

## United States Department of Agriculture Natural Resources Conservation Service

### Ecological Site Description

**Site Type:** Rangeland

**Site Name:** Clayey

**Site ID:** R061XS011SD

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

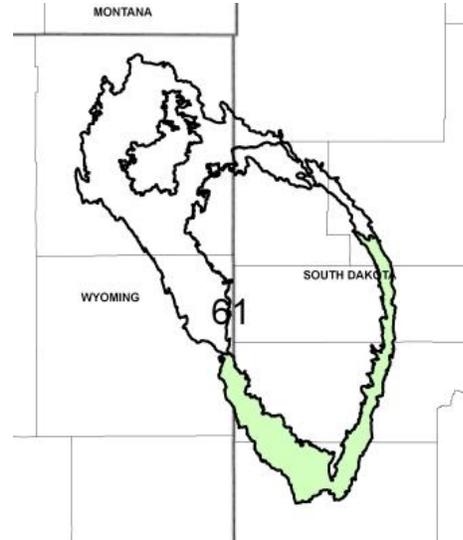
### Physiographic Features

This site occurs on gently to steeply sloping uplands.

**Landform:** hill, hogback, plain

**Aspect:** N/A

	<u>Minimum</u>	<u>Maximum</u>
<b>Elevation (feet):</b>	2,900	4,000
<b>Slope (percent):</b>	5	30
<b>Water Table Depth (inches):</b>	None	None
<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>	High	Very high



### 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 19 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 47°F. January is the coldest month with average temperatures ranging from about 22°F (Hermosa 3 SSW, South Dakota (SD)), to about 25°F (Hot Springs, SD). July is the warmest month with temperatures averaging from about 71°F (Hermosa 3 SSW, SD), 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. 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>	129	148
<b>Freeze-free period (days):</b>	144	168
<b>Mean Annual Precipitation (inches):</b>	14	19

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

	<b>Precip. Min.</b>	<b>Precip. Max</b>	<b>Temp. Min.</b>	<b>Temp. Max.</b>
January	0.32	0.49	8.6	37.9
February	0.36	0.58	12.7	41.9
March	0.77	1.12	20.7	49.9
April	1.77	2.10	31.8	61.0
May	3.17	3.27	41.1	70.7
June	3.20	3.47	51.2	80.9
July	2.34	2.69	57.7	89.3
August	1.84	2.21	55.4	88.0
September	1.25	1.45	45.1	78.4
October	0.98	1.34	33.9	65.5
November	0.42	0.56	23.4	49.6
December	0.33	0.34	12.3	39.9

<b>Climate Stations</b>		<b>Period</b>	
<b>Station ID</b>	<b>Location or Name</b>	<b>From</b>	<b>To</b>
SD3775	Hermosa 3 SSW	1906	2009
SD4007	Hot Springs	1894	2009
SD6947	Rapid City	1916	2009
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 common features of soils in this site are silty clay loam to clay textured subsurface soils, with slopes ranging from about 5 to 30 percent. The soils in this site are well-drained and formed in residuum. The silty clay loam to clay surface layer is three to six inches thick. The soils have a slow to very slow infiltration rate. This site typically 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 nonrestrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 10 percent. 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: residuum  
Parent Material Origin:  
Surface Texture: clay loam, silty clay loam, clay  
Surface Texture Modifier: none  
Subsurface Texture Group: clayey  
Surface Fragments ≤3” (% Cover): 0-10  
Surface Fragments >3” (%Cover): 0-3  
Subsurface Fragments ≤3” (% Volume): 0-30  
Subsurface Fragments >3” (% Volume): 0-2

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	well	well
Permeability Class:	very slow	slow
Depth (inches):	30	50
Electrical Conductivity (mmhos/cm)*:	0	2
Sodium Absorption Ratio*:	0	2
Soil Reaction (1:1 Water)*:	6.1	8.4
Soil Reaction (0.1M CaCl <sub>2</sub> )*:	NA	NA
Available Water Capacity (inches)*:	4	6
Calcium Carbonate Equivalent (percent)*:	0	20

\*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.

