

## United States Department of Agriculture Natural Resources Conservation Service

### Ecological Site Description

**Site Type:** Rangeland

**Site Name:** Rocky Hills

**Site ID:** R061XS044SD

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

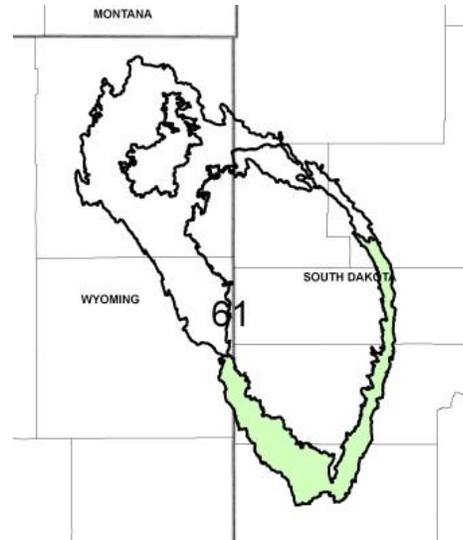
### Physiographic Features

This site occurs on moderately to steeply sloping uplands.

**Landform:** hill, terrace

**Aspect:** N/A

	<u>Minimum</u>	<u>Maximum</u>
<b>Elevation (feet):</b>	2,900	4,000
<b>Slope (percent):</b>	10	45
<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>	Low	Medium



### 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. 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):	129	148
Freeze-free period (days):	144	168
Mean Annual Precipitation (inches):	14	19

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
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

Climate Stations		Period	
Station ID	Location or Name	From	To
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 soils in this site are well to somewhat excessively well-drained and formed in alluvium over residuum or residuum. The gravelly loam to gravelly silt loam surface layer is about four to seven inches thick. The soils have a moderate to moderately rapid infiltration rate. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Subsurface soil layers are restrictive to water movement and root penetration. Erosion potential on this site is very low due to the relatively rapid infiltration and the high amounts of gravel on the surface and throughout the profile.

Low available water capacity caused by the shallow rooting depth strongly influences the soil-water-plant relationship.

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

Parent Material Kind: alluvium, residuum  
Parent Material Origin:  
Surface Texture: loam, silt loam  
Surface Texture Modifier: gravelly  
Subsurface Texture Group: loamy  
Surface Fragments ≤3" (% Cover): 20-30  
Surface Fragments >3" (%Cover): 0-15  
Subsurface Fragments ≤3" (% Volume): 39-55  
Subsurface Fragments >3" (% Volume): 2-35

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	well	somewhat excessively
Permeability Class:	moderate	moderately rapid
Depth (inches):	4	10
Electrical Conductivity (mmhos/cm)*:	0	1
Sodium Absorption Ratio*:	0	0
Soil Reaction (1:1 Water)*:	6.6	8.4
Soil Reaction (0.1M CaCl <sub>2</sub> )*:	NA	NA
Available Water Capacity (inches)*:	1	4
Calcium Carbonate Equivalent (percent)*:	0	8

