

# United States Department of Agriculture Natural Resources Conservation Service

## Ecological Site Description

**Site Type:** Rangeland

**Site Name:** Claypan

**Site ID:** R060AY013SD

**Major Land Resource Area (MLRA):** 60A – Pierre Shale Plains



### Physiographic Features

This site occurs on nearly level or gently sloping uplands.

**Landform:** flat, plain, terrace, depression

**Aspect:** N/A

	<u>Minimum</u>	<u>Maximum</u>
<b>Elevation (feet):</b>	2,500	4,300
<b>Slope (percent):</b>	0	9
<b>Water Table Depth (inches):</b>	48	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	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 13 to 18 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 normal average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 19°F (Moorcroft CAA, Wyoming (WY)), to about 22°F (Belle Fourche, South Dakota (SD)). July is the warmest month with temperatures averaging from about 70°F (Moorcroft CAA, WY), to about 72°F (Belle Fourche, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 51°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 strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and can 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>
<b>Frost-free period (days):</b>	122	129
<b>Freeze-free period (days):</b>	145	152
<b>Mean Annual Precipitation (inches):</b>	13	18

**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	0.43	7.1	34.1
February	0.44	0.57	12.6	40.1
March	0.65	0.94	19.7	46.5
April	1.43	1.72	29.4	60.2
May	2.45	3.19	39.7	70.6
June	2.34	3.38	48.5	80.1
July	1.60	2.78	54.8	88.0
August	1.24	1.76	53.1	87.7
September	1.01	1.50	42.3	77.0
October	0.90	1.11	31.4	64.9
November	0.40	0.61	19.8	47.5
December	0.40	0.48	10.2	38.0

<b>Climate Stations</b>		<b>Period</b>	
<b>Station ID</b>	<b>Location or Name</b>	<b>From</b>	<b>To</b>
SD0236	Ardmore 2 N	1948	1999
SD0559	Belle Fourche	1948	1999
SD1124	Buffalo Gap	1951	1999
WY6395	Moorcroft CAA	1948	1998
WY9207	Upton 13 SW	1949	1998

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

### Influencing Water Features

No significant water features influence this site.

### Representative Soil Features

The loam to silt loam surface textures of this site change abruptly at about 5 to 15 inches below the surface, to an extremely hard clayey Btn horizon having round-topped or “bun shaped” columnar or prismatic structure. These subsoils are high in sodium. Saturated hydraulic conductivity is very slow, available water capacity is low and permeability is slow to very slow. Slopes range from 0 to 9 percent. The soils on this site are deep, somewhat poorly to well-drained and were formed in residuum from siltstone, shale, or in silty and clayey alluvium. The surface layer is 5 to 15 inches thick. The texture of the subsoil ranges from loam to clay. The soils have a slow to very slow infiltration rate. This site should show slight to no evidence of rills or wind scoured areas. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers.

These soils are mainly susceptible to water erosion. More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

**Parent Material Kind:** alluvium  
**Parent Material Origin:** siltstone or shale, unspecified  
**Surface Texture:** silt loam, loam and fine sandy loam  
**Surface Texture Modifier:** none  
**Subsurface Texture Group:** clayey  
**Surface Fragments ≤3” (% Cover):** 0  
**Surface Fragments >3” (%Cover):** 0  
**Subsurface Fragments ≤3” (% Volume):** 5  
**Subsurface Fragments >3” (% Volume):** 0

	<u>Minimum</u>	<u>Maximum</u>
<b>Drainage Class:</b>	moderately well	well
<b>Permeability Class:</b>	slow	very slow
<b>Depth (inches):</b>	20	60
<b>Electrical Conductivity (mmhos/cm)*:</b>	0	16
<b>Sodium Absorption Ratio*:</b>	13	50
<b>Soil Reaction (1:1 Water)*:</b>	5.6	9.6
<b>Soil Reaction (0.1M CaCl2)*:</b>	NA	NA
<b>Available Water Capacity (inches)*:</b>	4	5
<b>Calcium Carbonate Equivalent (percent)*:</b>	0	25