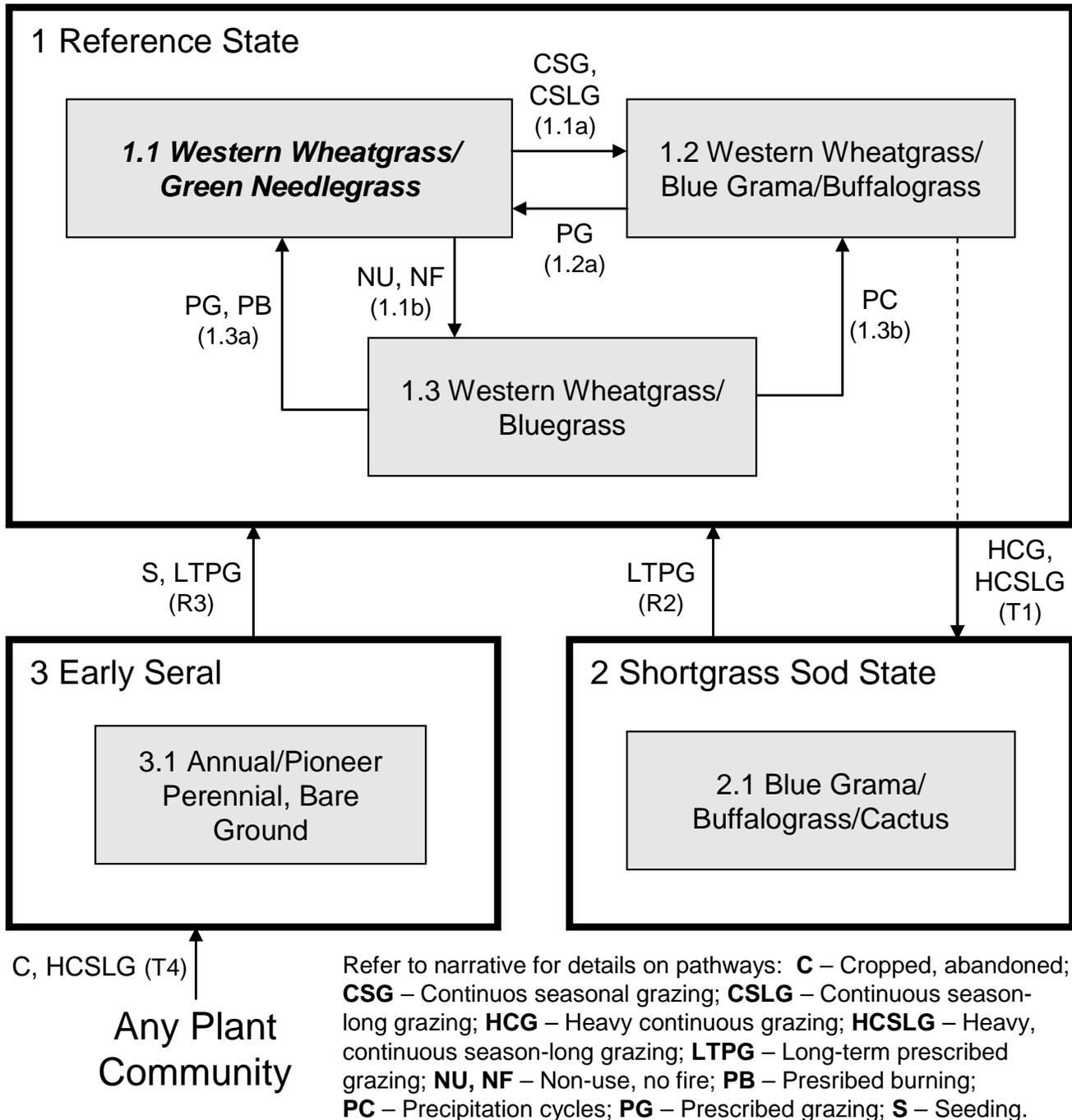
Continuous season-long grazing (during the typical growing season of May through October) and/or heavy continuous grazing (e.g., every spring and/or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes departure from the Western Wheatgrass/Green Needlegrass Plant Community Phase. Bluegrass will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass, big bluestem, sideoats grama, switchgrass, and Indiangrass will decrease in frequency and production. Excessive defoliation can cause threeawn and annuals to increase and dominate the site. Extended periods of nonuse and/or lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as green needlegrass, western wheatgrass, bluegrass, smooth brome grass, and cheatgrass.

