

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Thin Claypan

Site ID: R058DY015SD

Major Land Resource Area (MLRA): 58D – Northern Rolling High Plains, Eastern Part



Physiographic Features

This site occurs on nearly level to gently undulating or rolling uplands.

Landform: terrace, hill

Aspect: N/A

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	2,300	4,000
Slope (percent):	0	12
Water Table Depth (inches):	None	None
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):	None	None
Frequency:	None	None
Duration:	None	None
Runoff Class:	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 to the east. Annual precipitation ranges from 14 to 16 inches. Most of the rainfall occurs as frontal storms early in the growing season. Some high-intensity, convective thunderstorms occur in the summer. Precipitation in winter occurs as snow. 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. Outbreaks of cold air from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. 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 44°F. January is the coldest month with average temperatures ranging from about 12°F (Marmarth, North Dakota (ND)), to about 20°F (Baker, Montana (MT)). July is the warmest month with temperatures averaging from about 70°F (Marmarth, ND), to about 76°F (Baker, MT). The range of normal average monthly temperatures between the coldest and warmest months is about 55°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>
Frost-free period (days):	110	123
Freeze-free period (days):	130	140
Mean Annual Precipitation (inches):	14	16

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.39	0.46	-0.8	31.0
February	0.34	0.54	5.7	34.4
March	0.73	0.82	15.7	43.8
April	1.23	1.73	29.1	60.4
May	2.29	2.71	39.6	67.7
June	2.79	3.00	49.3	76.7
July	1.91	2.10	54.5	90.7
August	1.35	1.46	50.2	88.2
September	1.16	1.25	40.1	76.5
October	0.85	1.07	28.9	59.5
November	0.43	0.57	15.9	44.6
December	0.31	0.50	6.1	33.7

Climate Stations		Period	
Station ID	Location or Name	From	To
MT0412	Baker	1948	2005
SD1294	Camp Crook	1896	2006
SD3560	Harding 3 SE	1951	2006
ND5575	Marmarth	1950	2006
SD7062	Redig 11 NE	1948	2006

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 soils in this site are well drained and formed in residuum from sandstone and shale. The fine sandy loam surface layer is one to four inches thick. The extremely hard clayey Btn horizon has round-topped or “bun shaped” columnar or a subangular blocky structure. These Btn horizons are high in sodium. The soils have a slow infiltration rate and very slow saturated hydraulic conductivity. Wet surface compaction can occur with heavy traffic. 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. The soil surface is stable and intact. These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about nine percent. Access

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

Parent Material Kind: residuum
Parent Material Origin: sandstone and shale
Surface Texture: fine sandy loam
Surface Texture Modifier: none
Subsurface Texture Group: loamy
Surface Fragments ≤3” (% Cover): 0-5
Surface Fragments >3” (%Cover): 0-10
Subsurface Fragments ≤3” (% Volume): 0-5
Subsurface Fragments >3” (% Volume): 0

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	well	well
Permeability Class:	very slow	very slow
Depth to Bedrock (inches):	20	40
Electrical Conductivity (mmhos/cm)*:	0	8
Sodium Absorption Ratio*:	0	20
Soil Reaction (1:1 Water)*:	6.1	9
Soil Reaction (0.1M CaCl2)*:	NA	NA
Available Water Capacity (inches)*:	4	5
Calcium Carbonate Equivalent (percent)*:	0	15