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

## Plant Communities

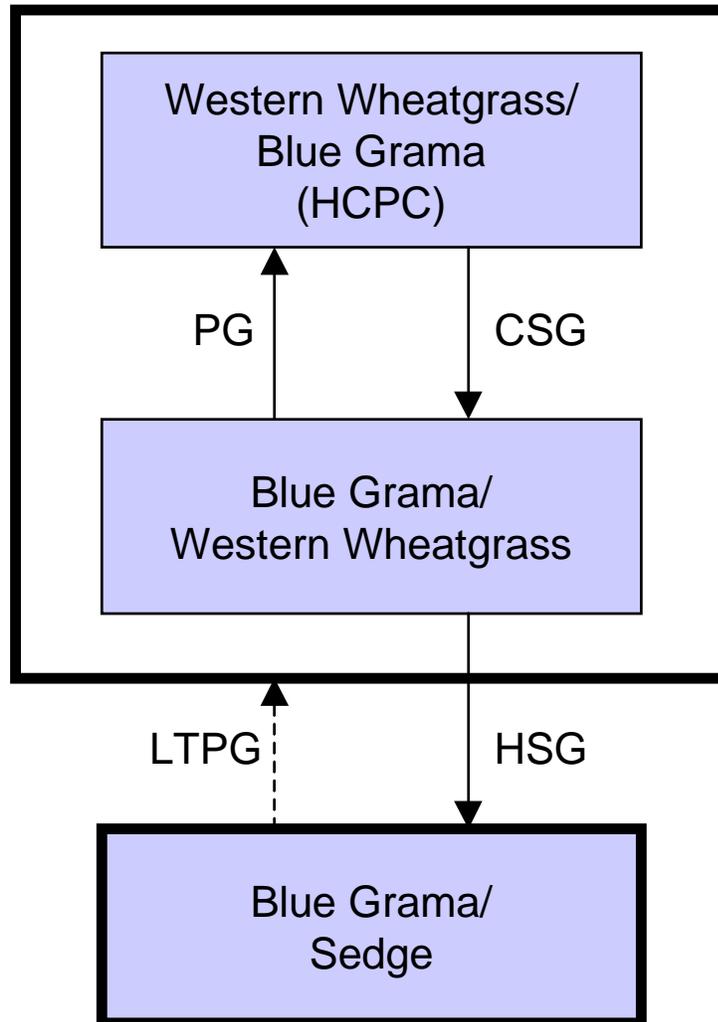
### Ecological Dynamics of the Site:

This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, 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 between communities that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition.

The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). The HCPC has been determined by studying rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

## Plant Communities and Transitional Pathways



**CSG** - continuous seasonal grazing; **HCPC** - Historic Climax Plant Community; **HSG** - heavy seasonal grazing; **LTPG** - long-term prescribed grazing; **PG** - prescribed grazing.