Interpretations are primarily based on the Western Wheatgrass/Green 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

thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current knowledge and experience, and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

### Plant Communities and Transitional Pathways



Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	1.1 Western Wheatgrass/ Green Needlegrass		
			Group	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>				1680 - 1890	80 - 90
<b>WHEATGRASS</b>			1	420 - 840	20 - 40
western wheatgrass	Pascopyrum smithii	PASM	1	420 - 840	20 - 40
slender wheatgrass	Elymus trachycaulus	ELTR7	1	0 - 105	0 - 5
<b>NEEDLEGRASS</b>			2	315 - 630	15 - 30
green needlegrass	Nassella viridula	NAVI4	2	315 - 630	15 - 30
needleandthread	Hesperostipa comata ssp. comata	HECOC8	2	0 - 105	0 - 5
<b>TALL WARM-SEASON GRASSES</b>			3	105 - 210	5 - 10
big bluestem	Andropogon gerardii	ANGE	3	42 - 210	2 - 10
tall dropseed	Sporobolus compositus var. compositus	SPCOC2	3	0 - 63	0 - 3
<b>MID WARM-SEASON GRASSES</b>			4	42 - 210	2 - 10
sideoats grama	Bouteloua curtipendula	BOCU	4	42 - 210	2 - 10
little bluestem	Schizachyrium scoparium	SCSC	4	0 - 105	0 - 5
<b>SHORT WARM-SEASON GRASSES</b>			5	42 - 210	2 - 10
blue grama	Bouteloua gracilis	BOGR2	5	21 - 168	1 - 8
buffalograss	Bouteloua dactyloides	BODA2	5	21 - 84	1 - 4
threeawn	Aristida spp.	ARIST	5	0 - 42	0 - 2
<b>OTHER NATIVE GRASSES</b>			6	42 - 105	2 - 5
prairie junegrass	Koeleria macrantha	KOMA	6	21 - 63	1 - 3
Cusick's bluegrass	Poa cusickii	POCU3	6	21 - 42	1 - 2
Sandberg bluegrass	Poa secunda	POSE	6	0 - 21	0 - 1
other grasses		2GRAM	6	0 - 84	0 - 4
<b>GRASS-LIKES</b>			7	21 - 105	1 - 5
needleleaf sedge	Carex duriuscula	CADU6	7	21 - 105	1 - 5
other grass-likes		2GL	7	0 - 63	0 - 3
<b>FORBS</b>			9	105 - 210	5 - 10
American vetch	Vicia americana	VIAM	9	21 - 42	1 - 2
bluebells	Mertensia spp.	MERTE	9	0 - 21	0 - 1
cinquefoil	Potentilla spp.	POTEN	9	0 - 21	0 - 1
cudweed sagewort	Artemisia ludoviciana	ARLU	9	21 - 42	1 - 2
desert biscuitroot	Lomatium foeniculaceum	LOFO	9	21 - 42	1 - 2
dotted gayfeather	Liatris punctata	LIPU	9	21 - 42	1 - 2
erigonum	Eriogonum spp.	ERIOG	9	0 - 21	0 - 1
fleabane	Erigeron spp.	ERIGE2	9	0 - 21	0 - 1
goldenpea	Thermopsis rhombifolia	THRH	9	21 - 42	1 - 2
goldenrod	Solidago spp.	SOLID	9	21 - 42	1 - 2
bellflower	Campanula spp.	CAMPA	9	0 - 21	0 - 1
penstemon	Penstemon spp.	PENST	9	21 - 42	1 - 2
prairie clover	Dalea spp.	DALEA	9	21 - 42	1 - 2
prairie coneflower	Ratibida columnifera	RACO3	9	21 - 42	1 - 2
purple coneflower	Echinacea angustifolia	ECAN2	9	0 - 21	0 - 1
scarlet gaura	Gaura coccinea	GACO5	9	21 - 42	1 - 2
scarlet globemallow	Sphaeralcea coccinea	SPCO	9	21 - 42	1 - 2
scurfpea	Psoraleum spp.	PSORA2	9	21 - 42	1 - 2
western ragweed	Ambrosia psilostachya	AMPS	9	0 - 21	0 - 1
western yarrow	Achillea millefolium var. occidentalis	ACMIO	9	0 - 21	0 - 1
white prairie aster	Symphotrichum falcatum	SYFA	9	21 - 42	1 - 2
wild parsley	Musineon divaricatum	MUDI	9	21 - 42	1 - 2
native forbs		2FN	9	21 - 84	1 - 4
<b>SHRUBS</b>			10	63 - 210	3 - 10
big sagebrush	Artemisia tridentata	ARTR2	10	0 - 63	0 - 3
cactus	Opuntia spp.	OPUNT	10	21 - 42	1 - 2
Douglas rabbitbrush	Chrysothamnus viscidiflorus	CHV18	10	0 - 21	0 - 1
fringed sagewort	Artemisia frigida	ARFR4	10	21 - 63	1 - 3
rose	Rosa spp.	ROSA5	10	21 - 42	1 - 2
rubber rabbitbrush	Ericameria nauseosa	ERNA10	10	0 - 21	0 - 1
winterfat	Krascheninnikovia lanata	KRLA2	10	0 - 42	0 - 2
other shrubs		2SHRUB	10	0 - 42	0 - 2