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

## Plant Communities

### Ecological Dynamics of the Site

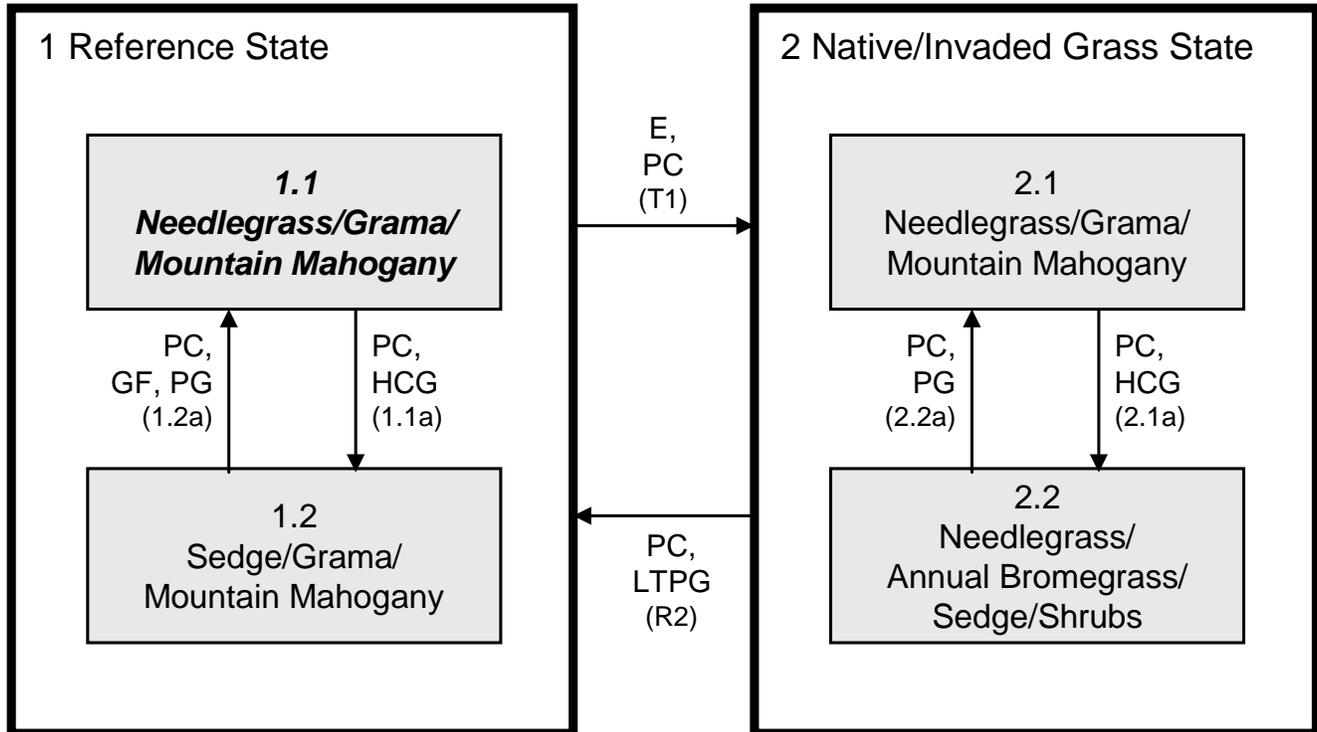
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur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

This ecological site (ES) is naturally resilient, and quite resistant to change. Also, due to the relatively steep slopes and naturally low fertility of the soils, this site generally avoids more intensive disturbances such as farming. However, continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence can cause this site to depart from the Needlegrass/Grama/Mountain Mahogany Plant Community Phase. Sedges and grammas can increase and eventually develop into a sod, while many of the tall and mid-statured grasses will decrease (e.g., little bluestem, green needlegrass, needleandthread, bluebunch wheatgrass, and western wheatgrass). Even with these disturbances, many of the tall and mid-statured grasses will remain in the community at reduced levels, allowing recovery after removal of disturbances.

Interpretations are primarily based on the Needlegrass/Grama/Mountain Mahogany 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: **E** – Encroachment of non-native species; **GF** – Grazing and fire returned to normal disturbance regime levels and frequencies; **HCG** – Heavy continuous grazing (repeated grazing during the growing season without adequate recovery periods; **LTPG** – Long-term prescribed grazing; **PC** – Precipitation cycles; **PG** – Prescribed grazing.