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

Plant Communities

Ecological Dynamics of the Site

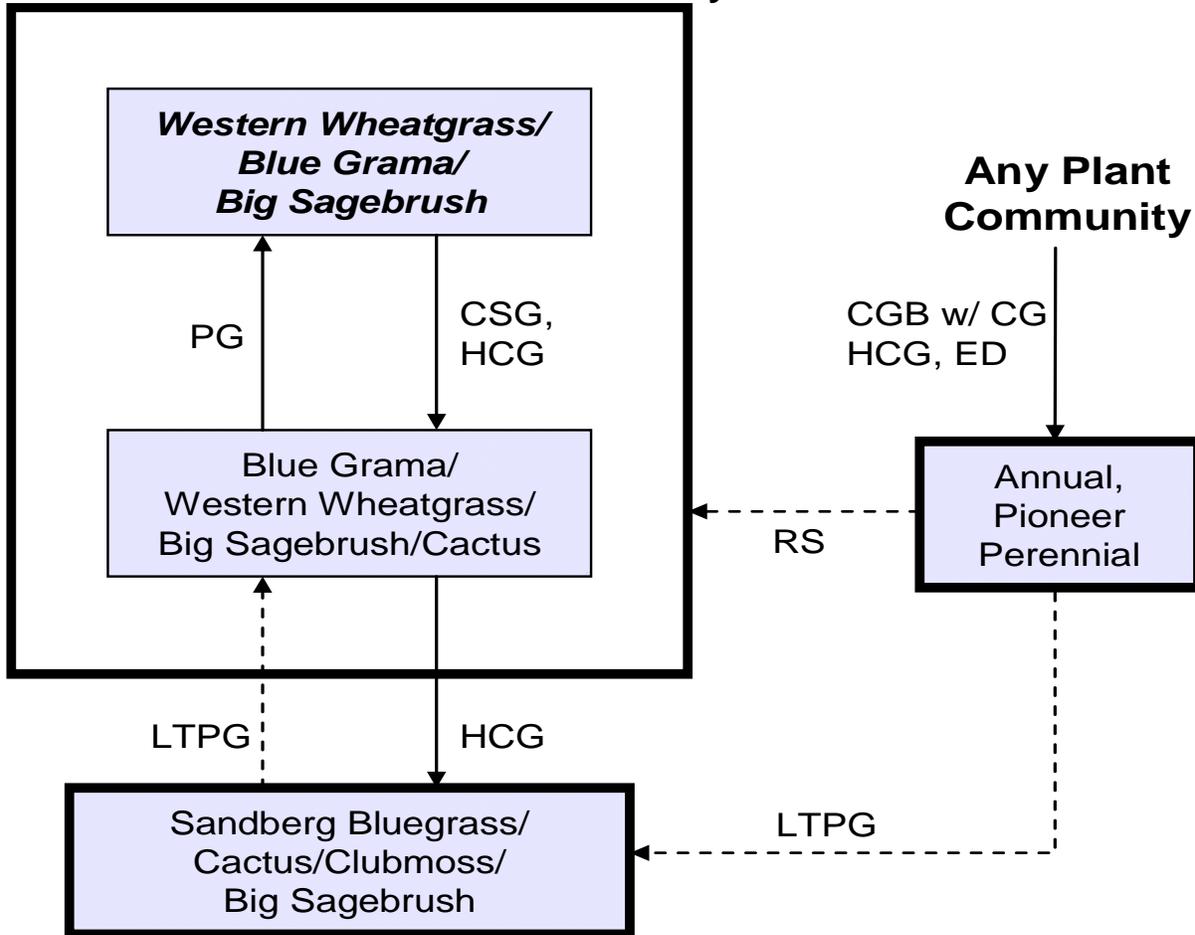
This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts 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.

In association with this site are areas of slick spots that usually have considerably more bare ground, and are typically dominated by cactus. Slick spots are bare ground areas that are affected by high sodium concentrations. The soil factors are the dominant influence and grazing management is not necessarily the primary influence of these areas. These areas can occur as a complex with this site, sometimes being difficult to differentiate between the two.

The plant community upon which the interpretations are primarily based is the Western Wheatgrass/Blue Grama/Big Sagebrush Plant Community. This plant community 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



- CGB w/ CG** – Cropped go-back with continuous grazing;
- CSG** – Continuous seasonal grazing;
- ED** – Excessive defoliation;
- HCG** – Heavy continuous grazing;
- LTPG** – Long-term prescribed grazing;
- PG** – Prescribed grazing;
- RS** – Range seeding.

