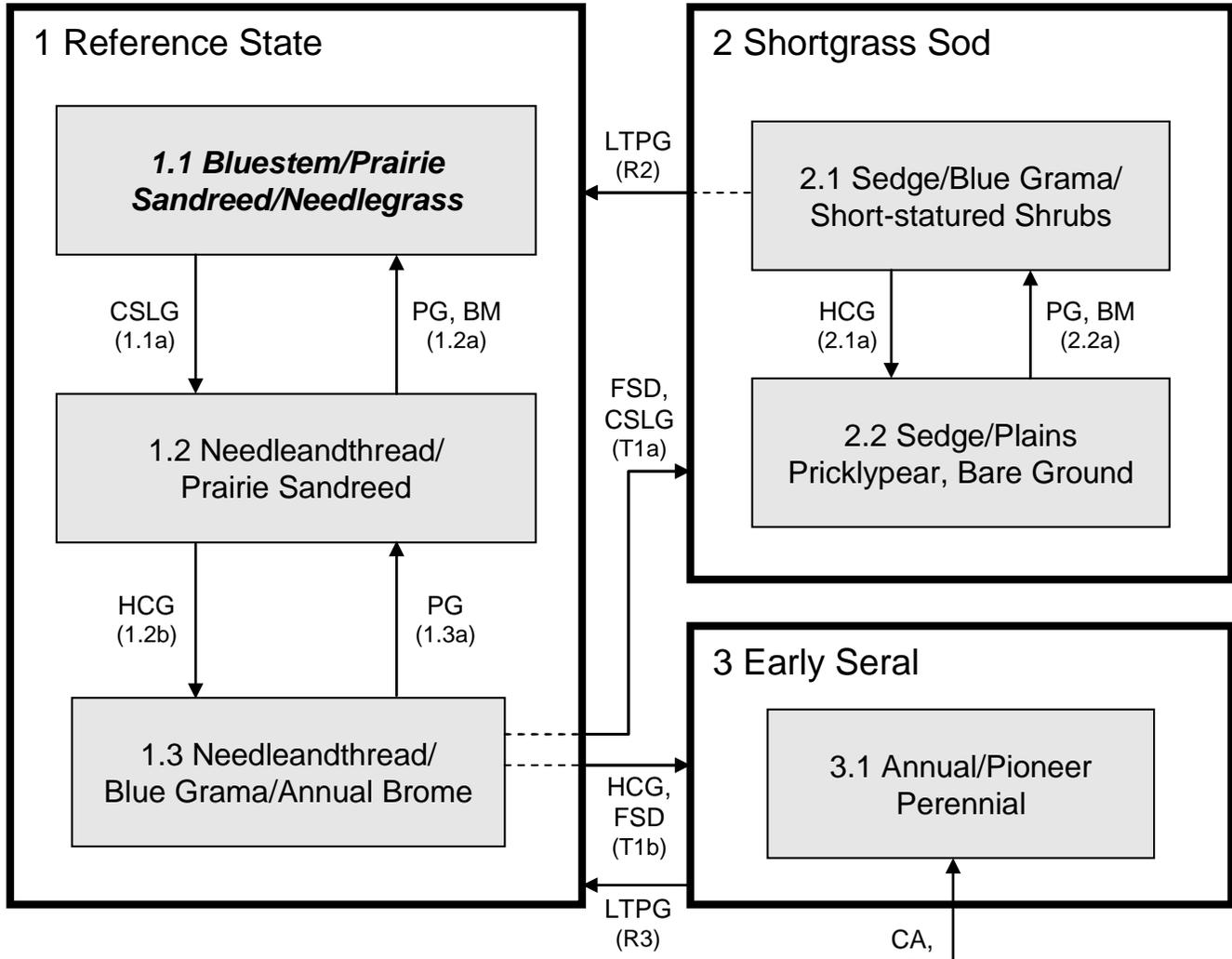
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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 grazing (e.g., every spring and/or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes departure from the Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase. Short grass and grass-like species such as sedge, blue grama, and bluegrass will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Big bluestem, switchgrass, and Indiangrass will decrease in frequency and production. Excessive defoliation can cause blue grama and annuals to increase and dominate the site.