### Plant Community Composition and Group Annual Production

			Western Wheatgrass/Blue Grama (HCPC)		
COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Group	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>				1190 - 1330	85 - 95
<b>RHIZOMATOUS WHEATGRASSES</b>			<b>1</b>	<b>280 - 560</b>	<b>20 - 40</b>
western wheatgrass	Pascopyrum smithii	PASM	1	280 - 560	20 - 40
thickspike wheatgrass	Elymus lanceolatus ssp. lanceolatus	ELLAL	1	70 - 210	5 - 15
Montana wheatgrass	Elymus albicans	ELAL7	1	0 - 210	0 - 15
<b>NEEDLEGRASS</b>			<b>2</b>	<b>70 - 280</b>	<b>5 - 20</b>
green needlegrass	Nassella viridula	NAVI4	2	70 - 210	5 - 15
needleandthread	Hesperostipa comata ssp. comata	HECOC8	2	70 - 210	5 - 15
<b>SHORT WARM-SEASON GRASSES</b>			<b>3</b>	<b>70 - 280</b>	<b>5 - 20</b>
blue grama	Bouteloua gracilis	BOGR2	3	70 - 280	5 - 20
buffalograss	Buchloe dactyloides	BUDA	3	0 - 70	0 - 5
<b>GRASS-LIKES</b>			<b>4</b>	<b>28 - 140</b>	<b>2 - 10</b>
threadleaf sedge	Carex filifolia	CAFI	4	28 - 140	2 - 10
other grass-likes		2GL	4	0 - 70	0 - 5
<b>OTHER NATIVE GRASSES</b>			<b>5</b>	<b>28 - 140</b>	<b>2 - 10</b>
prairie junegrass	Koeleria macrantha	KOMA	5	14 - 42	1 - 3
Sandberg bluegrass	Poa secunda	POSE	5	0 - 28	0 - 2
prairie sandreed	Calamovilfa longifolia	CALO	5	0 - 56	0 - 4
little bluestem	Schizachyrium scoparium	SCSC	5	0 - 56	0 - 4
sideoats grama	Bouteloua curtipendula	BOCU	5	0 - 70	0 - 5
dropseed	Sporobolus spp.	SPORO	5	14 - 42	1 - 3
inland saltgrass	Distichlis spicata	DISP	5	0 - 42	0 - 3
other perennial grasses		2GP	5	0 - 70	0 - 5
<b>FORBS</b>			<b>7</b>	<b>70 - 140</b>	<b>5 - 10</b>
American vetch	Vicia americana	VIAM	7	14 - 28	1 - 2
biscuitroot	Lomatium spp.	LOMAT	7	14 - 28	1 - 2
cudweed sagewort	Artemisia ludoviciana	ARLU	7	14 - 28	1 - 2
deathcamas	Zigadenus spp.	ZIGAD	7	0 - 14	0 - 1
heath aster	Symphyotrichum ericoides	SYER	7	0 - 14	0 - 1
Missouri goldenrod	Solidago missouriensis	SOMI2	7	0 - 14	0 - 1
prairie coneflower	Ratibida columnifera	RACO3	7	14 - 28	1 - 2
rose pussytoes	Antennaria rosea	ANRO2	7	0 - 14	0 - 1
rush skeletonweed	Lygodesmia juncea	LYJU	7	0 - 14	0 - 1
scarlet gaura	Gaura coccinea	GACO5	7	0 - 14	0 - 1
scarlet globemallow	Sphaeralcea coccinea	SPCO	7	14 - 28	1 - 2
scurfpea	Psoralegium spp.	PSORA2	7	14 - 28	1 - 2
wavyleaf thistle	Cirsium undulatum	CIUN	7	0 - 14	0 - 1
western yarrow	Achillea millefolium	ACMI2	7	14 - 28	1 - 2
wild onion	Allium spp.	ALLIU	7	14 - 28	1 - 2
wild parsley	Musineon divaricatum	MUDI	7	14 - 28	1 - 2
woolly Indianwheat	Plantago patagonica	PLPA2	7	0 - 14	0 - 1
other perennial forbs		2FP	7	0 - 28	0 - 2
other annual forbs		2FA	7	0 - 14	0 - 1
<b>SHRUBS</b>			<b>8</b>	<b>14 - 70</b>	<b>1 - 5</b>
big sagebrush	Artemisia tridentata	ARTR2	8	0 - 70	0 - 5
brittle cactus	Opuntia fragilis	OPFR	8	0 - 14	0 - 1
broom snakeweed	Gutierrezia sarothrae	GUSA2	8	0 - 14	0 - 1
fringed sagewort	Artemisia frigida	ARFR4	8	14 - 42	1 - 3
plains pricklypear	Opuntia polyacantha	OPPO	8	14 - 28	1 - 2
rubber rabbitbrush	Ericameria nauseosa	ERNA10	8	0 - 28	0 - 2
silver sagebrush	Artemisia cana	ARCA13	8	0 - 70	0 - 5
other shrubs		2SHRUB	8	0 - 42	0 - 3
<b>CRYPTOGAMS</b>			<b>9</b>	<b>0 - 14</b>	<b>0 - 1</b>
clubmoss	Selaginella densa	SEDE2	9	0 - 14	0 - 1

Annual Production lbs./acre	LOW	RV	HIGH
<b>GRASSES &amp; GRASS-LIKES</b>	825-	1246	-1765
<b>FORBS</b>	65-	105	-145
<b>SHRUBS</b>	10-	42	-75
<b>CRYPTOGAMS</b>	0-	7	-15
<b>TOTAL</b>	900-	1400	-2000