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Western Wheatgrass/Blue Grama/ Big Sagebrush		
			Group	lbs./acre	% Comp
GRASSES & GRASS-LIKES				600 - 680	75 - 85
RHIZOMATOUS COOL-SEASON GRASSES			1	200 - 320	25 - 40
western wheatgrass	Pascopyrum smithii	PASM	1	160 - 280	20 - 35
Montana wheatgrass	Elymus albicans	ELAL7	1	16 - 80	2 - 10
thickspike wheatgrass	Elymus lanceolatus ssp. lanceolatus	ELLAL	1	16 - 80	2 - 10
SHORT WARM-SEASON GRASSES			2	120 - 240	15 - 30
blue grama	Bouteloua gracilis	BOGR2	2	80 - 200	10 - 25
buffalograss	Bouteloua dactyloides	BODA2	2	0 - 40	0 - 5
inland saltgrass	Distichlis spicata	DISP	2	0 - 40	0 - 5
SHORT COOL-SEASON GRASSES			3	40 - 120	5 - 15
needleandthread	Hesperostipa comata ssp. comata	HECOC8	3	8 - 40	1 - 5
prairie junegrass	Koeleria macrantha	KOMA	3	8 - 40	1 - 5
Sandberg bluegrass	Poa secunda	POSE	3	8 - 40	1 - 5
plains reedgrass	Calamagrostis montanensis	CAMO	3	0 - 24	0 - 3
MID COOL-SEASON GRASSES			4	8 - 40	1 - 5
green needlegrass	Nassella viridula	NAV14	4	0 - 24	0 - 3
slender wheatgrass	Elymus trachycaulus	ELTR7	4	0 - 40	0 - 5
WARM-SEASON BUNCHGRASSES			5	0 - 16	0 - 2
sand dropseed	Sporobolus cryptandrus	SPCR	5	0 - 16	0 - 2
tumblegrass	Schedonnardus paniculatus	SCPA	5	0 - 8	0 - 1
MISCELLANEOUS GRASSES			6	0 - 24	0 - 3
other perennial grasses		2GP	6	0 - 24	0 - 3
other annual grasses		2GA	6	0 - 8	0 - 1
GRASS-LIKES			7	8 - 40	1 - 5
needleleaf sedge	Carex duriuscula	CADU6	7	8 - 40	1 - 5
threadleaf sedge	Carex filifolia	CAFI	7	8 - 40	1 - 5
other grass-like		2GL	7	0 - 8	0 - 1
FORBS			9	40 - 80	5 - 10
American vetch	Vicia americana	VIAM	9	0 - 8	0 - 1
bighead pygmycudweed	Evax prolifera	EVPR	9	8 - 16	1 - 2
cinquefoil	Potentilla spp.	POTEN	9	0 - 8	0 - 1
cudweed sagewort	Artemisia ludoviciana	ARLU	9	8 - 16	1 - 2
green sagewort	Artemisia dracunculoides	ARDR4	9	0 - 8	0 - 1
heath aster	Symphotrichum ericoides	SYER	9	8 - 16	1 - 2
Lambert crazyweed	Oxytropis lambertii	OXLA3	9	0 - 8	0 - 1
littlepod false flax	Camelina microcarpa	CAMI2	9	8 - 16	1 - 2
Nuttall's violet	Viola nuttallii	VINU2	9	0 - 8	0 - 1
pussytoes	Antennaria spp.	ANTEN	9	8 - 16	1 - 2
rush skeletonweed	Lygodesmia juncea	LYJU	9	8 - 16	1 - 2
scarlet globemallow	Sphaeralcea coccinea	SPCO	9	8 - 24	1 - 3
scurfpea	Psoraleum spp.	PSORA2	9	8 - 16	1 - 2
spiny phlox	Phlox hoodii	PHHO	9	8 - 16	1 - 2
wavyleaf thistle	Cirsium undulatum	CIUN	9	8 - 16	1 - 2
western yarrow	Achillea millefolium var. occidentalis	ACMIO	9	8 - 16	1 - 2
wild onion	Allium spp.	ALLIU	9	0 - 8	0 - 1
wild parsley	Musineon divaricatum	MUDI	9	0 - 16	0 - 2
woolly Indianwheat	Plantago patagonica	PLPA2	9	8 - 16	1 - 2
native forbs		2FN	9	8 - 24	1 - 3
SHRUBS			10	40 - 120	5 - 15
big sagebrush	Artemisia tridentata	ARTR2	10	16 - 80	2 - 10
brittle cactus	Opuntia fragilis	OPFR	10	8 - 16	1 - 2
broom snakeweed	Gutierrezia sarothrae	GUSA2	10	0 - 8	0 - 1
fringed sagewort	Artemisia frigida	ARFR4	10	8 - 24	1 - 3
plains pricklypear	Opuntia polyacantha	OPPO	10	0 - 16	0 - 2
purple pincushion	Escobaria vivipara var. vivipara	ESVIV	10	0 - 8	0 - 1
saltbush	Atriplex spp.	ATRIP	10	8 - 16	1 - 2
silver sagebrush	Artemisia cana	ARCA13	10	8 - 24	1 - 3
winterfat	Krascheninnikovia lanata	KRLA2	10	8 - 24	1 - 3
other shrubs		2SHRUB	10	0 - 24	0 - 3
CRYPTOGAMS			11	0 - 8	0 - 1
clubmoss	Selaginella densa	SEDE2	11	0 - 8	0 - 1

Annual Production lbs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	430 -	656	-880
FORBS	35 -	80	-85
SHRUBS	35 -	80	-125
CRYPTOGAMS	0 -	4	-10
TOTAL	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.

