

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Claypan

Site ID: R058DY013SD

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



Physiographic Features

This site occurs on nearly level to moderately steep uplands.

Landform: terrace, plain, flat

Aspect: N/A

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	2,300	4,000
Slope (percent):	0	9
Water Table Depth (inches):	80	80
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 silt loam to fine sandy loam surface textures of this site change abruptly at about 5 to 15 inches below the surface, to a hard clayey or clay loam Btn horizon having round-topped or “bun shaped” columnar or prismatic structure. These subsoils are high in sodium. Permeability is very slow. Slopes range from zero to nine percent. The soils on this site are moderately deep to deep, well-drained, and were formed in alluvium or residuum from sandstone. The surface layer is two to six inches thick. The texture of the subsoil ranges from loam to clay. The soils have a 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. Access Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>) for specific local soils information.

Parent Material Kind: alluvium
Parent Material Origin: sandstone and siltstone
Surface Texture: fine sandy loam, silt loam, loam
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments ≤3" (% Cover): 0
Surface Fragments >3" (%Cover): 0
Subsurface Fragments ≤3" (% Volume): 0-15
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	80
Electrical Conductivity (mmhos/cm)*:	0	16
Sodium Absorption Ratio*:	0	20
Soil Reaction (1:1 Water)*:	5.6	9
Soil Reaction (0.1M CaCl2)*:	NA	NA
Available Water Capacity (inches)*:	4	5
Calcium Carbonate Equivalent (percent)*:	0	20

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

Plant Communities

Ecological Dynamics of the Site

This site developed under Northern Great Plains climatic conditions, 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 Western Wheatgrass/Blue Grama/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.

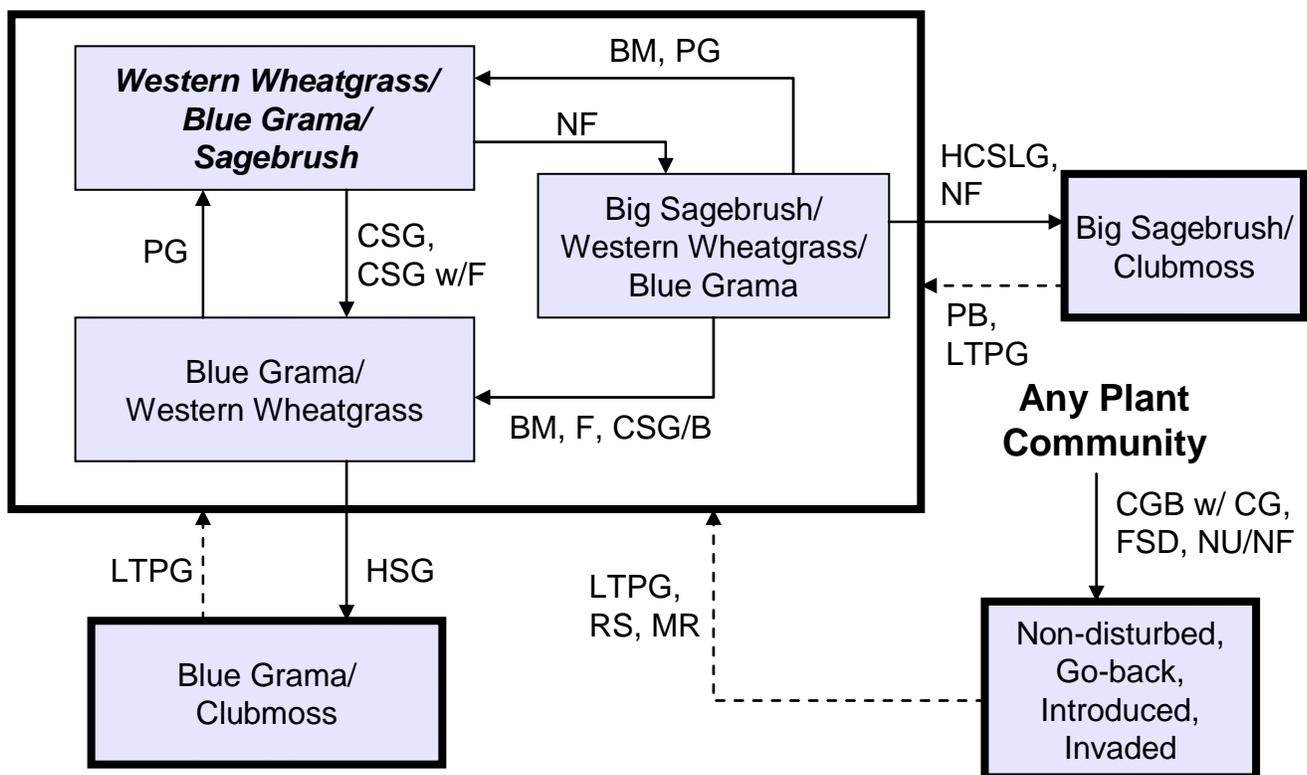
Heavy continuous grazing and/or continuous seasonal (spring) grazing, without adequate recovery periods following each grazing occurrence causes this site to depart from the Western Wheatgrass/Blue Grama/Sagebrush Plant Community. Blue grama will begin to increase. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass will decrease in frequency and production. In time, heavy continuous grazing will likely cause upland sedges and blue grama to dominate and club moss to increase. This resulting plant community is relatively stable and