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

### Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	Western Wheatgrass/ Blue Grama (HCPC)			Blue Grama/ Western Wheatgrass			Blue Grama/Sedge		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>			1190 - 1330	85 - 95		750 - 900	75 - 90		488 - 585	75 - 90
<b>RHIZOMATOUS WHEATGRASSES</b>		1	280 - 560	20 - 40	1	150 - 300	15 - 30	1	33 - 98	5 - 15
western wheatgrass	PASM	1	280 - 560	20 - 40	1	150 - 250	15 - 25	1	33 - 98	5 - 15
thickspike wheatgrass	ELLAL	1	70 - 210	5 - 15	1	0 - 150	0 - 15	1	0 - 65	0 - 10
Montana wheatgrass	ELAL7	1	0 - 210	0 - 15	1	0 - 150	0 - 15	1	0 - 65	0 - 10
<b>NEEDLEGRASS</b>		2	70 - 280	5 - 20	2	50 - 100	5 - 10	2	33 - 65	5 - 10
green needlegrass	NAVI4	2	70 - 210	5 - 15	2	0 - 50	0 - 5	2	0 - 7	0 - 1
needleandthread	HECOC8	2	70 - 210	5 - 15	2	50 - 100	5 - 10	2	33 - 65	5 - 10
<b>SHORT WARM-SEASON GRASSES</b>		3	70 - 280	5 - 20	3	150 - 350	15 - 35	3	195 - 325	30 - 50
blue grama	BOGR2	3	70 - 280	5 - 20	3	150 - 300	15 - 30	3	195 - 293	30 - 45
buffalograss	BUDA	3	0 - 70	0 - 5	3	50 - 100	5 - 10	3	33 - 98	5 - 15
<b>GRASS-LIKES</b>		4	28 - 140	2 - 10	4	100 - 200	10 - 20	4	98 - 163	15 - 25
threadleaf sedge	CAFI	4	28 - 140	2 - 10	4	100 - 200	10 - 20	4	98 - 163	15 - 25
other grass-likes	ZGL	4	0 - 70	0 - 5	4	0 - 50	0 - 5	4	0 - 33	0 - 5
<b>OTHER NATIVE GRASSES</b>		5	28 - 140	2 - 10	5	50 - 200	5 - 20	5	33 - 130	5 - 20
prairie junegrass	KOMA	5	14 - 42	1 - 3	5	30 - 70	3 - 7	5	20 - 46	3 - 7
Sandberg bluegrass	POSE	5	0 - 28	0 - 2	5	0 - 50	0 - 5	5	0 - 33	0 - 5
prairie sandreed	CALO	5	0 - 56	0 - 4	5	0 - 50	0 - 5	5	0 - 7	0 - 1
little bluestem	SCSC	5	0 - 56	0 - 4	5	0 - 30	0 - 3	5	0 - 7	0 - 1
sideoats grama	BOCU	5	0 - 70	0 - 5	5	0 - 30	0 - 3	5	0 - 13	0 - 2
dropseed	SPORO	5	14 - 42	1 - 3	5	0 - 50	0 - 5	5	0 - 33	0 - 5
inland saltgrass	DISP	5	0 - 42	0 - 3	5	50 - 100	5 - 10	5	33 - 98	5 - 15
threeawn	ARIST				5	0 - 50	0 - 5	5	13 - 65	2 - 10
other perennial grasses	ZGP	5	0 - 70	0 - 5		0 - 50	0 - 5	5	0 - 33	0 - 5
<b>NON-NATIVE GRASSES</b>		6			6	0 - 50	0 - 5	6	0 - 33	0 - 5
cheatgrass	BRTE				6	0 - 50	0 - 5	6	0 - 33	0 - 5
Kentucky bluegrass	POPR				6	0 - 50	0 - 5	6	0 - 33	0 - 5
#N/A	#N/A									
<b>FORBS</b>		7	70 - 140	5 - 10	7	50 - 100	5 - 10	7	33 - 65	5 - 10
American vetch	VIAM	7	14 - 28	1 - 2	7	10 - 20	1 - 2	7	7 - 13	1 - 2