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	Western Wheatgrass/Blue Grama/ Big Sagebrush			Blue Grama/Western Wheatgrass/ Big Sagebrush/Cactus			Sandburg Bluegrass/Cactus/ Clubmoss/Big Sagebrush		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES			600 - 680	75 - 85		360 - 510	60 - 85		180 - 280	45 - 70
RHIZOMATOUS COOL-SEASON		1	200 - 320	25 - 40	1	30 - 90	5 - 15	1	4 - 40	1 - 10
western wheatgrass	PASM	1	160 - 280	20 - 35	1	30 - 90	5 - 15	1	4 - 40	1 - 10
Montana wheatgrass	ELAL7	1	16 - 80	2 - 10	1	0 - 30	0 - 5	1	0 - 8	0 - 2
thickspike wheatgrass	ELLAL	1	16 - 80	2 - 10	1	0 - 30	0 - 5	1	0 - 8	0 - 2
SHORT WARM-SEASON GRASSES		2	120 - 240	15 - 30	2	120 - 210	20 - 35	2	20 - 60	5 - 15
blue grama	BOGR2	2	80 - 200	10 - 25	2	90 - 210	15 - 35	2	20 - 60	5 - 15
buffalograss	BODA2	2	0 - 40	0 - 5	2	0 - 30	0 - 5	2	0 - 20	0 - 5
inland saltgrass	DISP	2	0 - 40	0 - 5	2	6 - 48	1 - 8	2	8 - 40	2 - 10
SHORT COOL-SEASON GRASSES		3	40 - 120	5 - 15	3	30 - 60	5 - 10	3	20 - 72	5 - 18
needleandthread	HECOC8	3	8 - 40	1 - 5	3	0 - 30	0 - 5	3	0 - 8	0 - 2
prairie junegrass	KOMA	3	8 - 40	1 - 5	3	6 - 30	1 - 5	3	4 - 12	1 - 3
Sandberg bluegrass	POSE	3	8 - 40	1 - 5	3	12 - 48	2 - 8	3	8 - 60	2 - 15
plains reedgrass	CAMO	3	0 - 24	0 - 3						
MID COOL-SEASON GRASSES		4	8 - 40	1 - 5	4			4		
green needlegrass	NAVI4	4	0 - 24	0 - 3						
slender wheatgrass	ELTR7	4	0 - 40	0 - 5						
WARM-SEASON BUNCHGRASSES		5	0 - 16	0 - 2	5	0 - 30	0 - 5	5	0 - 20	0 - 5
sand dropseed	SPCR	5	0 - 16	0 - 2	5	0 - 30	0 - 5	5	0 - 20	0 - 5
tumblegrass	SCPA	5	0 - 8	0 - 1	5	0 - 18	0 - 3	5	0 - 12	0 - 3
MISCELLANEOUS GRASSES		6	0 - 24	0 - 3	6	0 - 18	0 - 3	6	0 - 12	0 - 3
other perennial grasses	2GP	6	0 - 24	0 - 3	6	0 - 18	0 - 3	6	0 - 12	0 - 3
other annual grasses	2GA	6	0 - 8	0 - 1	6	0 - 18	0 - 3	6	0 - 12	0 - 3
GRASS-LIKES		7	8 - 40	1 - 5	7	12 - 60	2 - 10	7	8 - 60	2 - 15
needleleaf sedge	CADU6	7	8 - 40	1 - 5	7	6 - 48	1 - 8	7	4 - 40	1 - 10
threadleaf sedge	CAFI	7	8 - 40	1 - 5	7	6 - 48	1 - 8	7	4 - 40	1 - 10
other grass-likes	2GL	7	0 - 8	0 - 1	7	0 - 6	0 - 1	7	0 - 4	0 - 1
NON-NATIVE GRASSES		8			8	6 - 30	1 - 5	8	4 - 32	1 - 8
cheatgrass	BRTE	8			8	6 - 30	1 - 5	8	4 - 32	1 - 8
FORBS		9	40 - 80	5 - 10	9	30 - 60	5 - 10	9	20 - 60	5 - 15
American vetch	VIAM	9	0 - 8	0 - 1						
bighead pygmycudweed	EVPR	9	8 - 16	1 - 2	9	6 - 18	1 - 3	9	4 - 20	1 - 5
cinquefoil	POTEN	9	0 - 8	0 - 1						
cudweed sagewort	ARLU	9	8 - 16	1 - 2	9	6 - 18	1 - 3	9	4 - 20	1 - 5