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	1.1 Needlegrass/Grama/ Mountain Mahogany		
			Group	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>				700 - 980	50 - 70
<b>COOL-SEASON BUNCHGRASSES</b>			1	280 - 420	20 - 30
needleandthread	Hesperostipa comata ssp. comata	HECOC8	1	140 - 350	10 - 25
bluebunch wheatgrass	Pseudoroegneria spicata	PSSP6	1	70 - 280	5 - 20
green needlegrass	Nassella viridula	NAV14	1	0 - 70	0 - 5
<b>SHORT WARM-SEASON GRASSES</b>			2	140 - 210	10 - 15
blue grama	Bouteloua gracilis	BOGR2	2	70 - 210	5 - 15
hairy grama	Bouteloua hirsuta	BOH12	2	28 - 140	2 - 10
threeawn	Aristida spp.	ARIST	2	14 - 42	1 - 3
<b>WHEATGRASS</b>			3	70 - 210	5 - 15
western wheatgrass	Pascopyrum smithii	PASM	3	70 - 210	5 - 15
<b>MID WARM-SEASON GRASSES</b>			4	28 - 112	2 - 8
little bluestem	Schizachyrium scoparium	SCSC	4	14 - 84	1 - 6
sideoats grama	Bouteloua curtipendula	BOCU	4	14 - 56	1 - 4
plains muhly	Muhlenbergia cuspidata	MUCU3	4	0 - 42	0 - 3
<b>OTHER NATIVE GRASSES</b>			5	28 - 70	2 - 5
prairie junegrass	Koeleria macrantha	KOMA	5	14 - 42	1 - 3
Sandberg bluegrass	Poa secunda	POSE	5	14 - 28	1 - 2
bottlebrush squirreltail	Elymus elymoides	ELEL5	5	0 - 28	0 - 2
other grasses		2GRAM	5	0 - 28	0 - 2
<b>GRASS-LIKES</b>			6	28 - 98	2 - 7
threadleaf sedge	Carex filifolia	CAFI	6	28 - 98	2 - 7
other grass-likes		2GL	6	0 - 70	0 - 5
<b>FORBS</b>			8	70 - 210	5 - 15
American vetch	Vicia americana	VIAM	8	14 - 28	1 - 2
bush morningglory	Ipomoea leptophylla	IPL	8	0 - 28	0 - 2
cudweed sagewort	Artemisia ludoviciana	ARLU	8	14 - 28	1 - 2
cutleaf ironplant	Machaeranthera pinnatifida	MAPI	8	14 - 28	1 - 2
dotted gayfeather	Liatris punctata	LIPU	8	0 - 14	0 - 1
erigonum	Eriogonum spp.	ERIOG	8	14 - 28	1 - 2
green sagewort	Artemisia campestris	ARCA12	8	0 - 14	0 - 1
hairy goldaster	Heterotheca villosa	HEV14	8	14 - 42	1 - 3
Indian paintbrush	Castilleja spp.	CAST12	8	14 - 28	1 - 2
little larkspur	Delphinium bicolor	DEBI	8	0 - 14	0 - 1
milkvetch	Astragalus spp.	ASTRA	8	14 - 42	1 - 3
purple coneflower	Echinacea angustifolia	ECAN2	8	14 - 42	1 - 3
purple prairie clover	Dalea purpurea	DAPU5	8	14 - 28	1 - 2
pussytoes	Antennaria spp.	ANTEN	8	14 - 28	1 - 2
rayless tansyaster	Machaeranthera grindelioides	MAGR2	8	14 - 28	1 - 2
scarlet gaura	Gaura coccinea	GACO5	8	0 - 14	0 - 1
silverleaf scurfpea	Pediomelum argophyllum	PEAR6	8	0 - 14	0 - 1
slender crazyweed	Oxytropis campestris var. spicata	OXCAS3	8	14 - 28	1 - 2
spiny phlox	Phlox hoodii	PHHO	8	14 - 28	1 - 2
stemless hymenoxys	Tetaneuris acaulis var. acaulis	TEACA2	8	14 - 28	1 - 2
white prairie aster	Symphotrichum falcatum	SYFA	8	14 - 28	1 - 2
white prairie clover	Dalea candida	DACA7	8	0 - 14	0 - 1
native forbs		2FN	8	14 - 42	1 - 3
<b>SHRUBS</b>			9	210 - 490	15 - 35
cactus	Opuntia spp.	OPUNT	9	0 - 14	0 - 1
creeping juniper	Juniperus horizontalis	JUHO2	9	0 - 28	0 - 2
fringed sagewort	Artemisia frigida	ARFR4	9	14 - 42	1 - 3
kinnikinnick	Arctostaphylos uva-ursi	ARUV	9	0 - 28	0 - 2
rose	Rosa spp.	ROSA5	9	14 - 28	1 - 2
skunkbush sumac	Rhus trilobata	RHTR	9	0 - 14	0 - 1
true mountainmahogany	Cercocarpus montanus var. montanus	CEMOM4	9	140 - 420	10 - 30
other shrubs		2SHRUB	9	0 - 28	0 - 2