biscuitroot	LOMAT	7	14 - 28	1 - 2	7	10 - 20	1 - 2	7	7 - 13	1 - 2
cudweed sagewort	ARLU	7	14 - 28	1 - 2	7	20 - 50	2 - 5	7	13 - 33	2 - 5
curlycup gumweed	GRSQ							7	0 - 20	0 - 3
deathcamas	ZIGAD	7	0 - 14	0 - 1	7	0 - 10	0 - 1	7	0 - 7	0 - 1
heath aster	SYER	7	0 - 14	0 - 1	7	10 - 30	1 - 3	7	7 - 20	1 - 3
Missouri goldenrod	SOMI2	7	0 - 14	0 - 1	7	0 - 10	0 - 1	7	0 - 7	0 - 1
prairie coneflower	RACO3	7	14 - 28	1 - 2	7	10 - 20	1 - 2	7	7 - 13	1 - 2
rose pussytoes	ANRO2	7	0 - 14	0 - 1	7	0 - 10	0 - 1	7	0 - 7	0 - 1
rush skeletonweed	LYJU	7	0 - 14	0 - 1	7	0 - 10	0 - 1	7	0 - 7	0 - 1
scarlet gaura	GACO5	7	0 - 14	0 - 1	7	0 - 10	0 - 1			
scarlet globemallow	SPCO	7	14 - 28	1 - 2	7	10 - 30	1 - 3	7	7 - 20	1 - 3
scurfpea	PSORA2	7	14 - 28	1 - 2	7	10 - 30	1 - 3	7	7 - 20	1 - 3
wavyleaf thistle	CIUN	7	0 - 14	0 - 1	7	0 - 10	0 - 1	7	0 - 7	0 - 1
western yarrow	ACMI2	7	14 - 28	1 - 2	7	20 - 50	2 - 5	7	13 - 33	2 - 5
wild onion	ALLIU	7	14 - 28	1 - 2	7	10 - 20	1 - 2	7	7 - 13	1 - 2
wild parsley	MUDI	7	14 - 28	1 - 2	7	10 - 20	1 - 2	7	7 - 13	1 - 2
woolly Indianwheat	PLPA2	7	0 - 14	0 - 1	7	0 - 20	0 - 2	7	0 - 13	0 - 2
other perennial forbs	ZFP	7	0 - 28	0 - 2	7	0 - 20	0 - 2	7	0 - 13	0 - 2
other annual forbs	ZFA	7	0 - 14	0 - 1	7	0 - 10	0 - 1	7	0 - 7	0 - 1
#N/A	#N/A									
<b>SHRUBS</b>		8	14 - 70	1 - 5	8	50 - 150	5 - 15	8	33 - 98	5 - 15
big sagebrush	ARTR2	8	0 - 70	0 - 5	8	0 - 70	0 - 7	8	0 - 46	0 - 7
brittle cactus	OPFR	8	0 - 14	0 - 1	8	0 - 30	0 - 3	8	0 - 20	0 - 3
broom snakeweed	GUSA2	8	0 - 14	0 - 1	8	10 - 50	1 - 5	8	7 - 33	1 - 5
fringed sagewort	ARFR4	8	14 - 42	1 - 3	8	20 - 50	2 - 5	8	13 - 33	2 - 5
plains pricklypear	OPPO	8	14 - 28	1 - 2	8	20 - 100	2 - 10	8	33 - 65	5 - 10
rubber rabbitbrush	ERNA10	8	0 - 28	0 - 2	8	0 - 10	0 - 1	8	0 - 7	0 - 1
silver sagebrush	ARCA13	8	0 - 70	0 - 5	8	0 - 70	0 - 7	8	0 - 46	0 - 7
other shrubs	ZSHRUB	8	0 - 42	0 - 3	8	0 - 30	0 - 3	8	0 - 20	0 - 3
<b>CRYPTOGAMS</b>		9	0 - 14	0 - 1	9	0 - 30	0 - 3	9	0 - 26	0 - 4
clubmoss	SEDE2	9	0 - 14	0 - 1	9	0 - 30	0 - 3	9	0 - 26	0 - 4
<b>Annual Production lbs./acre</b>			LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH	
<b>GRASSES &amp; GRASS-LIKES</b>			825 - 1253 - 1780		510 - 825 - 1340		340 - 536 - 830			
<b>FORBS</b>			65 - 105 - 145		45 - 75 - 105		30 - 49 - 70			
<b>SHRUBS</b>			10 - 42 - 75		45 - 100 - 155		30 - 65 - 100			
<b>TOTAL</b>			900 - 1400 - 2000		600 - 1000 - 1600		400 - 650 - 1000			