Interpretations are primarily based on the Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase (1.1). 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 narrative for details on pathways: **BM** – Brush management; **CA** – Cropped, abandoned; **CSLG** – Continuous season-long grazing; **FSD** – Frequent and severe defoliation; **HCG** – Heavy continuous grazing; **LTPG** – Long-term prescribed grazing; **PG** – Prescribed grazing including adequate recovery periods.

Any Plant Community

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	1.1 Bluestem/Prairie Sandreed/Needlegrass		
			Group	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>				2000 - 2250	80 - 90
<b>TALL WARM-SEASON GRASSES</b>			<b>1</b>	<b>750 - 1250</b>	<b>30 - 50</b>
prairie sandreed	Calamovilfa longifolia	CALO	1	250 - 750	10 - 30
big bluestem	Andropogon gerardii	ANGE	1	125 - 500	5 - 20
sand bluestem	Andropogon hallii	ANHA	1	50 - 500	2 - 20
switchgrass	Panicum virgatum	PAVI2	1	0 - 200	0 - 8
Indiangrass	Sorghastrum nutans	SONU2	1	0 - 125	0 - 5
<b>MID WARM-SEASON GRASSES</b>			<b>2</b>	<b>250 - 500</b>	<b>10 - 20</b>
little bluestem	Schizachyrium scoparium	SCSC	2	125 - 500	5 - 20
sideoats grama	Bouteloua curtipendula	BOCU	2	25 - 200	1 - 8
<b>COOL-SEASON BUNCHGRASSES</b>			<b>3</b>	<b>125 - 375</b>	<b>5 - 15</b>
needleandthread	Hesperostipa comata ssp. comata	HECOC8	3	125 - 375	5 - 15
porcupine grass	Hesperostipa spartea	HESP11	3	0 - 125	0 - 5
Canada wildrye	Elymus canadensis	ELCA4	3	0 - 125	0 - 5
<b>WHEATGRASS</b>			<b>4</b>	<b>125 - 250</b>	<b>5 - 10</b>
western wheatgrass	Pascopyrum smithii	PASM	4	125 - 250	5 - 10
slender wheatgrass	Elymus trachycaulus	ELTR7	4	0 - 125	0 - 5
<b>SHORT WARM-SEASON GRASSES</b>			<b>5</b>	<b>25 - 125</b>	<b>1 - 5</b>
blue grama	Bouteloua gracilis	BOGR2	5	25 - 125	1 - 5
hairy grama	Bouteloua hirsuta	BOH2	5	0 - 75	0 - 3
sand dropseed	Sporobolus cryptandrus	SPCR	5	0 - 50	0 - 2