Annual Production lbs./acre	LOW	RV	HIGH
<b>GRASSES &amp; GRASS-LIKES</b>	1345 -	1806	-2220
<b>FORBS</b>	95 -	158	-240
<b>SHRUBS</b>	60 -	137	-240
<b>TOTAL</b>	1500 -	2100	-2700

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/ Green Needlegrass			1.2 Western Wheatgrass/ Blue Grama/Buffalograss			1.3 Western Wheatgrass/ Bluegrass			2.1 Blue Grama/ Buffalograss/Cactus		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>			1680 - 1890	80 - 90		1360 - 1530	80 - 90		1615 - 1805	85 - 95		840 - 1020	70 - 85
<b>WHEATGRASS</b>		1	420 - 840	20 - 40	1	255 - 595	15 - 35	1	285 - 665	15 - 35	1	12 - 120	1 - 10
western wheatgrass	PASM	1	420 - 840	20 - 40	1	255 - 595	15 - 35	1	285 - 665	15 - 35	1	12 - 120	1 - 10
slender wheatgrass	ELTR7	1	0 - 105	0 - 5				1	0 - 38	0 - 2			
<b>NEEDLEGRASS</b>		2	315 - 630	15 - 30	2	85 - 255	5 - 15	2	190 - 570	10 - 30	2	0 - 60	0 - 5
green needlegrass	NAVI4	2	315 - 630	15 - 30	2	85 - 255	5 - 15	2	190 - 570	10 - 30	2	0 - 60	0 - 5
needleandthread	HECOC8	2	0 - 105	0 - 5	2	0 - 85	0 - 5	2	0 - 57	0 - 3	2	0 - 60	0 - 5
<b>TALL WARM-SEASON GRASSES</b>		3	105 - 210	5 - 10	3	0 - 85	0 - 5	3	0 - 95	0 - 5	3		
big bluestem	ANGE	3	42 - 210	2 - 10	3	0 - 51	0 - 3	3	0 - 95	0 - 5			
tall dropseed	SPCOC2	3	0 - 63	0 - 3	3	0 - 68	0 - 4	3	0 - 57	0 - 3			
<b>MID WARM-SEASON GRASSES</b>		4	42 - 210	2 - 10	4	17 - 136	1 - 8	4	19 - 95	1 - 5	4	0 - 60	0 - 5
sideoats grama	BOCU	4	42 - 210	2 - 10	4	17 - 136	1 - 8	4	19 - 95	1 - 5	4	0 - 60	0 - 5
little bluestem	SCSC	4	0 - 105	0 - 5	4	0 - 34	0 - 2	4	0 - 57	0 - 3			
<b>SHORT WARM-SEASON GRASSES</b>		5	42 - 210	2 - 10	5	170 - 255	10 - 15	5	19 - 95	1 - 5	5	180 - 480	15 - 40
blue grama	BOGR2	5	21 - 168	1 - 8	5	85 - 255	5 - 15	5	19 - 95	1 - 5	5	120 - 420	10 - 35
buffalograss	BODA2	5	21 - 84	1 - 4	5	34 - 136	2 - 8	5	0 - 57	0 - 3	5	60 - 120	5 - 10
threeawn	ARIST	5	0 - 42	0 - 2	5	0 - 68	0 - 4	5	0 - 38	0 - 2	5	12 - 84	1 - 7
<b>OTHER NATIVE GRASSES</b>		6	42 - 105	2 - 5	6	17 - 85	1 - 5	6	19 - 95	1 - 5	6	0 - 36	0 - 3