Annual Production lbs./acre	LOW	RV	HIGH
<b>GRASSES &amp; GRASS-LIKES</b>	550 -	910	1075
<b>FORBS</b>	65 -	140	240
<b>SHRUBS</b>	185 -	350	585
<b>TOTAL</b>	800 -	1400	1900

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 Needlegrass/Grama/ Mountain Mahogany			1.2 Sedge/Grama/ Mountain Mahogany			2.2 Needlegrass/Annual Brome/graminoid/Sedge/Shrubs			
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	
<b>GRASSES &amp; GRASS-LIKES</b>			<b>700 - 980</b>	<b>50 - 70</b>		<b>605 - 825</b>	<b>55 - 75</b>		<b>480 - 640</b>	<b>60 - 80</b>	
<b>NEELEDGRASS</b>		1	<b>280 - 420</b>	<b>20 - 30</b>	1	<b>55 - 165</b>	<b>5 - 15</b>	1	<b>40 - 160</b>	<b>5 - 20</b>	
needleandthread	HECOC8	1	140 - 350	10 - 25	1	55 - 165	5 - 15	1	0 - 160	0 - 20	
bluebunch wheatgrass	PSSP6	1	70 - 280	5 - 20	1	0 - 33	0 - 3	1	0 - 24	0 - 3	
green needlegrass	NAV14	1	0 - 70	0 - 5							
<b>SHORT WARM-SEASON GRASSES</b>		2	<b>140 - 210</b>	<b>10 - 15</b>	2	<b>165 - 275</b>	<b>15 - 25</b>	2	<b>40 - 120</b>	<b>5 - 15</b>	
blue grama	BOGR2	2	70 - 210	5 - 15	2	110 - 275	10 - 25	2	16 - 80	2 - 10	
hairy grama	BOH12	2	28 - 140	2 - 10	2	33 - 165	3 - 15	2	0 - 56	0 - 7	
threeawn	ARIST	2	14 - 42	1 - 3	2	22 - 88	2 - 8	2	16 - 96	2 - 12	
<b>WHEATGRASS</b>		3	<b>70 - 210</b>	<b>5 - 15</b>	3	<b>11 - 110</b>	<b>1 - 10</b>	3	<b>0 - 24</b>	<b>0 - 3</b>	
western wheatgrass	PASM	3	70 - 210	5 - 15	3	11 - 110	1 - 10	3	0 - 24	0 - 3	
<b>MID WARM-SEASON GRASSES</b>		4	<b>28 - 112</b>	<b>2 - 8</b>	4	<b>0 - 55</b>	<b>0 - 5</b>	4			
little bluestem	SCSC	4	14 - 84	1 - 6	4	0 - 44	0 - 4				
sideoats grama	BOCU	4	14 - 56	1 - 4	4	0 - 33	0 - 3				
plains muhly	MUCU3	4	0 - 42	0 - 3							
<b>OTHER NATIVE GRASSES</b>		5	<b>28 - 70</b>	<b>2 - 5</b>	5	<b>11 - 44</b>	<b>1 - 4</b>	5	<b>0 - 32</b>	<b>0 - 4</b>	
prairie junegrass	KOMA	5	14 - 42	1 - 3	5	11 - 33	1 - 3	5	0 - 16	0 - 2	
Sandberg bluegrass	POSE	5	14 - 28	1 - 2	5	0 - 22	0 - 2	5	0 - 16	0 - 2	
bottlebrush squirreltail	ELEL5	5	0 - 28	0 - 2	5	0 - 22	0 - 2	5	0 - 8	0 - 1	
other grasses	2GRAM	5	0 - 28	0 - 2	5	0 - 22	0 - 2	5	0 - 16	0 - 2	
<b>GRASS-LIKES</b>		6	<b>28 - 98</b>	<b>2 - 7</b>	6	<b>165 - 275</b>	<b>15 - 25</b>	6	<b>120 - 200</b>	<b>15 - 25</b>	
threadleaf sedge	CAFI	6	28 - 98	2 - 7	6	110 - 275	10 - 25	6	80 - 200	10 - 25	
other grass-likes	2GL	6	0 - 70	0 - 5	6	0 - 110	0 - 10	6	0 - 80	0 - 10	
<b>NON-NATIVE GRASSES</b>		7			7			7	<b>80 - 160</b>	<b>10 - 20</b>	
bluegrass	POA							7	0 - 24	0 - 3	
cheatgrass	BRTE							7	40 - 160	5 - 20	
Japanese brome	BRAR5							7	40 - 160	5 - 20	
<b>FORBS</b>		8	<b>70 - 210</b>	<b>5 - 15</b>	8	<b>55 - 165</b>	<b>5 - 15</b>	8	<b>40 - 120</b>	<b>5 - 15</b>	