<b>OTHER NATIVE GRASSES</b>			<b>6</b>	<b>25 - 125</b>	<b>1 - 5</b>
prairie junegrass	Koeleria macrantha	KOMA	6	25 - 75	1 - 3
Sandberg bluegrass	Poa secunda	POSE	6	0 - 50	0 - 2
other grasses		2GRAM	6	0 - 100	0 - 4
<b>GRASS-LIKES</b>			<b>7</b>	<b>25 - 125</b>	<b>1 - 5</b>
threadleaf sedge	Carex filifolia	CAFI	7	25 - 125	1 - 5
other grass-likes		2GL	7	0 - 75	0 - 3
<b>FORBS</b>			<b>9</b>	<b>125 - 250</b>	<b>5 - 10</b>
American vetch	Vicia americana	VIAM	9	25 - 50	1 - 2
bracted spiderwort	Tradescantia bracteata	TRBR	9	25 - 50	1 - 2
catclaw sensitive briar	Mimosa nuttallii	MINU6	9	0 - 25	0 - 1
cudweed sagewort	Artemisia ludoviciana	ARLU	9	25 - 50	1 - 2
dotted gayfeather	Liatris punctata	LIPU	9	25 - 50	1 - 2
false boneset	Brickellia eupatorioides	BREU	9	0 - 50	0 - 2
goldenrod	Solidago spp.	SOLID	9	25 - 50	1 - 2
green sagewort	Artemisia campestris	ARCA12	9	25 - 50	1 - 2
hairy goldaster	Heterotheca villosa	HEVI4	9	25 - 50	1 - 2
hoary puccoon	Lithospermum canescens	LICA12	9	25 - 50	1 - 2
penstemon	Penstemon spp.	PENST	9	25 - 50	1 - 2
prairie coneflower	Ratibida columnifera	RACO3	9	25 - 50	1 - 2
purple coneflower	Echinacea angustifolia	ECAN2	9	0 - 25	0 - 1
purple prairie clover	Dalea purpurea	DAPU5	9	25 - 50	1 - 2
rush skeletonweed	Lygodesmia juncea	LYJU	9	0 - 25	0 - 1
scarlet gaura	Gaura coccinea	GACO5	9	25 - 50	1 - 2
scurfpea	Psoralegium spp.	PSORA2	9	25 - 50	1 - 2
stiff sunflower	Helianthus pauciflorus	HEPA19	9	25 - 75	1 - 3
western ragweed	Ambrosia psilostachya	AMPS	9	0 - 25	0 - 1
western wallflower	Erysimum capitatum var. capitatum	ERCAC	9	0 - 25	0 - 1
white prairie aster	Symphotrichum falcatum	SYFA	9	25 - 50	1 - 2
native forbs		2FN	9	25 - 75	1 - 3
<b>SHRUBS</b>			<b>10</b>	<b>125 - 250</b>	<b>5 - 10</b>
fringed sagewort	Artemisia frigida	ARFR4	10	0 - 50	0 - 2
leadplant	Amorpha canescens	AMCA6	10	25 - 175	1 - 7
rose	Rosa spp.	ROSA5	10	25 - 75	1 - 3
snowberry	Symphoricarpos spp.	SYMPH	10	0 - 75	0 - 3
other shrubs		2SHRUB	10	0 - 75	0 - 3