prairie junegrass	KOMA	6	21 - 63	1 - 3	6	17 - 51	1 - 3	6	19 - 57	1 - 3	6	0 - 24	0 - 2
Cusick's bluegrass	POCU3	6	21 - 42	1 - 2	6	0 - 17	0 - 1	6	0 - 19	0 - 1			
Sandberg bluegrass	POSE	6	0 - 21	0 - 1	6	0 - 17	0 - 1	6	0 - 19	0 - 1	6	0 - 12	0 - 1
other grasses	2GRAM	6	0 - 84	0 - 4	6	0 - 68	0 - 4	6	0 - 57	0 - 3	6	0 - 24	0 - 2
<b>GRASS-LIKES</b>		7	21 - 105	1 - 5	7	34 - 170	2 - 10	7	19 - 95	1 - 5	7	60 - 240	5 - 20
needleleaf sedge	CADU6	7	21 - 105	1 - 5	7	34 - 170	2 - 10	7	19 - 95	1 - 5	7	60 - 240	5 - 20
other grass-likes	2GL	7	0 - 63	0 - 3	7	0 - 85	0 - 5	7	0 - 57	0 - 3	7	0 - 60	0 - 5
<b>NON-NATIVE GRASSES</b>		8			8	85 - 255	5 - 15	8	190 - 475	10 - 25	8	12 - 84	1 - 7
annual bromegrass	BROMU					17 - 102	1 - 6	8	19 - 152	1 - 8	8	12 - 84	1 - 7
bluegrass	POA					34 - 255	2 - 15	8	95 - 380	5 - 20	8	0 - 60	0 - 5
smooth bromegrass	BRIN2					0 - 68	0 - 4	8	0 - 190	0 - 10			
<b>FORBS</b>		9	105 - 210	5 - 10	9	85 - 204	5 - 12	9	95 - 190	5 - 10	9	60 - 180	5 - 15
American vetch	VIAM	9	21 - 42	1 - 2	9	0 - 17	0 - 1	9	0 - 19	0 - 1			
bluebells	MERTE	9	0 - 21	0 - 1									
cinquefoil	POTEN	9	0 - 21	0 - 1	9	0 - 17	0 - 1	9	0 - 19	0 - 1			
cutweed sagewort	ARLU	9	21 - 42	1 - 2	9	17 - 51	1 - 3	9	19 - 57	1 - 3	9	12 - 60	1 - 5
desert biscuitroot	LOFO	9	21 - 42	1 - 2	9	0 - 34	0 - 2	9	0 - 19	0 - 1			
dotted gayfeather	LIPU	9	21 - 42	1 - 2	9	0 - 17	0 - 1	9	0 - 19	0 - 1			
erigonum	ERIOG	9	0 - 21	0 - 1	9	0 - 17	0 - 1				9	0 - 12	0 - 1
fleabane	ERIGE2	9	0 - 21	0 - 1	9	0 - 17	0 - 1	9	0 - 19	0 - 1			
goldenpea	THRH	9	21 - 42	1 - 2	9	0 - 34	0 - 2	9	0 - 19	0 - 1	9	0 - 24	0 - 2
goldenrod	SOLID	9	21 - 42	1 - 2	9	17 - 51	1 - 3	9	19 - 57	1 - 3	9	12 - 60	1 - 5
bellflower	CAMPA	9	0 - 21	0 - 1									
penstemon	PENST	9	21 - 42	1 - 2	9	0 - 17	0 - 1						
prairie clover	DALEA	9	21 - 42	1 - 2	9	0 - 17	0 - 1	9	0 - 19	0 - 1			
prairie coneflower	RACO3	9	21 - 42	1 - 2	9	17 - 34	1 - 2	9	0 - 38	0 - 2	9	0 - 12	0 - 1