curlycup gumweed	GRSQ	9			9	0 - 18	0 - 3	9	0 - 24	0 - 6
green sagewort	ARCA12	9	0 - 8	0 - 1	9	0 - 12	0 - 2	9	0 - 16	0 - 4
heath aster	SYER	9	8 - 16	1 - 2	9	6 - 18	1 - 3	9	4 - 20	1 - 5
Lambert crazyweed	OXLA3	9	0 - 8	0 - 1	9	0 - 12	0 - 2	9	0 - 8	0 - 2
littlepod false flax	CAMI2	9	8 - 16	1 - 2	9	6 - 12	1 - 2	9	4 - 8	1 - 2
Nuttall's violet	VINU2	9	0 - 8	0 - 1	9	0 - 12	0 - 2	9	0 - 8	0 - 2
pussytoes	ANTEN	9	8 - 16	1 - 2	9	6 - 18	1 - 3	9	4 - 20	1 - 5
rush skeletonweed	LYJU	9	8 - 16	1 - 2	9	6 - 24	1 - 4	9	4 - 20	1 - 5
scarlet globemallow	SPCO	9	8 - 24	1 - 3	9	6 - 30	1 - 5	9	4 - 32	1 - 8
scurpea	PSORA2	9	8 - 16	1 - 2	9	6 - 24	1 - 4	9	4 - 28	1 - 7
spiny phlox	PHHO	9	8 - 16	1 - 2	9	6 - 18	1 - 3	9	4 - 20	1 - 5
sweetclover	MELIL				9	0 - 30	0 - 5	9	0 - 36	0 - 9
wayleaf thistle	CIUN	9	8 - 16	1 - 2	9	6 - 18	1 - 3	9	4 - 20	1 - 5
western salsify	TRDU				9	0 - 18	0 - 3	9	0 - 20	0 - 5
western yarrow	ACMIO	9	8 - 16	1 - 2	9	6 - 18	1 - 3	9	4 - 20	1 - 5
wild onion	ALLIU	9	0 - 8	0 - 1	9	0 - 12	0 - 2	9	0 - 16	0 - 4
wild parsley	MUDI	9	0 - 16	0 - 2	9	0 - 12	0 - 2	9	0 - 8	0 - 2
woolly Indianwheat	PLPA2	9	8 - 16	1 - 2	9	6 - 18	1 - 3	9	4 - 20	1 - 5
native forbs	2FN	9	8 - 24	1 - 3	9	6 - 18	1 - 3	9	4 - 12	1 - 3
introduced forbs	2FI				9	6 - 30	1 - 5	9	4 - 20	1 - 5
SHRUBS		10	40 - 120	5 - 15	10	60 - 180	10 - 30	10	80 - 140	20 - 35
big sagebrush	ARTR2	10	16 - 80	2 - 10	10	12 - 90	2 - 15	10	8 - 60	2 - 15
brittle cactus	OPFR	10	8 - 16	1 - 2	10	6 - 48	1 - 8	10	20 - 60	5 - 15
broom snakeweed	GUSA2	10	0 - 8	0 - 1	10	0 - 30	0 - 5	10	0 - 32	0 - 8
fringed sagewort	ARFR4	10	8 - 24	1 - 3	10	12 - 30	2 - 5	10	8 - 32	2 - 8
plains pricklypear	OPPO	10	0 - 16	0 - 2	10	12 - 48	2 - 8	10	20 - 60	5 - 15
purple pincushion	ESVIV	10	0 - 8	0 - 1	10	0 - 6	0 - 1	10	0 - 4	0 - 1
saltbush	ATRIP	10	0 - 16	0 - 2						
silver sagebrush	ARCA13	10	8 - 24	1 - 3	10	6 - 30	1 - 5	10	4 - 20	1 - 5
winterfat	KRLA2	10	8 - 24	1 - 3						
other shrubs	2SHRUB	10	0 - 24	0 - 3	10	0 - 18	0 - 3	10	0 - 12	0 - 3
CRYPTOGAMS		11	0 - 8	0 - 1	11	0 - 12	0 - 2	11	0 - 24	0 - 6
clubmoss	SEDE2	11	0 - 8	0 - 1	11	0 - 12	0 - 2	11	0 - 24	0 - 6
Annual Production lbs./acre			LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH	
GRASSES & GRASS-LIKES			430 - 656 - 880		220 - 429 - 635		160 - 238 - 365			
FORBS			35 - 60 - 85		25 - 45 - 65		15 - 40 - 65			
SHRUBS			35 - 80 - 125		55 - 120 - 185		75 - 110 - 145			
CRYPTOGAMS			0 - 4 - 10		0 - 6 - 15		0 - 12 - 25			
TOTAL			500 - 800 - 1100		300 - 600 - 900		250 - 400 - 600			