Annual Production lbs./acre	LOW	RV	HIGH
<b>GRASSES &amp; GRASS-LIKES</b>	1580 -	2125	-2630
<b>FORBS</b>	110 -	188	-285
<b>SHRUBS</b>	110 -	188	-285
<b>TOTAL</b>	1800 -	2500	-3200

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

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	1.1 Bluestem/Prairie Sandreed/Needlegrass			1.2 Needleandthread/Prairie Sandreed			1.3 Needleandthread/Blue Grama/Annual Brome			2.1 Sedge/Blue Grama/Short-statured Shrubs		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>													
<b>TALL WARM-SEASON GRASSES</b>													
prairie sandreed	CALO	1	250 - 750	10 - 30	1	100 - 400	5 - 20	1	18 - 144	1 - 8	1	0 - 48	0 - 4
big bluestem	ANGE	1	125 - 500	5 - 20	1	40 - 200	2 - 10	1	0 - 72	0 - 4	1	0 - 36	0 - 3
sand bluestem	ANHA	1	50 - 500	2 - 20	1	0 - 140	0 - 7						
switchgrass	PAV12	1	0 - 200	0 - 8	1	0 - 80	0 - 4						
Indiangrass	SONU2	1	0 - 125	0 - 5									
<b>MID WARM-SEASON GRASSES</b>													
little bluestem	SCSC	2	125 - 500	5 - 20	2	40 - 200	2 - 10	2	0 - 36	0 - 2			
sideoats grama	BOCU	2	25 - 200	1 - 8	2	20 - 140	1 - 7	2	18 - 108	1 - 6	2	0 - 60	0 - 5
<b>COOL-SEASON BUNCHGRASSES</b>													
needleandthread	HECOC8	3	125 - 375	5 - 15	3	200 - 500	10 - 25	3	90 - 270	5 - 15	3	0 - 60	0 - 5
porcupine grass	HESP11	3	0 - 125	0 - 5	3	0 - 60	0 - 3						
Canada wildrye	ELCA4	3	0 - 125	0 - 5	3	0 - 40	0 - 2						
<b>WHEATGRASS</b>													
western wheatgrass	PASM	4	125 - 250	5 - 10	4	20 - 160	1 - 8	4	18 - 126	1 - 7	4	0 - 60	0 - 5
slender wheatgrass	ELTR7	4	0 - 125	0 - 5	4	0 - 60	0 - 3						
<b>SHORT WARM-SEASON GRASSES</b>													
blue grama	BOGR2	5	25 - 125	1 - 5	5	40 - 200	2 - 10	5	90 - 360	5 - 20	5	180 - 420	15 - 35
hairy grama	BOHI2	5	0 - 75	0 - 3	5	0 - 100	0 - 5	5	0 - 144	0 - 8	5	0 - 120	0 - 10
sand dropseed	SPCR	6	0 - 50	0 - 2	6	0 - 40	0 - 2	6	0 - 54	0 - 3	6	0 - 60	0 - 5
<b>OTHER NATIVE GRASSES</b>													
prairie junegrass	KOMA	6	25 - 75	1 - 3	6	20 - 60	1 - 3	6	18 - 36	1 - 2	6	12 - 24	1 - 2
Sandberg bluegrass	POSE	6	0 - 50	0 - 2	6	0 - 20	0 - 1	6	0 - 36	0 - 2	6	0 - 36	0 - 3
other grasses	2GRAM	6	0 - 100	0 - 4	6	0 - 60	0 - 3	6	0 - 54	0 - 3	6	0 - 36	0 - 3
<b>GRASS-LIKES</b>													
threadleaf sedge	CAFI	7	25 - 125	1 - 5	7	40 - 160	2 - 8	7	90 - 270	5 - 15	7	120 - 360	10 - 30
other grass-like	2GL	7	0 - 75	0 - 3	7	0 - 80	0 - 4	7	0 - 90	0 - 5	7	0 - 96	0 - 8
<b>NON-NATIVE GRASSES</b>													
bluegrass	POA	8			8	0 - 100	0 - 5	8	0 - 126	0 - 7	8	0 - 48	0 - 4