purple coneflower	ECAN2	9	0 - 21	0 - 1	9	0 - 17	0 - 1						
scarlet gaura	GACO5	9	21 - 42	1 - 2	9	0 - 17	0 - 1						
scarlet globemallow	SPCO	9	21 - 42	1 - 2	9	17 - 34	1 - 2	9	0 - 19	0 - 1	9	0 - 12	0 - 1
scurfpea	PSORA2	9	21 - 42	1 - 2	9	17 - 34	1 - 2	9	19 - 38	1 - 2	9	12 - 36	1 - 3
western ragweed	AMPS	9	0 - 21	0 - 1	9	0 - 34	0 - 2	9	19 - 38	1 - 2	9	12 - 48	1 - 4
western yarrow	ACMIO	9	0 - 21	0 - 1	9	17 - 34	1 - 2	9	19 - 38	1 - 2	9	12 - 48	1 - 4
white prairie aster	SYFA	9	21 - 42	1 - 2	9	17 - 34	1 - 2	9	19 - 38	1 - 2	9	0 - 24	0 - 2
wild parsley	MUDI	9	21 - 42	1 - 2	9	0 - 34	0 - 2	9	0 - 19	0 - 1			
native forbs	2FN	9	21 - 84	1 - 4	9	17 - 51	1 - 3	9	0 - 57	0 - 3	9	0 - 24	0 - 2
introduced forbs	2FI					17 - 51	1 - 3	9	19 - 95	1 - 5	9	12 - 96	1 - 8
<b>SHRUBS</b>		10	63 - 210	3 - 10	10	85 - 170	5 - 10	10	57 - 95	3 - 5	10	60 - 180	5 - 15
big sagebrush	ARTR2	10	0 - 63	0 - 3	10	0 - 17	0 - 1	10	0 - 19	0 - 1			
cactus	OPUNT	10	21 - 42	1 - 2	10	17 - 51	1 - 3	10	19 - 38	1 - 2	10	24 - 96	2 - 8
Douglas rabbitbrush	CHV18	10	0 - 21	0 - 1	10	0 - 17	0 - 1	10	0 - 19	0 - 1			
fringed sagewort	ARFR4	10	21 - 63	1 - 3	10	17 - 51	1 - 3	10	19 - 38	1 - 2	10	12 - 84	1 - 7
rose	ROSA5	10	21 - 42	1 - 2	10	17 - 34	1 - 2	10	19 - 38	1 - 2	10	0 - 24	0 - 2
rubber rabbitbrush	ERNA10	10	0 - 21	0 - 1	10	0 - 34	0 - 2	10	0 - 19	0 - 1	10	0 - 24	0 - 2
winterfat	KRLA2	10	0 - 42	0 - 2									
other shrubs	2SHRUB	10	0 - 42	0 - 2	10	0 - 51	0 - 3	10	0 - 38	0 - 2	10	0 - 48	0 - 4
<b>Annual Production lbs./acre</b>			LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		
<b>GRASSES &amp; GRASS-LIKES</b>			1345 - 1806 - 2220		1140 - 1428 - 1680		1255 - 1682 - 2085		590 - 960 - 1300				
<b>FORBS</b>			95 - 158 - 240		80 - 145 - 230		90 - 143 - 215		55 - 120 - 200				
<b>SHRUBS</b>			60 - 137 - 240		80 - 128 - 190		55 - 76 - 100		55 - 120 - 200				
<b>TOTAL</b>			1500 - 2100 - 2700		1300 - 1700 - 2100		1400 - 1900 - 2400		700 - 1200 - 1700				