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 and Vegetation State Narratives

Following are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more information is collected, some of these plant community descriptions may be revised or removed, and new ones added. None of these plant communities should necessarily be thought of as “Desired Plant Communities (DPCs).” According to the USDA Natural Resources Conservation Service (NRCS) National Range and Pasture Handbook, DPCs will be determined by the decision makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

### Western Wheatgrass/Blue Grama Plant Community

The plant community upon which interpretations are primarily based is the Western Wheatgrass/Blue Grama Plant Community. This is also considered to be the HCPC. 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 85-95 percent grasses or grass-like plants, 5-10 percent forbs, and 1-5 percent shrubs. Cool-season grasses dominate the site, but warm-season short grasses are also prevalent. Western wheatgrass is the dominant grass. Other grasses and grass-like plants occurring include blue grama, needleandthread, prairie sandreed, little bluestem, and green needlegrass. Significant forbs include silverleaf scurpea, biscuitroot, wild parsley, cudweed sagewort, and heath aster. Silver and/or big sagebrush are the principal shrubs. Other shrubs include fringed sagewort, rubber rabbitbrush, and cactus.

This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is low. The diversity in plant species allows for high drought tolerance. Good vegetative cover coupled with moderate available water capacity can provide a favorable soil-water-plant relationship.

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: SD6002

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

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

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

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Continuous seasonal grazing (annual, early spring) will convert the plant community to the *Blue Grama/Western Wheatgrass Plant Community*.

### Blue Grama/Western Wheatgrass Plant Community

This plant community develops under continuous seasonal grazing (i.e., grazing an area during the same season every year) or from over utilization during extended drought periods. The potential vegetation is about 75-90 percent grasses or grass-like plants, 5-10 percent forbs, and 5-15 percent

shrubs. A fairly even mix of cool-season grasses and short warm-season grasses dominates this plant community.

Blue grama and western wheatgrass are the dominant grasses. Other grasses and grass-like plants occurring include needleandthread, buffalograss, prairie Junegrass, threadleaf sedge, dropseed, sandberg bluegrass, and inland saltgrass. Significant forbs include silverleaf scurfpea, cudweed sagewort, western yarrow, and heath aster. Silver and/or big sagebrush are the principal shrubs and increase slightly when compared to the HCPC. Other shrubs include fringed sagewort, rubber rabbitbrush, broom snakeweed, and cactus. This plant community is somewhat resistant to change. The dominant herbaceous species are very adapted to grazing; however, the mid-grass species and the more palatable forbs will decrease in the community through continuous seasonal grazing. If the herbaceous component is intact, it tends to be resilient if disturbance is not long-term. Because of the sod forming habit of the shortgrass species, water infiltration decreases and runoff increases when compared to the HCPC.

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: SD6003

Growth curve name: Pierre Shale Plains, 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

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Heavy continuous grazing will convert this plant community to the *Blue Grama/Sedge Plant Community*.
- Prescribed grazing will shift this plant community back to the *Western Wheatgrass/Blue Grama Plant Community (HCPC)*.

### **Blue Grama/Sedge Plant Community**

This plant community results from heavy, continuous grazing, and/or annual, early spring seasonal grazing. Short grasses and forbs increase to dominate the plant community and annual production decreases dramatically. Lack of litter and short plant heights result in high soil temperatures, high soil water loss and poor water infiltration rates, which gives blue grama a competitive advantage over cool-season mid-grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Blue grama and sedge are the prominent species with the balance being lesser amounts of buffalograss, inland saltgrass, prairie Junegrass, western wheatgrass, and needleandthread. Forbs and shrubs such as fringed sagewort, cudweed sagewort, heath aster, broom snakeweed, cactus, and western yarrow may also be present. This plant community is relatively stable. The thick sod and competitive advantage prevents other species from establishing. This plant community is less productive than the HCPC. Runoff increases and infiltration will decrease. 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: SD6003

Growth curve name: Pierre Shale Plains, 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

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Long-term prescribed grazing that includes changing season of use and allowing adequate recovery periods to enhance cool-season grasses can slowly shift this plant community back towards the *Blue Grama/Western Wheatgrass Plant Community*.