American vetch	VIAM	8	14 - 28	1 - 2	8	0 - 11	0 - 1				
bush morningglory	IPLE	8	0 - 28	0 - 2	8	0 - 11	0 - 1				
cudweed sagewort	ARLU	8	14 - 28	1 - 2	8	11 - 55	1 - 5	8	8 - 56	1 - 7	
cutleaf ironplant	MAPI	8	14 - 28	1 - 2	8	0 - 11	0 - 1	8	0 - 8	0 - 1	
dotted gayfeather	LIPU	8	0 - 14	0 - 1							
erigonum	ERIOG	8	14 - 28	1 - 2	8	0 - 11	0 - 1	8	0 - 8	0 - 1	
green sagewort	ARCA12	8	0 - 14	0 - 1	8	11 - 44	1 - 4	8	8 - 48	1 - 6	
hairy goldaster	HEVI4	8	14 - 42	1 - 3	8	0 - 22	0 - 2				
Indian paintbrush	CAST12	8	14 - 28	1 - 2	8	0 - 11	0 - 1				
little larkspur	DEBI	8	0 - 14	0 - 1	8	0 - 11	0 - 1	8	0 - 8	0 - 1	
milkvetch	ASTRA	8	14 - 42	1 - 3	8	11 - 22	1 - 2	8	8 - 16	1 - 2	
purple coneflower	ECAN2	8	14 - 42	1 - 3	8	0 - 11	0 - 1				
purple prairie clover	DAPU5	8	14 - 28	1 - 2	8	0 - 11	0 - 1				
pussytoes	ANTEN	8	14 - 28	1 - 2	8	0 - 11	0 - 1	8	0 - 8	0 - 1	
rayless tansyaster	MAGR2	8	14 - 28	1 - 2	8	0 - 11	0 - 1	8	0 - 8	0 - 1	
scarlet gaura	GACO5	8	0 - 14	0 - 1							
silverleaf scurfpea	PEAR6	8	0 - 14	0 - 1	8	0 - 11	0 - 1				
slender crazyweed	OXCAS3	8	14 - 28	1 - 2	8	0 - 11	0 - 1	8	0 - 8	0 - 1	
spiny phlox	PHHO	8	14 - 28	1 - 2	8	11 - 22	1 - 2	8	8 - 16	1 - 2	
stemless hymenoxys	TEACA2	8	14 - 28	1 - 2	8	0 - 11	0 - 1				
white prairie aster	SYFA	8	14 - 28	1 - 2	8	11 - 33	1 - 3	8	8 - 24	1 - 3	
white prairie clover	DACA7	8	0 - 14	0 - 1							
native forbs	2FN	8	14 - 42	1 - 3	8	11 - 33	1 - 3	8	0 - 16	0 - 2	
introduced forbs	2FI				8	0 - 44	0 - 4	8	8 - 48	1 - 6	
<b>SHRUBS</b>		9	<b>210 - 490</b>	<b>15 - 35</b>	9	<b>110 - 330</b>	<b>10 - 30</b>	9	<b>80 - 200</b>	<b>10 - 25</b>	
cactus	OPUNT	9	0 - 14	0 - 1	9	11 - 22	1 - 2	9	8 - 32	1 - 4	
creeping juniper	JUHO2	9	0 - 28	0 - 2	9	11 - 33	1 - 3	9	8 - 24	1 - 3	
fringed sagewort	ARFR4	9	14 - 42	1 - 3	9	11 - 55	1 - 5	9	16 - 64	2 - 8	
kinnikinnick	ARUV	9	0 - 28	0 - 2	9	0 - 22	0 - 2	9	0 - 8	0 - 1	
rose	ROSA5	9	14 - 28	1 - 2	9	0 - 11	0 - 1				
skunkbush sumac	RHTR	9	0 - 14	0 - 1	9	0 - 11	0 - 1				
true mountainmahogany	CEMOM4	9	140 - 420	10 - 30	9	55 - 220	5 - 20	9	16 - 120	2 - 15	
other shrubs	2SHRUB	9	0 - 28	0 - 2	9	0 - 22	0 - 2	9	0 - 40	0 - 5	
<b>Annual Production lbs./acre</b>			<b>LOW</b>	<b>RV</b>	<b>HIGH</b>	<b>LOW</b>	<b>RV</b>	<b>HIGH</b>	<b>LOW</b>	<b>RV</b>	<b>HIGH</b>
<b>GRASSES &amp; GRASS-LIKES</b>			550 - 910	-1075		550 - 770	-930		390 - 580	-745	
<b>FORBS</b>			65 - 140	-240		50 - 110	-185		35 - 80	-130	
<b>SHRUBS</b>			185 - 350	-585		100 - 220	-385		75 - 140	-225	
<b>TOTAL</b>			800 - 1400	-1900		700 - 1100	-1500		500 - 800	-1100	