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

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” (DPC). According to the United States Department of Agriculture (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/Big Sagebrush Plant Community

The plant community upon which interpretations are primarily based is the Western Wheatgrass/Blue Grama/Big Sagebrush Plant Community. This is also considered to be climax. This plant community can be found on areas having a history of proper grazing management, including adequate recovery periods between grazing events. The potential vegetation is about 75-85 percent grasses or grass-like plants, 5-10 percent forbs, and 5-15 percent shrubs. The rhizomatous wheatgrasses dominate the plant community, while blue grama is also prevalent. Other grasses and grass-like plants occurring on the site include needleandthread, buffalograss, Sandberg bluegrass, and sedges. Significant forbs include scarlet globemallow, cudweed sagewort, and heath aster. Shrubs occurring in this plant community include cactus, big sagebrush, saltbush, and fringed sagewort.

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 at the site’s potential. Plant litter is properly distributed with some movement offsite and natural plant mortality is low. Low to moderate available water capacity coupled with high accumulations of sodium and slow permeability strongly influences the soil-water-plant relationships.

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: SD5802

Growth curve name: Northern Rolling High Plains, cool-season dominant/warm-season subdominant.

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

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

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

- Continuous seasonal grazing and/or heavy continuous grazing during the active growing period of cool-season plants will lead to the *Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus Plant Community*.

Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus Plant Community

This plant community can develop from the adverse effects of heavy continuous grazing and/or annual, continuous seasonal grazing. While western wheatgrass remains a subdominant, short grasses, big sagebrush, and cactus increase to become prominent and annual production decreases. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and

high evaporation, 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, western wheatgrass, and cactus are the dominant species, while big sagebrush can also express itself strongly. Other grasses and grass-like occurring include sedge, buffalograss, inland saltgrass, needleandthread, prairie Junegrass, and annual grasses. Forbs such as brome snakeweed, cudweed sagewort, heath aster, and western yarrow may also be present. Some nonnative species will begin to invade this plant community including salsify, sweetclover, and annual bromes. There is usually more than 15 percent bare ground.

This plant community is somewhat resilient. Runoff increases and infiltration will decrease. Soil erosion will be minimal due to the sod forming habit of blue grama. While less productive, a return to longer recovery periods and alternating season of use can easily result in a shift back to the Western Wheatgrass/Blue Grama/Big Sagebrush Plant Community.

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: SD5803

Growth curve name: Northern Rolling High 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

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

- Prescribed grazing, which allows for adequate plant recovery periods will move this plant community to the *Western Wheatgrass/Blue Grama/Big Sagebrush Plant Community*.
- With heavy continuous grazing this plant community will move towards the *Sandberg Bluegrass/Cactus/Clubmoss/Big Sagebrush Plant Community*.

Sandberg Bluegrass/Cactus/Clubmoss/Big Sagebrush Plant Community

This plant community can develop from the adverse effects of heavy continuous grazing. Short grasses and cactus increase to dominate the site and annual production continues to decrease. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives Sandberg bluegrass, cactus, and club moss a competitive advantage over cool-season midgrasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur.