the competitive advantage prevents other species from establishing. This plant community is less productive than the Western Wheatgrass/Blue Grama/Sagebrush Plant Community. Runoff increases and infiltration will decrease. Soil erosion will be minimal.

Extended periods of nonuse and/or lack of fire will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass. Shrubs such as big sagebrush and western snowberry will also typically increase.

The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

Plant Communities and Transitional Pathways



B – Browsing or mechanical disturbance of brush; **BM** – Brush management; **CGB w/ CG** – Cropped go-back with continuous grazing; **CSG** – Continuous seasonal grazing; **F** – Fire, typically wildfire; **FSD** – Frequent and severe defoliation; **HCSG** – Heavy continuous seasonal grazing; **HCSLG** – Heavy continuous season-long grazing; **HSG** – Heavy seasonal grazing; **LTPG** – Long-term prescribed grazing; **MR** – Mechanical renovation; **NF** – No fire for extended periods; **NU** – Non-use for extended periods; **PB** – Prescribed burning; **PG** – Prescribed grazing; **RS** – Range seeding native species; **S** – Seeding of introduced species. * Sagebrush may be absent if sufficient fuels from non-use build up and a wildfire occurs.

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Western Wheatgrass/ Blue Grama/Sagebrush		
			Group	Ibs./acre	% Comp
GRASSES & GRASS-LIKES				1050 - 1260	75 - 90
RHIZOMATOUS WHEATGRASS			1	350 - 560	25 - 40
western wheatgrass	Pascopyrum smithii	PASM	1	280 - 490	20 - 35
thickspike wheatgrass	Elymus lanceolatus ssp. lanceolatus	ELLAL	1	28 - 140	2 - 10
Montana wheatgrass	Elymus albicans	ELAL7	1	28 - 140	2 - 10
SHORT WARM-SEASON GRASSES			2	70 - 280	5 - 20
blue grama	Bouteloua gracilis	BOGR2	2	70 - 210	5 - 15
buffalograss	Bouteloua dactyloides	BODA2	2	28 - 140	2 - 10
inland saltgrass	Distichlis spicata	DISP	2	0 - 70	0 - 5
sand dropseed	Sporobolus cryptandrus	SPCR	2	0 - 70	0 - 5
COOL-SEASON BUNCH GRASSES			3	70 - 210	5 - 15
needleandthread	Hesperostipa comata ssp. comata	HECOC8	3	70 - 210	5 - 15
green needlegrass	Nassella viridula	NAV4	3	14 - 42	1 - 3
slender wheatgrass	Elymus trachycaulus	ELTR7	3	14 - 42	1 - 3
SHORT COOL-SEASON GRASSES			4	14 - 112	1 - 8
Sandberg bluegrass	Poa secunda	POSE	4	14 - 70	1 - 5
prairie junegrass	Koeleria macrantha	KOMA	4	14 - 28	1 - 2
plains reedgrass	Calamagrostis montanensis	CAMO	4	0 - 42	0 - 3
Cusick's bluegrass	Poa cusickii	POCU3	4	0 - 28	0 - 2
WARM-SEASON GRASSES			5	14 - 42	1 - 3
little bluestem	Schizachyrium scoparium	SCSC	5	0 - 28	0 - 2