## Ecological Site Interpretations

### Animal Community – Wildlife Interpretations

The MLRA 60A lies within the drier portion of the northern mixed-grass prairie ecosystem where sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this area consisted of diverse grass/shrub land habitats interspersed with varying densities of depressional, in-stream wetlands, and woody riparian corridors. These habitats provided critical life cycle components for many of its users. Many species of grassland birds, small mammals, reptiles, amphibians, and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as, several small mammal and insect species, were the primary consumers linking the grassland resources to predators such as the wolf, mountain lion, and grizzly bear, as well as, smaller carnivores such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant; however, the species remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox were associated with prairie dog complexes.

Historically, the northern mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbance factors either singly or in combination. Following European settlement, livestock grazing, cropland conversion, elimination of fire, energy development, and other anthropogenic factors influenced species composition and abundance. Introduced and invasive species further impacted plant and animal communities. Bison was a historical keystone species but have been extirpated as a free-ranging herbivore. The loss of the bison and prairie dog, and fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development has reduced habitat quality for area-sensitive species.

Within MLRA 60A, the Claypan Ecological Site provides upland grassland cover with an associated forb and shrub component. It was typically part of an expansive grassland landscape that included combinations of Shallow Loamy, Shallow Clayey, Thin Loamy, Thin Claypan, Sandy, Sandy Claypan, Loamy, and Clayey Ecological Sites. This site provided habitat for species requiring unfragmented grassland. Important habitat features and components found commonly or exclusively on this site may include greater sage-grouse and sharp-tailed grouse leks; upland nesting habitat for grassland birds, forbs and insects for brood habitat; and a forage source for small and large herbivores. Many grassland and shrub steppe nesting bird populations are declining. Extirpated species include free-ranging American bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Claypan Ecological Site remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, coyotes, and a variety of reptiles, amphibians, and insects. Invasive species such as annual brome grasses and crested wheatgrass have impacted the biological integrity of the site for some grassland birds such as greater sage-

grouse. Changes in historic fire regime and domestic grazing have impacted the forb/shrub/grass percentages. Greater sage-grouse and Brewer's sparrow benefit when big sagebrush increases.

**Western Wheatgrass/Blue Grama (HCPC):** The predominance of grasses plus high diversity of forbs and shrubs in this community favors grazers and mixed-feeders, such as deer and pronghorn. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. The complex plant structural diversity provides habitat for a wide array of migratory and resident birds. Brewer's and grasshopper sparrow, lark bunting, western meadowlark, greater sage-grouse, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides. This site provides important breeding habitat for the loggerhead shrike. This site provides excellent nesting and brood rearing habitat for greater sage-grouse and sharp-tailed grouse. Diverse prey populations are available for grassland raptors such as northern harrier, ferruginous hawk, Swainson's hawk, golden eagle, and prairie falcon.

The diversity of grasses, forbs, and shrubs provide high nutrition levels for small and large herbivores including voles, mice, thirteen-lined ground squirrels, white-tailed jackrabbit, and deer. This ecological site provides excellent wintering habitat for pronghorn. The moderate stature of this plant community provides suitable thermal, protective, and escape cover for small herbivores and grassland birds. Predators utilizing this plant community including coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for spade foot toad, Great Plains toad, bull snake, and western rattlesnake.

**Blue Grama/Western Wheatgrass and Blue Grama/Sedge:** Resulting from continued continuous seasonal grazing or from over utilization during extended drought periods, blue grama and western wheatgrass will dominate. The forb diversity and abundance has remained relatively unchanged. Shrub abundance increases significantly, especially cacti.

A shift to shorter plant structure will favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, and swift fox. Species such as horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit may be present, while species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail will increase. This plant community may provide areas suitable for lek site development.

The short stature of this plant community limits suitable thermal, protective, and escape cover. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel.

Resulting from heavy continuous grazing and/or annual, early spring seasonal grazing, sedge will become dominate over western wheatgrass. However, this shift does not substantially change the wildlife community. Short grass nesting songbirds use may increase.