Sandberg bluegrass and cactus are the dominant species. Other grasses and grass-like occurring include blue grama, western wheatgrass, sedge, buffalograss, inland saltgrass, needleandthread, prairie Junegrass, and annual grasses. Forbs such as brome snakeweed, cudweed sagewort, heath aster, and western yarrow may also be present. Nonnative species will continue to invade this plant community including salsify, sweetclover, and annual bromes. There is usually more than 25 percent bare ground.

This plant community is quite resilient. Reduced infiltration prevents the cool-season midgrasses from increasing and competing with the cactus and clubmoss. This plant community is less productive than the Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus Plant Community. Runoff

continues to increase and infiltration will decrease. Soil erosion will begin to be more evident and water flow patterns may be fairly obvious.

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: SD5803

Growth curve name: Northern Rolling High 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

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

- Long-term prescribed grazing and favorable climatic conditions, which allow for adequate plant recovery periods, may cause a shift to the *Blue Grama/Western Wheatgrass/Big Sagebrush/Cactus Plant Community*.
- Heavy, continuous season-long grazing, or frequent and severe defoliation (e.g., rodents) will move this plant community to the *Annual, Pioneer Perennial Plant Community*.

Annual, Pioneer Perennial Plant Community

This state can be reached whenever severe disturbance (i.e., abandoned farmland, severe continuous season-long grazing, frequent and severe defoliation by rodents, etc.) occurs. During the early successional stages, the species that mainly dominate are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes being dominated by threeawn, cheatgrass, crested wheatgrass, buffalograss, broom snakeweed, sweetclover, and nonnative thistles. Other plants that commonly occur on the site include wheatgrass, deathcamas, prickly lettuce, maretail, kochia, squirreltail, foxtail, and sunflowers.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

Major Land Resource Area 58D lies within the drier portion of 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, instream 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 black-tailed 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 were historically a keystone

species but have been extirpated as a free-ranging herbivore. The loss of the bison, reduction of prairie dog colonies, and loss of 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 58D, the Thin Claypan Ecological Site (ES) 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, Claypan, Sandy Claypan, Sandy, Loamy, and Clayey ESs. 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 bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Thin Claypan ES remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, the coyote, and a variety of reptiles, amphibians, and insects. Invasive species such as annual brome grasses and crested wheat 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/Big Sagebrush: 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 ES provides important breeding habitat for loggerhead shrikes. 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 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 ES 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 include the 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/Big Sagebrush/Cactus: This plant community develops after an extended period of continuous grazing by herbivores and exclusion of fire favoring nonnative grasses such as annual brome grasses, and the expansion of woody species such as big sage brush. The predominance of grasses, but a lower diversity of forbs and an increase in shrub cover, favors grazers and mixed-feeders, such as deer, pronghorn, and small mammals. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. Chestnut-collared longspur, Brewer's and vesper sparrow, long-billed curlew, and western

meadowlark, are common and benefit from the structure and composition this plant community provides. The big sagebrush benefits pronghorn, as well as, greater sage-grouse nesting and brood rearing. Prey populations are likely less dense but may be more available for grassland raptors such as ferruginous hawk, Swainson's hawk, and northern harrier. This plant community provides lower quality habitat for Great Plains toad, bull snake, and western rattlesnake.

Sandberg Bluegrass/Cactus/Clubmoss/Big Sagebrush: Resulting from continued heavy continuous season-long grazing without adequate recovery periods between grazing events or no fire for extended periods of time, Sandberg bluegrass will dominate. The forb diversity has decreased with cactus and clubmoss dominating the site. Annual bromegrasses are prevalent on this site. Increase in bare ground will increase soil erosion and sediment loads to associated water features. A shift to shorter plant structure will favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, mountain plover, and swift fox.

Sharp-tailed grouse and greater sage-grouse may use this site for leks due to the shorter height structure. The plant community provides high early season nutrition value for white-tailed jackrabbit, deer, and pronghorn. The short stature of this plant community limits suitable thermal, protective, and escape cover. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel.