cheatgrass	BRTE	8			8	20 - 100	1 - 5	8	36 - 270	2 - 15	8	12 - 120	1 - 10
<b>FORBS</b>													
American vetch	VIAM	8	25 - 50	1 - 2	8	0 - 20	0 - 1						
bracted spiderwort	TRBR	8	25 - 50	1 - 2	8	0 - 20	0 - 1						
catclaw sensitive briar	MINU6	8	0 - 25	0 - 1									
cudweed sagewort	ARLU	8	25 - 50	1 - 2	8	20 - 80	1 - 4	8	18 - 90	1 - 5	8	12 - 48	1 - 4
dotted gayfeather	LIPU	8	25 - 50	1 - 2	8	0 - 20	0 - 1						
false boneset	BREU	8	0 - 50	0 - 2	8	0 - 20	0 - 1						
goldenrod	SOLID	8	25 - 50	1 - 2	8	20 - 60	1 - 3	8	18 - 54	1 - 3	8	12 - 36	1 - 3
green sagewort	ARCA12	8	25 - 50	1 - 2	8	20 - 60	1 - 3	8	18 - 72	1 - 4	8	12 - 60	1 - 5
hairy goldaster	HEVI4	8	25 - 50	1 - 2	8	0 - 40	0 - 2	8	0 - 18	0 - 1			
hoary puccoon	LICA12	8	25 - 50	1 - 2	8	0 - 20	0 - 1						
penstemon	PENST	8	25 - 50	1 - 2	8	0 - 20	0 - 1						
prairie coneflower	RACO3	8	25 - 50	1 - 2	8	20 - 40	1 - 2	8	0 - 18	0 - 1			
purple coneflower	ECAN2	8	0 - 25	0 - 1	8	0 - 20	0 - 1						
purple prairie clover	DAPU5	8	25 - 50	1 - 2	8	0 - 40	0 - 2	8	0 - 18	0 - 1			
rush skeletonweed	LYJU	8	0 - 25	0 - 1	8	0 - 20	0 - 1	8	0 - 18	0 - 1			
scarlet gaura	GACO5	8	25 - 50	1 - 2	8	0 - 20	0 - 1						
scurfpea	PSORA2	8	25 - 50	1 - 2	8	20 - 40	1 - 2	8	18 - 54	1 - 3	8	12 - 24	1 - 2
stiff sunflower	HEPA19	8	25 - 75	1 - 3	8	0 - 20	0 - 1						
western ragweed	AMPS	8	0 - 25	0 - 1	8	20 - 40	1 - 2	8	18 - 54	1 - 3	8	12 - 48	1 - 4
western wallflower	ERCAC	8	0 - 25	0 - 1	8	0 - 20	0 - 1						
white prairie aster	SYFA	8	25 - 50	1 - 2	8	20 - 40	1 - 2	8	18 - 36	1 - 2	8	12 - 24	1 - 2
native forbs	2FN	8	25 - 75	1 - 3	8	0 - 60	0 - 3	8	0 - 54	0 - 3	8	0 - 36	0 - 3
introduced forbs	2FI				8	0 - 60	0 - 3	8	18 - 90	1 - 5	8	12 - 60	1 - 5
<b>SHRUBS</b>													
fringed sagewort	ARFR4	9	0 - 50	0 - 2	9	20 - 100	1 - 5	9	36 - 126	2 - 7	9	36 - 144	3 - 12
leadplant	AMCA6	9	25 - 175	1 - 7	9	0 - 40	0 - 2						
rose	ROSA5	9	25 - 75	1 - 3	9	20 - 60	1 - 3	9	18 - 36	1 - 2	9	0 - 12	0 - 1
snowberry	SYMPH	9	0 - 75	0 - 3	9	0 - 80	0 - 4	9	0 - 54	0 - 3	9	0 - 24	0 - 2
other shrubs	2SHRUB	9	0 - 75	0 - 3	9	0 - 100	0 - 5	9	18 - 126	1 - 7	9	12 - 60	1 - 5
<b>Annual Production lbs./acre</b>													
		LOW	RV	HIGH	LOW	RV	HIGH	LOW	RV	HIGH	LOW	RV	HIGH
<b>GRASSES &amp; GRASS-LIKES</b>		1580	2125	2630	1210	1650	2030	1030	1440	1780	690	960	1200
<b>FORBS</b>		110	188	285	95	200	345	85	180	310	55	120	200
<b>SHRUBS</b>		110	188	285	95	150	225	85	180	310	55	120	200
<b>TOTAL</b>		1800	2500	3200	1400	2000	2600	1200	1800	2400	800	1200	1600