prairie sandreed	Calamovilfa longifolia	CALO	5	0 - 28	0 - 2
ANNUAL GRASSES			6	14 - 28	1 - 2
sixweeks fescue	Vulpia octiflora	VUOC	6	14 - 28	1 - 2
tumblegrass	Schedonnardus paniculatus	SCPA	6	0 - 14	0 - 1
GRASS-LIKES			7	70 - 140	5 - 10
needleleaf sedge	Carex duriuscula	CADU6	7	42 - 140	3 - 10
threadleaf sedge	Carex filifolia	CAFI	7	14 - 70	1 - 5
rush	Juncus spp.	JUNCU	7	0 - 28	0 - 2
other grass-likes		2GL	7	0 - 42	0 - 3
FORBS			9	70 - 140	5 - 10
American vetch	Vicia americana	VIAM	9	0 - 28	0 - 2
bighead pygmycudweed	Evax prolifera	EVPR	9	14 - 28	1 - 2
biscuitroot	Lomatium spp.	LOMAT	9	14 - 28	1 - 2
cinquefoil	Potentilla spp.	POTEN	9	0 - 14	0 - 1
cudweed sagewort	Artemisia ludoviciana	ARLU	9	14 - 42	1 - 3
heath aster	Symphotrichum ericoides	SYER	9	0 - 28	0 - 2
Lambert crazyweed	Oxytropis lambertii	OXLA3	9	0 - 28	0 - 2
littlepod false flax	Camelina microcarpa	CAMI2	9	0 - 14	0 - 1
milkvetch	Astragalus spp.	ASTRA	9	0 - 28	0 - 2
Missouri goldenrod	Solidago missouriensis	SOMI2	9	14 - 28	1 - 2
Nuttall's violet	Viola nuttallii	VINU2	9	14 - 28	1 - 2
prairie clover	Dalea spp.	DALEA	9	0 - 28	0 - 2
prairie coneflower	Ratibida columnifera	RACO3	9	0 - 28	0 - 2
rose pussytoes	Antennaria rosea	ANRO2	9	0 - 28	0 - 2
rush skeletonweed	Lygodesmia juncea	LYJU	9	0 - 14	0 - 1
scarlet gaura	Gaura coccinea	GACO5	9	14 - 28	1 - 2
scarlet globemallow	Sphaeralcea coccinea	SPCO	9	14 - 28	1 - 2
scurfpea	Psoraleum spp.	PSORA2	9	14 - 42	1 - 3
slenderleaf collomia	Collomia linearis	COLI2	9	0 - 14	0 - 1
spiny phlox	Phlox hoodii	PHHO	9	0 - 14	0 - 1
wavyleaf thistle	Cirsium undulatum	CIUN	9	14 - 42	1 - 3
western yarrow	Achillea millefolium var. occidentalis	ACMIO	9	14 - 28	1 - 2
wild onion	Allium spp.	ALLIU	9	0 - 14	0 - 1
wild parsley	Musineon divaricatum	MUDI	9	14 - 28	1 - 2
wooly Indianwheat	Plantago patagonica	PLPA2	9	14 - 28	1 - 2
native forbs		2FN	9	14 - 66	1 - 4
SHRUBS			10	70 - 210	5 - 15
big sagebrush	Artemisia tridentata	ARTR2	10	28 - 140	2 - 10
black greasewood	Sarcobatus vermiculatus	SAVE4	10	0 - 28	0 - 2
brittle cactus	Opuntia fragilis	OPFR	10	14 - 28	1 - 2
broom snakeweed	Gutierrezia sarothrae	GUSA2	10	0 - 28	0 - 2
fringed sagewort	Artemisia frigida	ARFR4	10	14 - 42	1 - 3
plains pricklypear	Opuntia polyacantha	OPPO	10	14 - 42	1 - 3
purple pincushion	Escobaria vivipara var. vivipara	ESVIV	10	0 - 14	0 - 1
rose	Rosa spp.	ROSA5	10	0 - 28	0 - 2
saltbush	Atriplex spp.	ATRIP	10	14 - 42	1 - 3
silver sagebrush	Artemisia cana	ARCA13	10	14 - 98	1 - 7
winterfat	Krascheninnikovia lanata	KRLA2	10	0 - 42	0 - 3
other shrubs		2SHRUB	10	0 - 42	0 - 3
CRYPTOGAMS			11	0 - 14	0 - 1
clubmoss	Selaginella densa	SEDE2	11	0 - 14	0 - 1