Extreme impairment of the ecological processes impacts offsite aquatic habitats through excessive runoff, nutrient, and sediment loads. Elevated surface temperatures resulting from reduced cover and litter will eliminate habitat for most amphibian species, as well as, most grassland birds and mammals. The earlier green-up associated with Sandberg bluegrass will provide foraging habitat for upland sandpipers. The short stature provides habitat for killdeer, horned lark, white-tailed jackrabbit, and thirteen-lined ground squirrel species. Prey populations are limited due to increased vulnerability to raptor and mammalian predation.

Annual/Pioneer Plant Community: This plant community develops under severe disturbance and/or excessive defoliation. This can result from heavy livestock, prairie dog concentration, or cropping abandonment (go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Plant species from adjacent ESs may become minor components of this plant community. The community is susceptible to invasion of annual bromegrasses, crested wheatgrass, and other nonnative species due to severe soil disturbances and relatively high percent of bare ground.

Soil erosion is potentially high, impacting offsite aquatic habitats through increased runoff, nutrient, and sediment loads. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased wildlife abundance and diversity.

Since secondary succession is highly variable plant and wildlife species will vary. This plant community provides habitat for generalist or early successional species. In addition, these communities may contain prairie dog towns. Prairie dog towns are sites of high plant and wildlife diversity.

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses and Grass-likes							
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
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
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
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
plains reedgrass	U D U U	N D N N	U D U U	N D N N	N D N N	U D U U	U D U 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
sand dropseed	N U N N	N U N N	N U N N	N U N N	N U N N	N U N N	N U N N
Sandberg bluegrass	N U N N	N D N N	N U N N	N D N N	N D N N	N U N N	N U N N
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
thickspike wheatgrass	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
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
tumblegrass	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
Forbs							
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
bighead pygmycudweed	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
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
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
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
Lambert 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
littlepod false flax	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
Nuttall's violet	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
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 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
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
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
Shrubs and Cryptogams							
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
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
purple pincushion	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
saltbush	P D D P	P D D P	P D D P	P D D P	P D D P	P D D P	P D D P
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
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
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

As this site improves in condition through proper management (from the more short grass dominated plant communities to the interpretive plant community), the advantage for livestock production includes: higher forage production from cool-season grasses, improved early spring forage

production, and higher water infiltration. The disadvantage for livestock include: reduction in cool-/warm-season grass mix which would provides better management flexibility, less plant diversity, and a potential increase in soil erosion. The Annual, Pioneer Perennial Plant Community is of limited value for livestock production.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrology Functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where shortgrasses form a strong 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 variety of plants which 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

Clayey (R058DY011SD), Claypan (R058DY013SD), Loamy (R058DY010SD), Sandy (R058DY009SD), Sands (R058DY008SD), Shallow Loamy (R058DY024SD).

Similar Sites

(058DY011SD) – Clayey [more western wheatgrass; less blue grama; more productive]
(058DY013SD) – Claypan [more western wheatgrass; more cactus; more productive]
(058DY010SD) – Loamy [more blue grama; more big bluestem; more productive]

Inventory Data References

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations and experience were also used. Those involved in developing this site description include: Ryan Beer, Range Management Specialist (RMS), NRCS; Chuck Berdan, Biologist (BIO), Bureau of Land Management (BLM); Stan Boltz, RMS, NRCS; Dave Dewald, Wildlife BIO, NRCS; Jody Forman, RMS, NRCS; Dennis Froemke, RMS, NRCS; Tom Juntti, BIO, US Forest Service (USFS); Cheryl Nielsen, RMS, NRCS; Jeff Printz, RMS, NRCS; Mike Stirling, RMS, NRCS; Dan

Svingen, BIO, USFS; Darrell Vanderbusch, Soil Scientist, NRCS; Cindy Zachmeier, BIO, NRCS; and Tim Zachmeier, BIO, BLM.

<u>Data Source</u>	<u>Number of Records</u>	<u>Sample Period</u>	<u>State</u>	<u>County</u>
SCS-RANGE-417	2	1981 – 1985	SD	Harding

State Correlation

This site has been correlated between MT, ND, and South Dakota (SD) in MLRA 58D.

Field Offices

Baker, MT (Fallon County)	Belle Fourche, SD (Butte County)
Bowman, ND (Bowman and Slope Counties)	Buffalo, SD (Harding County)
Ekalaka, MT (Carter County)	

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 43e – Sagebrush Steppe.

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>)
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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
_____ ND, State Range Management Specialist	_____ Date
_____ SD, State Range Management Specialist	_____ Date