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 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 grazing by large herding ungulates and fluctuations in levels of precipitation. Grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Today, this 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. The dominant tall and mid-grass species can decline and a corresponding increase in short statured species will occur.

### 1.1 Needlegrass/Grama/Mountain Mahogany Plant Community Phase

The Needlegrass/Grama/Mountain Mahogany Plant Community Phase is the plant community upon which interpretations are primarily based. This is also considered to be climax. This plant community can be found on areas that are properly managed with prescribed grazing that allows for proper utilization, changes in season of use and adequate recovery periods following each grazing event. The potential vegetation is about 50 percent grasses or grass-like plants, 15 percent forbs, and 35 percent shrubs. Cool-season grass and grass-like species dominate this plant community, with warm-season grasses being subdominant. The major grass or grass-like species include needleandthread, bluebunch wheatgrass, blue and/or hairy grama, western wheatgrass, threadleaf sedge, and sideoats grama. Other grasses occurring on the site include threeawn, plains muhly, little bluestem, and prairie Junegrass. The significant forbs include dotted gayfeather, hairy goldaster, purple coneflower, prairie clover, and stemless hymenoxys. Significant shrubs are True Mountain mahogany, fringed sagewort, rose, skunkbush sumac, and kinnikinnick.

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. This plant community is stable and protected from excessive erosion.

The following growth curve is an estimate of the monthly percentages of the annual growth of the dormant species expected during the normal 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 – Heavy continuous grazing (grazing the same area for extended portions of the growing season well above recommended stocking rates and without adequate recovery periods), especially when coupled with extended periods of below average precipitation will convert the plant community to the *1.2 Sedge/Grama/Mountain Mahogany Plant Community Phase*.