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, with warm-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included occasional 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 condition 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 Western Wheatgrass/Green Needlegrass Plant Community Phase

Interpretations are based primarily on the Western Wheatgrass/Green 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 cool-season grasses. The major grasses include western wheatgrass, green needlegrass, big bluestem, and sideoats grama. Other grass and grass-like species include blue grama, buffalograss, needleleaf sedge, needleandthread, little bluestem, slender wheatgrass, and prairie Junegrass. 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: 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:

- 1.1a – Continuous seasonal grazing which includes grazing at moderate to heavy stocking levels at the same time of year each year, continuous season-long grazing, 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/ Blue Grama/Buffalograss Plant Community Phase*.
- 1.1b – Non-use and no fire for extended periods of time with result in a buildup of plant litter and encourage encroachment of nonnative cool-season species which will lead to the *1.3 Western Wheatgrass/Bluegrass Plant Community Phase*.

### 1.2 Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phase

This plant community evolved under continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year), continuous season-long grazing, or from over utilization during extended drought periods. The potential plant community is made up of approximately 78 percent grasses and grass-like species, 12 percent forbs, and 10 percent shrubs.

Dominant grass and grass-like species include western wheatgrass, blue grama, green needlegrass, needleleaf sedge, sideoats grama, and buffalograss. Grasses of secondary importance include needleandthread, tall dropseed, big bluestem, and prairie Junegrass. Nonnative grasses such as Kentucky bluegrass, cheatgrass, Canada bluegrass, and Japanese brome grass will likely invade and possibly become somewhat prevalent in this plant community phase. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, goldenrod, and western yarrow.

When compared to the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), blue grama and buffalograss have increased. Green needlegrass and the production of mid and tall warm-season grasses have decreased. 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 hydrologic function of the site is beginning to be altered when this plant community phase is reached due to the shallow, compact nature of the roots of species such as blue grama, buffalograss, needleleaf sedge, and Kentucky bluegrass.

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:

- T1 – Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning early in the season) or heavy continuous season-long grazing will convert this plant community to the *2.1 Blue Grama/Buffalograss/Cactus Plant Community Phase* in the *Shortgrass Sod State (State 2)*.
- 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 Western Wheatgrass/Green Needlegrass Plant Community Phase*.

### 1.3 Western Wheatgrass/Bluegrass Plant Community Phase

This plant community phase is a result of extended periods of nonuse and a lack of fire. Excess plant material begins to accumulate which favors the increase and/or encroachment of several nonnative cool-season grass species such as Kentucky bluegrass, Canada bluegrass, cheatgrass, smooth brome grass, and Japanese brome grass. 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, green needlegrass, Kentucky bluegrass, and smooth brome grass. Other grass and grass-like species include big bluestem, blue grama, sideoats grama, needleandthread, slender wheatgrass, and needleleaf sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The nonnative species typically do not increase to the point of dominance; however, their presence tends to reduce the overall diversity of the plant community. As such, this is a somewhat 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: SD6101

Growth curve name: Black Hills Foot Slopes, 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:

- 1.3a – Prescribed grazing (alternating season of use and providing adequate recovery periods) or a combination of prescribed grazing and prescribed burning (typically an early spring burn to reduce the nonnative cool-season species) will shift this community to the *1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase*.
- 1.3b – Precipitation cycles (extended periods of well below average precipitation, usually over two or more years) in the absence of grazing and fire will likely cause a shift to the *1.2 Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phase*. This transition may also occur if grazing at heavy stocking levels or with inadequate recovery periods commenced.

### Shortgrass Sod State (State 2)

This state occurs as a result of heavy stocking levels, inadequate recovery periods between grazing events, or a combination of these disturbances. This state is dominated by warm-season grasses, with cool-season grasses being subdominant. The shallow, compact nature of the roots of the dominant species causes increased runoff and reduced infiltration. In addition, reduced shading due to a lesser amount of foliar cover causes increased soil temperatures and increased evaporation of the surface soil moisture. These conditions combine to cause the site to become droughtier and thus reduce the opportunity for recruitment and/or establishment of the taller statured grasses. This state is relatively stable and resistant to change.

### 2.1 Blue Grama/Buffalograss/Cactus Plant Community Phase

This plant community developed with heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year), heavy continuous season-long 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 grass and grass-like species include blue grama, buffalograss, and needleleaf sedge. Grasses of secondary importance include western wheatgrass, green needlegrass, needleandthread, sideoats grama, threeawn, cheatgrass and/or Japanese brome grass, and Kentucky bluegrass. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, scurfpea, western ragweed, and western yarrow. Dominant shrubs include plains pricklypear, brittle cactus, and fringed sagewort. When compared to the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), blue grama, needleleaf sedge, and buffalograss 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 is less productive than most other phases. The thick sod prevents other species from establishing. 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 cool-season midgrasses.