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 was dominated by cool-season grasses with warm-season grasses being subdominant. In pre-European times, 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. Taller cool- and warm-season grasses would have declined and a corresponding increase in short statured grass and grass-like species would have occurred. Today, a similar state can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

#### 1.1 Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase

Interpretations are based primarily on the Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. The community is dominated by warm-season grasses with cool-season grasses being subdominant. The major grasses include prairie sandreed, big bluestem, sand bluestem, little bluestem, needleandthread, and sideoats grama. Other grass or grass-like species include blue grama, slender wheatgrass, Indiangrass, blue grama, switchgrass, and threadleaf sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

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

Growth curve number: SD6105

Growth curve name: Black Hills Foot Slopes, warm-season dominant.

Growth curve description: Warm-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	2	5	15	25	30	15	7	1	0	0

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

- 1.1a – Continuous season-long grazing or prolonged periods with very light use or no use and a lack of fire will cause this plant community to shift to the *1.2 Needleandthread/Prairie Sandreed Plant Community Phase*. With continuous season-long grazing, some areas will receive little or no grazing while other areas will be repeatedly grazed.

#### 1.2 Needleandthread/Prairie Sandreed Plant Community Phase

This plant community phase is a result of continuous season-long grazing or prolonged periods of light use or nonuse and a lack of fire. The potential vegetation is about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. The community is co-dominated by cool- and warm-season grasses. The major grasses include needleandthread, prairie sandreed, big bluestem, little bluestem, and blue grama. Other grass or grass-like species include sideoats grama, sand bluestem, western wheatgrass, prairie Junegrass, and threadleaf sedge. Kentucky bluegrass and cheatgrass also begin to invade. Forbs commonly include cudweed sagewort, goldenrod, scurfpea, white prairie aster, and western ragweed. Shrubs include western snowberry, fringed sagewort, rose, and leadplant.

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. However, blue grama and sedge have increased and runoff and infiltration will begin to be negatively affected.

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: SD6103

Growth curve name: Black Hills Foot Slopes, cool-season/warm-season codominant.

Growth curve description: Cool-season, warm-season codominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	20	28	21	10	5	3	0	0

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

- 1.2b – Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season) or a combination of disturbances for extended periods of time will lead to the *1.3 Needleandthread/Blue Grama/Annual Brome Plant Community Phase*.
- 1.2a – Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the *1.1 Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase*.

### 1.3 Needleandthread/Blue Grama/Annual Brome Plant Community Phase

This plant community evolves under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 70 percent grasses and grass-like species, 15 percent forbs, and 15 percent shrubs. Dominant grasses include needleandthread, blue grama, and threadleaf sedge. Annual brome (cheatgrass and/or Japanese brome) may also invade and become significant. Grasses of secondary importance include western wheatgrass, little bluestem, hairy grama, sideoats grama, and Kentucky bluegrass. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, scurfpea, and western ragweed.

When compared to the Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase (1.1), blue grama and threadleaf sedge have increased. Prairie sandreed, big bluestem, and other tall and mid-statured grasses have decreased and production is also reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

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: SD6102

Growth curve name: Black Hills Foot Slopes, 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:

- 1.3a – 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 *1.2 Needleandthread/Prairie Sandreed Plant Community Phase* or possibly to the *1.1 Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase*.
- T1a – Continuous season-long grazing over extended periods of time or the beginnings of frequent and severe defoliation (as occurs adjacent to prairie dog colonies) will tend to shift this plant community over a threshold leading to the *Shortgrass Sod State (State 2)*.
- T1b – Heavy continuous grazing (typically very heavy grazing for extended periods of time) or frequent and severe defoliation (as occurs with occupation by prairie dogs) will shift this plant community over a threshold leading to the *3.1 Annual/Pioneer Perennial Plant Community Phase* within the *Early Seral State (State 3)*.

### Shortgrass Sod State (State 2)

This state typically occurs as a result on continuous season-long grazing at moderate to heavy stocking levels over extended periods of time. Gradually short-statured species such as blue grama and threadleaf sedge become dominant. This change in plant composition alters the hydrologic cycle increasing runoff and reducing infiltration. This is due to the compact, short depth of the rooting structure of the dominant species, and in the advanced stages, to the increased bare ground.