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
<b>Grasses &amp; Grass-likes</b>							
blue grama	U D P D	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 P D	U U P D	U U D U	N U D U	N U D U	U U D U	U U D U
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
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
inland saltgrass	N U U N	N N N N	N U U N	N N N N	N N N N	N U U N	N U U N
little bluestem	U D D U	U U D U	U D D U	N D N N	N D N N	U D D U	U D D U
Montana 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
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
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
Sandberg bluegrass	U U U U	U D U U	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 D	U P D D	U D P U	U P D U	U P D U	U D P U	U D P U
thickspike wheatgrass	U D D U	U D U U	U D D U	N D N N	N D N N	U D D U	U D D U
threadleaf sedge	U P U D	U P U 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 D	U D U U	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
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
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
deathcamas	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
heath aster	U U D U	U U P U	U U D U	U U P U	U U P U	U U D U	U U P U
Missouri 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
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
rose 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
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
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
wavyleaf thistle	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
western yarrow	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
wild onion	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
wild parsley	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
woolly Indianwheat	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
<b>Shrubs</b>							
big sagebrush	U U 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
brittle 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
broom snakeweed	N N N N	U U U U	N N N N	U U U U	U U U U	N N N N	U U U U
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
plains pricklypear	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
rubber rabbitbrush	N N N N	D U U D	N N N N	D U U D	U P P U	N N N N	D U U U
silver sagebrush	D U U D	D U U D	D U U D	P D D P	P P P P	D U U D	D U U D
<b>Cryptogams</b>							
clubmoss	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

**N** = not used; **U** = undesirable; **D** = desirable; **P** = preferred; **T** = toxic

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

## Animal Community – Grazing Interpretations

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this Ecological Site 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/Blue Grama (HCPC)	1,400	0.40 – 0.50
Blue Grama/Western Wheatgrass	1,000	0.25 – 0.35
Blue Grama/Sedge	650	0.15 – 0.25

\*Based on 790 lbs./acre (air-dry weight) per Animal Unit Month (AUM) and on 25 percent harvest efficiency (refer to USDA 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 herbage production on this site. Soils on this site are in hydrologic groups 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 higher infiltration and lower runoff. An exception would be where short grasses form a dense sod and dominate the site. Normally, 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 opportunities for upland game species. The wide varieties of plants which bloom from spring until fall have an esthetic value that appeals to many visitors.

## Wood Products

## Other Products

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

## Supporting Information

### Associated Sites

(060AY011SD) – Clayey 13-16” P.Z. (060AY015SD) – Saline Lowland  
(060AY040SD) – Clayey 16-18” P.Z. (060AY015SD) – Thin Claypan  
(060AY018SD) – Dense Clay

### Similar Sites

(060AY011SD & 060AY040SD) – Clayey 13-16” P.Z. & Clayey 16-18” P.Z.  
[more green needlegrass; higher production]  
(060AY015SD) – Thin Claypan  
[lower production; greater dominance of short grass and salt tolerant species]

### 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 description include: Stan Boltz, Range Management Specialist (RMS), NRCS; Cheryl Nielsen, RMS, NRCS; Rick Peterson, RMS, NRCS; and Mike Stirling, RMS, NRCS.

<u>Data Source</u>	<u>Number of Records</u>	<u>Sample Period</u>	<u>State</u>	<u>County</u>
SCS-RANGE-417	2	1981	SD	Meade, Pennington

### State Correlation

This site has been correlated between Montana (MT), Nebraska (NE), SD, and WY in MLRA 60A.

### Field Offices

Belle Fourche, SD	Custer, SD	Hot Springs, SD	Pine Ridge, SD	Sundance, WY
Broadus, MT	Ekalaka, MT	Lusk, WY	Rapid City, SD	Wall, SD
Buffalo, SD	Faith, SD	Martin, SD	Rushville, NE	
Chadron, NE	Gillette, WY	Newcastle, WY	Sturgis, SD	

### Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 43e – Sagebrush Steppe, 43g – Semi-arid Pierre Shale Plains, and 43k – Dense Clay Prairie.

### Other References

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (<http://www.hprcc.unl.edu/>)

USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (<http://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://soils.usda.gov/technical/nasis>)

USDA, NRCS, 2002. National Soil Survey Handbook, Title 430-VI. (<http://soils.usda.gov/technical/handbook/>)

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

\_\_\_\_\_  
MT, State Range Management Specialist      Date

\_\_\_\_\_  
NE, State Range Management Specialist      Date

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

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