Annual Production Ibs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	770 -	1148	- 1825
FORBS	65 -	105	- 145
SHRUBS	65 -	140	- 215
CRYPTOGAMS	0 -	7	- 15
TOTAL	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/Sagebrush			Blue Grama/Western Wheatgrass			Blue Grama/Clubmoss			
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	
GRASSES & GRASS-LIKES			1050 - 1260	75 - 90		700 - 900	70 - 90		490 - 630	70 - 90	
RHIZOMATOUS WHEATGRASS		1	350 - 560	25 - 40	1	100 - 200	10 - 20	1	0 - 70	0 - 10	
western wheatgrass	PASM	1	280 - 490	20 - 35	1	100 - 200	10 - 20	1	0 - 56	0 - 8	
thickspike wheatgrass	ELLAL	1	28 - 140	2 - 10	1	0 - 80	0 - 8	1	0 - 35	0 - 5	
Montana wheatgrass	ELAL7	1	28 - 140	2 - 10	1	0 - 80	0 - 8	1	0 - 35	0 - 5	
SHORT WARM-SEASON GRASSES		2	70 - 280	5 - 20	2	150 - 300	15 - 30	2	175 - 315	25 - 45	
blue grama	BOGR2	2	70 - 210	5 - 15	2	150 - 250	15 - 25	2	140 - 280	20 - 40	
buffalograss	BODA2	2	28 - 140	2 - 10	2	50 - 150	5 - 15	2	35 - 140	5 - 20	
inland saltgrass	DISP	2	0 - 70	0 - 5	2	0 - 80	0 - 8	2	7 - 70	1 - 10	
sand dropseed	SPCR	2	0 - 70	0 - 5	2	0 - 80	0 - 8	2	0 - 56	0 - 8	
COOL-SEASON BUNCH GRASSES		3	70 - 210	5 - 15	3	50 - 100	5 - 10	3	0 - 35	0 - 5	
needleandthread	HECOC8	3	70 - 210	5 - 15	3	50 - 100	5 - 10	3	0 - 35	0 - 5	
green needlegrass	NAV14	3	14 - 42	1 - 3	3	0 - 10	0 - 1				
slender wheatgrass	ELTR7	3	14 - 42	1 - 3	3	0 - 10	0 - 1				
SHORT COOL-SEASON GRASSES		4	14 - 112	1 - 8	4	20 - 100	2 - 10	4	14 - 70	2 - 10	
Sandberg bluegrass	POSE	4	14 - 70	1 - 5	4	10 - 80	1 - 8	4	7 - 70	1 - 10	
prairie junegrass	KOMA	4	14 - 28	1 - 2	4	10 - 40	1 - 4	4	7 - 35	1 - 5	
plains reedgrass	CAMO	4	0 - 42	0 - 3	4	0 - 10	0 - 1				
Cusick's bluegrass	POCU3	4	0 - 28	0 - 2	4	0 - 10	0 - 1				
WARM-SEASON GRASSES		5	14 - 42	1 - 3	5	0 - 20	0 - 2	5			
little bluestem	SCSC	5	0 - 28	0 - 2	5	0 - 10	0 - 1				
prairie sandreed	CALO	5	0 - 28	0 - 2	5	0 - 10	0 - 1				
ANNUAL GRASSES		6	14 - 28	1 - 2	6	10 - 30	1 - 3	6	7 - 35	1 - 5	
sixweeks fescue	VUOC	6	14 - 28	1 - 2	6	10 - 30	1 - 3	6	7 - 35	1 - 5	
tumblegrass	SCPA	6	0 - 14	0 - 1	6	0 - 20	0 - 2	6	0 - 21	0 - 3	
GRASS-LIKES		7	70 - 140	5 - 10	7	50 - 150	5 - 15	7	70 - 140	10 - 20	
needleleaf sedge	CADU6	7	42 - 140	3 - 10	7	50 - 100	5 - 10	7	35 - 105	5 - 15	
threadleaf sedge	CAF1	7	14 - 70	1 - 5	7	10 - 80	1 - 8	7	14 - 70	2 - 10	
rush	JUNCU	7	0 - 28	0 - 2	7	0 - 20	0 - 2	7	0 - 14	0 - 2	
other grass-likes	2GL	7	0 - 42	0 - 3	7	0 - 30	0 - 3	7	0 - 21	0 - 3	
NON-NATIVE GRASSES		8			8	0 - 50	0 - 5	8	7 - 35	1 - 5	
bluegrass	POA				8	0 - 50	0 - 5	8	7 - 35	1 - 5	
cheatgrass	BRTE				8	0 - 50	0 - 5	8	7 - 35	1 - 5	
FORBS		9	70 - 140	5 - 10	9	50 - 100	5 - 10	9	14 - 49	2 - 7	