### 2.1 Sedge/Blue Grama/Short-statured Shrubs Plant Community Phase

This plant community evolved under moderate to heavy continuous season-long grazing or from over utilization during extended drought periods. This plant community may also exist adjacent to prairie dog colonies. The potential plant community is made up of approximately 70 percent grasses and grass-like species, 15 percent forbs, and 15 percent shrubs. Dominant grasses typically include blue grama and threadleaf sedge. Grasses of secondary importance include western wheatgrass, hairy grama, sun sedge, needleandthread, and sand dropseed. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, scurfpea, western ragweed, and western yarrow. When compared to the Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase (1.1), blue grama and threadleaf sedge are dominant on this plant community. Cool-season grasses have decreased significantly. This vegetation state is very resistant to change. The herbaceous species present are well adapted to grazing; however, composition can be altered through long-term prescribed grazing. This plant community has significantly less production. The thick sod prevents other species from getting established. Lack of litter and reduced plant vigor causes higher soil temperatures, poor water infiltration rates, and high evapotranspiration which gives blue grama a competitive advantage over most other grasses. Soil erosion will be minimal due to the sod forming habit of blue grama and buffalograss.

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: SD6103

Growth curve name: Black Hills Foot Slopes, cool-season/warm-season codominant.

Growth curve description: Cool-season, warm-season codominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	20	28	21	10	5	3	0	0

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

- 2.1a – Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season) or a combination of disturbances for extended periods of time will lead to the *2.2 Sedge/Plains Pricklypear, Bare Ground Plant Community Phase*.
- R2 – Long-term prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest may eventually shift this plant community over a threshold to the *Reference State (State 1)*.

## 2.2 Sedge/Plains Pricklypear, Bare Ground Plant Community Phase

This plant community is a result of heavy continuous grazing over extended periods of time, or from a combination of prolonged periods of below-average precipitation and other disturbances. This plant community is similar to the 2.1 Sedge/Blue Grama/Short-statured Shrubs Plant Community Phase but the grass cover has been reduced even further, and bare ground has increased. Short-statured shrubs such as plains pricklypear and broom snakeweed also have increased. The total annual production is typically about 900 pounds per acre on an air-dry weight basis. Runoff is increased even further due to the increase in bare ground, and erosion will begin to increase.

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: SD6103

Growth curve name: Black Hills Foot Slopes, cool-season/warm-season codominant.

Growth curve description: Cool-season, warm-season codominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	20	28	21	10	5	3	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 Sedge/Blue Grama/Short-statured Shrubs Plant Community Phase*. Brush management may also be needed to expedite this pathway.

## Early Seral State (State 3)

This state is the result of very heavy, concentrated disturbance such as cropping, concentrated rodent activity, or concentrated livestock areas. This state can also result from invasion by highly competitive weed species such as Canada thistle, hound's tongue, leafy spurge, or knapweeds. In most cases, this phase is dominated by annual and/or pioneer perennial species. Bare ground is also typically much higher than on any other plant community phase.

## 3.1 Annual/Pioneer Perennial Plant Community Phase

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, abandoned cropland, defoliation by rodents, etc.). The potential plant community is made up of approximately 60 to 80 percent grasses and grass-like species, 15 to 35 percent forbs, and 2 to 5 percent shrubs. The dominant grass is often threeawn. Other grasses may include cheatgrass, annual brome grass (Japanese brome and cheatgrass), sedge, blue grama, sand dropseed, bluegrass, and western wheatgrass. The dominant forbs include fetid marigold, sweet clover, western ragweed, cudweed sagewort, and other invader-like species. The dominant shrubs include fringed sagewort, broom snakeweed, and cactus. A wide variety of other early seral plant

species can occupy this site in varying amounts. This plant community is susceptible to invasion of Canada thistle and other nonnative species because of the relatively high percent of bare ground.

Compared to the Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase (1.1), red threeawn, annual brome grasses, and percent of bare ground has increased. Western wheatgrass, needlegrasses, and other cool-season grasses have decreased as have the warm-season species including big bluestem, sideoats grama, and little bluestem. 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 restoration pathways leading to other states are as follows:

- R2 – Long-term prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest may eventually shift this plant community over a threshold to the *Reference State (State 1)*.