### 1.2 Sedge/Grama/Mountain Mahogany Plant Community Phase

This plant community can develop from the adverse effects of heavy, continuous grazing in conjunction with extended periods of below average precipitation. Short grass and grass-like species increase to dominate the site and annual production decreases. Lack of litter and short plant heights

result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives blue grama and sedges a competitive advantage over cool and warm-season mid-grasses. The potential vegetation is about 55 percent grasses or grass-like plants, 15 percent forbs, and 30 percent shrubs. Blue grama and threadleaf sedge are the dominant grass/grass-like species. Other grasses may include western wheatgrass, needleandthread, prairie Junegrass, and threeawn. Significant forbs include green sagewort, cutleaf ironplant, silverleaf scurfpea, white prairie aster, milkvetch, and spiny phlox. Common shrubs include true mountain mahogany and fringed sagewort. At times, true mountain mahogany will be severely hedged and may be present at the lower range of the production listed in the plant composition table.

This plant community is relatively stable. The competitive advantage of blue grama and threadleaf sedge prevents other species from establishing. This plant community is less productive than the 1.1 Needlegrass/Grama/Mountain Mahogany Plant Community Phase. Runoff has increased and infiltration has decreased. Soil erosion does not increase substantially.

The following growth curve is an estimate of the monthly percentages of the annual growth of the dormant species expected during the normal 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

Transitional pathways leading to other plant communities are as follows:

- 1.2a – Grazing and fire returned to normal disturbance regime levels and frequencies or prescribed grazing (alternating season of use and providing adequate recovery periods) will convert this plant community to the *1.1 Needlegrass/Grama/Mountain Mahogany Plant Community Phase*.
- T1 – Encroachment of non-native species and fluctuations in precipitation cycles (typically extended periods of below-average precipitation) will cause a shift across a threshold from the *Reference State (State 1)* to the *Native/Invaded Grass State (State 2)*.

## 2.1 Needlegrass/Grama/Mountain Mahogany Plant Community Phase

This plant community is the result of encroachment of nonnative species, often as a result of fluctuations in precipitation cycles, typically extended periods of below average precipitation followed by a mild winter and/or a cool, wet spring. The potential vegetation is about 50 percent grasses or grass-like plants, 15 percent forbs, and 35 percent shrubs. Cool-season grass and grass-like species dominate this plant community, with warm-season grasses being subdominant. The major grass or grass-like species include needleandthread, bluebunch wheatgrass, blue and/or hairy grama, western wheatgrass, threadleaf sedge, and sideoats grama. Other grasses occurring on the site include threeawn, plains muhly, little bluestem, prairie Junegrass, and nonnative species such as cheatgrass and/or Japanese brome grass. The significant forbs include dotted gayfeather, hairy goldaster, purple coneflower, prairie clover, and stemless hymenoxys. Significant shrubs are True Mountain Mahogany, fringed sagewort, rose, skunkbush sumac, and kinnikinnick.

This plant community is very similar to the 1.1 Needlegrass/Grama/Mountain Mahogany Plant Community Phase (see plant composition tables for specific species composition). The main difference is that this plant community will have a minor amount on nonnative grasses, up to about 10 to 15 percent by weight.

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. This plant community is stable and protected from excessive erosion.

The following growth curve is an estimate of the monthly percentages of the annual growth of the dormant species expected during the normal 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 – Heavy continuous grazing (grazing the same area for extended portions of the growing season well above recommended stocking rates and without adequate recovery periods), especially when coupled with extended periods of below average precipitation will convert the plant community to the *2.2 Needlegrass/Annual Bromegrass/Sedge/Shrubs Plant Community Phase*.