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: SD6104

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

Growth curve description: Warm-season dominant, cool-season subdominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	7	17	25	25	15	7	1	0	0

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

- R2 – Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the *Reference State (State 1)*. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable.

### Transition from Any Plant Community to the Early Seral State (State 3)

- T4 – Cropping followed by abandonment or heavy, continuous season-long grazing (high stocking levels for a majority of the growing season over extended periods of time) will lead this plant community phase over a threshold to the *3.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase* within the *Early Seral State (State 3)*.

### Early Seral State (State 3)

This state occurs as a result of extreme disturbance that typically removes most of the native species normally present on this site. Disturbance in the form of cropping or severe grazing over several years are the most typical. Occupation by black-tailed prairie dogs may also result in this transition. The dominant species present is highly variable, but the common characteristics include high amounts of bare ground, reduced soil aggregate stability, increased runoff and increased erosion (including increased sediment loads in the runoff). Restoration of the ecological processes will be very difficult.

### 3.1 Annual/Pioneer Perennial, Bare Ground 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 Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), 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:

- R3 – Seeding of improved/selected varieties of native species may lead this plant community phase over a threshold to a plant community resembling a phase of the *Reference State (State 1)*. If seed and/or reproductive propagules of native species are still present in sufficient amounts, long-term prescribed grazing may eventually lead this plant community phase over the threshold and result in a phase of the *Reference State (State 1)*. This restoration pathway will likely take a long period of time, if attainable.

## **Ecological Site Interpretations**

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

-- Under Development --

**Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1):**

**Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phase (1.2):**

**Western Wheatgrass/Bluegrass Plant Community Phase (1.3):**

**Blue Grama/Buffalograss/Cactus Plant Community Phase (2.1):**

**Annual/Pioneer Perennial, Bare Ground 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
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
Cusick's bluegrass	U P U D	D P U D	U P U D	U P N D	U P N D	U P U D	U P U D
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
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
needleleaf 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
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
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
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
threeawn	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
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
bluebells	U D U U	U P P U	U D U U	U P P U	U P P U	U D U U	U P P U
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
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
desert biscuitroot	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
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
erigonum	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
fleabane	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
goldenpea	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 U
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
bellflower	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U D U
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 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
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
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
scarlet globemallow	U U D U	U D D U	U U D U	U D D U	U D D U	U U D U	U D D U
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
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
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
<b>Shrubs</b>							
big sagebrush	U N U U	D U U D	U N U U	P U D P	P P P P	U N U U	D U U U
cactus	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
Douglas rabbitbrush	D U U D	D U U D	D U U D	P U D D	P U D D	D U U D	D U U D
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
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
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
winterfat	P P P P	P P P P	P P P P	P P P P	P P P P	P P P P	P P P P

**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)
Western Wheatgrass/Green Needlegrass (1.1)	2,100	0.58
Western Wheatgrass/Blue Grama/Buffalograss (1.2)	1,700	0.47
Western Wheatgrass/Bluegrass (1.3)	1,900	0.52
Blue Grama/Buffalograss/Cactus (2.1)	1,200	0.33
Annual/Pioneer Perennial, Bare Ground (3.1)	700	0.19

\*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 C and 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 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

Thin Upland (R061XS012SD), Shallow Clayey (R061XS017SD), Loamy Overflow (R061XY020SD)

### Similar Sites

(R061XY020SD) – Loamy Overflow [more big bluestem; higher production]

(R061XS010SD) – Loamy [less green needlegrass; more needleandthread and big bluestem]

### 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

Hot Springs, SD Custer & Fall River Rapid City, SD Pennington Sturgis, SD Meade

### 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

\_\_\_\_\_  
SD, State Range Management Specialist

\_\_\_\_\_  
Date

\_\_\_\_\_  
WY, State Range Management Specialist

\_\_\_\_\_  
Date