## **Ecological Site Interpretations**

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

-- Under Development --

**Bluestem/Prairie Sandreed/Needlegrass Plant Community Phase (1.1):**

**Needleandthread/Prairie Sandreed Plant Community Phases (1.2):**

**Needleandthread/Blue Grama/Annual Brome Plant Community Phase (1.3):**

**Sedge/Blue Grama/Short-Statured Shrubs Plant Community Phase (2.1):**

**Sedge/Plains Pricklypear, Bare Ground Plant Community Phase (2.2):**

**Annual/Pioneer, Non-native Perennial Plant Community Phase (3.1):**

### Animal Preferences (Quarterly – 1,2,3,4<sup>†</sup>)

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
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
hairy 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
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
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
needleandthread	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
porcupine grass	U P U D	N D N U	U P U D	N D N U	N D N U	U P U D	U P U D
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
prairie sandreed	U D D U	U D U U	U D D U	U U D U	U U D U	U D D U	U D D U
sand 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
sand 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
Sandberg bluegrass	N U N N	N D N N	N U N N	N D N N	N D N N	N U N N	N U N N
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
threadleaf 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
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 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
bracted spiderwort	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
catclaw sensitive briar	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
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
dotted gayfeather	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
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
green sagewort	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
hairy goldaster	U U D U	N N N N	U U D U	N N N N	N N N N	U U D U	N N N N
hoary puccoon	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
penstemon	U U U U	U P P U	U U U U	U P P U	U P P U	U U U U	U P P U
prairie coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
purple 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
purple prairie clover	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
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
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
stiff 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
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 wallflower	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
white prairie aster	U U D U	N N N N	U U D U	N N N N	N N N N	U U D U	N N N N
<b>Shrubs</b>							
fringed sagewort	U U U U	U U U U	U U U U	U D D U	U P P D	U U U U	U U U D
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
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
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

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

## Animal Community – Grazing Interpretations

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ES description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community	Average Annual Production (lbs./acre, air-dry)	Stocking Rate* (AUM/acre)
Bluestem/Prairie Sandreed/Needlegrass (1.1)	2,500	0.69
Needleandthread/Prairie Sandreed (1.2)	2,000	0.55
Needleandthread/Blue Grama/Annual Brome (1.3)	1,800	0.49
Sedge/Blue Grama/Short-statured Shrubs (2.1)	1,200	0.33
Sedge/Plains Pricklypear, Bare Ground (2.2)	900	0.25
Annual/Pioneer Perennial (3.1)	800	0.22

\*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to the 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 B. 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 blue grama, buffalograss, bluegrass, and/or smooth brome grass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

## Recreational Uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

## Wood Products

No appreciable wood products are typically present on this site.

## Other Products

Seed harvest of native plant species can provide additional income on this site.

## Supporting Information

### Associated Sites

Loamy (R061XN010SD), Loamy (R061XS010SD), Loamy Overflow (R061XY020SD)

### Similar Sites

(R061XN010SD & R061XS010SD) – Loamy [less big bluestem and prairie sandreed; 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: Stan Boltz, Range Management Specialist (RMS), NRCS; Cynthia Englebert, RMS, Forest Service; George Gamblin, RMS, NRCS; Tate Lantz, RMS, NRCS; Ryan Murray, RMS, NRCS; Cheryl Nielsen, RMS, NRCS; L. Michael Stirling, RMS, NRCS; and Jim Westerman, Soil Scientist, NRCS.

### State Correlation

This site has been correlated with SD and WY in MLRA 61.

### Field Offices/Counties

Belle Fourche, SD   Butte & Lawrence   Sturgis, SD   Meade   Sundance, WY   Crook  
Hot Springs, SD   Fall River   Rapid City, SD   Pennington

### Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 17a – Black Hills Foothills.

### Other References

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (<http://hpccsun.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://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.

USDA, NRCS, Various Published Soil Surveys.

## **Site Description Approval**

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SD, State Range Management Specialist

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Date

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WY, State Range Management Specialist

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Date