## 2.2 Needlegrass/Annual Bromegrass/Sedge/Shrubs Plant Community Phase

This plant community can develop from the adverse effects of heavy, continuous grazing in conjunction with extended periods of below average precipitation. This plant community phase is further impacted by the invasion of nonnative species such as cheatgrass, Japanese bromegrass, and/or Kentucky bluegrass. Needlegrasses will be evident on the aspect of this phase but will be reduced in vigor and production. Annual bromegrass and sedge will make up a bulk of the composition on this plant community phase. The potential vegetation is about 60 percent grasses or grass-like plants, 15 percent forbs, and 25 percent shrubs. The dominant grass and grass-like species will include threadleaf sedge, needleandthread, blue grama, and cheatgrass and/or Japanese bromegrass. Other grasses present include western wheatgrass, threeawn, Kentucky bluegrass, hairy grama, and prairie Junegrass. Significant forbs include cudweed sagewort, green sagewort, milkvetch, white prairie aster, and spiny phlox. Common shrubs include true mountain mahogany, cactus, and fringed sagewort. At times true mountain mahogany will be severely hedged and may be present at the lower range of the production listed in the plant composition table.

Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives sedges and annual bromegrass a competitive advantage over cool- and warm-season midgrasses. This plant community is relatively stable. The competitive advantage of blue grama and threadleaf sedge prevents other species from establishing. This plant community is less productive than the 1.1 Needlegrass/Grama/Mountain Mahogany Plant Community Phase. Runoff has increased and infiltration has decreased. Soil erosion does not increase substantially.

The following growth curve is an estimate of the monthly percentages of the annual growth of the dormant species expected during the normal 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 recovery pathways leading to other plant communities are as follows:

- 2.2a – Prescribed grazing (alternating season of use and providing adequate recovery periods) especially when coupled with a return to more normal precipitation cycles will convert this plant community to the *2.1 Needlegrass/Grama/Mountain Mahogany Plant Community Phase*.
- 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) coupled with a return to more normal precipitation cycles 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.

## **Ecological Site Interpretations**

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

-- Under Development --

**Needlegrass/Grama/Mountain Mahogany Plant Community Phases (1.1 & 2.1):**

**Sedge/Grama/Mountain Mahogany Plant Community Phase (1.2):**

**Needlegrass/Annual Bromegrass/Sedge/Shrubs Plant Community Phase (2.2):**

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
<b>Grasses and Grass-likes</b>							
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
bluebunch wheatgrass	U P D D	P P P P	U P D D	D D D D	D D D D	U P D D	U P D D
bottlebrush squirreltail	U D U U	N D U N	U D U U	N D U N	N D U N	U D U U	U D U U
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
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
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
plains muhly	U U D U	U U D U	U U D U	N N N N	N N N N	U U D U	U U D U
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
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
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
bush morningglory	U D P U	U D D U	U D P U	U D D U	U D D U	U D P U	U D D 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
cutleaf ironplant	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
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
eriogonum	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
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
Indian paintbrush	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
little larkspur	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
milkvetch	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
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
pussytoes	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
rayless tansyaster	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 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
silverleaf 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
slender crazyweed	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
spiny phlox	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
stemless hymenoxys	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
white 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
<b>Shrubs</b>							
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
creeping juniper	U N N U	U N N U	U N N U	U N N U	U N N U	U N N U	U N N U
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
kinnikinnick	N N N N	D U D P	N N N N	D U D P	D U U D	N N N N	D U D P
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
skunkbush sumac	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 U D
true mountainmahogany	D U U U	P U U D	D U U U	P U D P	U N N U	D U U U	P U U D

**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)
Needlegrass/Grama/Mountain Mahogany (1.1 & 2.1)	1,400	0.38
Sedge/Grama/Mountain Mahogany (1.2)	1,100	0.30
Needlegrass/Annual Bromegrass/Sedge/Shrubs (2.2)	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 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

Shallow Loamy (R061XS024SD), Very Shallow (R061XY016SD), Thin Upland (R061XS012SD)

### Similar Sites

(R061XY016SD) – Very Shallow [no true mountain mahogany; slightly 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: 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

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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