American vetch	VIAM	9	0 - 28	0 - 2	9	0 - 10	0 - 1				
bighead pygmycudweed	EVPR	9	14 - 28	1 - 2	9	10 - 20	1 - 2	9	7 - 21	1 - 3	
biscuitroot	LOMAT	9	14 - 28	1 - 2	9	10 - 20	1 - 2	9	0 - 14	0 - 2	
cinquefoil	POTEN	9	0 - 14	0 - 1	9	0 - 10	0 - 1	9	0 - 7	0 - 1	
cudweed sagewort	ARLU	9	14 - 42	1 - 3	9	10 - 40	1 - 4	9	7 - 35	1 - 5	
heath aster	SYER	9	0 - 28	0 - 2	9	0 - 20	0 - 2	9	0 - 14	0 - 2	
Lambert crazyweed	OXLA3	9	0 - 28	0 - 2	9	0 - 10	0 - 1	9	0 - 7	0 - 1	
littlepod false flax	CAMI2	9	0 - 14	0 - 1	9	0 - 10	0 - 1	9	0 - 7	0 - 1	
milkvetch	ASTRA	9	0 - 28	0 - 2	9	0 - 20	0 - 2	9	0 - 14	0 - 2	
Missouri goldenrod	SOMI2	9	14 - 28	1 - 2	9	0 - 20	0 - 2	9	0 - 7	0 - 1	
Nuttall's violet	VINU2	9	14 - 28	1 - 2	9	0 - 20	0 - 2				
prairie clover	DALEA	9	0 - 28	0 - 2	9	0 - 10	0 - 1				
prairie coneflower	RACO3	9	0 - 28	0 - 2	9	0 - 20	0 - 2	9	0 - 7	0 - 1	
rose pussytoes	ANRO2	9	0 - 28	0 - 2	9	0 - 20	0 - 2	9	0 - 14	0 - 2	
rush skeletonweed	LYJU	9	0 - 14	0 - 1	9	0 - 10	0 - 1	9	0 - 7	0 - 1	
scarlet gaura	GACO5	9	14 - 28	1 - 2	9	10 - 20	1 - 2				
scarlet globemallow	SPCO	9	14 - 28	1 - 2	9	10 - 30	1 - 3	9	0 - 14	0 - 2	
scurfspea	PSORA2	9	14 - 42	1 - 3	9	10 - 40	1 - 4	9	0 - 28	0 - 4	
slenderleaf collomia	COLI2	9	0 - 14	0 - 1	9	0 - 10	0 - 1	9	0 - 7	0 - 1	
spiny phlox	PHHO	9	0 - 14	0 - 1	9	0 - 10	0 - 1	9	0 - 7	0 - 1	
wavyleaf thistle	CIUN	9	14 - 42	1 - 3	9	10 - 30	1 - 3	9	0 - 14	0 - 2	
western yarrow	ACMIO	9	14 - 28	1 - 2	9	10 - 40	1 - 4	9	7 - 28	1 - 4	
wild onion	ALLIU	9	0 - 14	0 - 1	9	0 - 10	0 - 1				
wild parsley	MUDI	9	14 - 28	1 - 2	9	10 - 20	1 - 2	9	0 - 14	0 - 2	
wooly Indianwheat	PLPA2	9	14 - 28	1 - 2	9	10 - 20	1 - 2	9	7 - 21	1 - 3	
native forbs	2FN	9	14 - 56	1 - 4	9	10 - 30	1 - 3	9	0 - 14	0 - 2	
introduced forbs	2FI				9	10 - 30	1 - 3	9	7 - 21	1 - 3	
SHRUBS		10	70 - 210	5 - 15	10	50 - 150	5 - 15	10	35 - 105	5 - 15	
big sagebrush	ARTR2	10	28 - 140	2 - 10	10	0 - 100	0 - 10	10	0 - 56	0 - 8	
black greasewood	SAVE4	10	0 - 28	0 - 2	10	0 - 10	0 - 1				
brittle cactus	OPFR	10	14 - 28	1 - 2	10	10 - 50	1 - 5	10	7 - 56	1 - 8	
broom snakeweed	GUSA2	10	0 - 28	0 - 2	10	10 - 50	1 - 5	10	7 - 35	1 - 5	
fringed sagewort	ARFR4	10	14 - 42	1 - 3	10	20 - 50	2 - 5	10	14 - 56	2 - 8	
plains pricklypear	OPPO	10	14 - 42	1 - 3	10	10 - 50	1 - 5	10	35 - 56	5 - 8	
purple pincushion	ESVIV	10	0 - 14	0 - 1	10	0 - 10	0 - 1	10	0 - 7	0 - 1	
rose	ROSA5	10	0 - 28	0 - 2	10	0 - 20	0 - 2	10	0 - 7	0 - 1	
saltbush	ATRIP	10	14 - 42	1 - 3	10	0 - 10	0 - 1				
silver sagebrush	ARCA13	10	14 - 98	1 - 7	10	0 - 80	0 - 8	10	0 - 70	0 - 10	
winterfat	KRLA2	10	0 - 42	0 - 3	10	0 - 10	0 - 1				
other shrubs	2SHRUB	10	0 - 42	0 - 3	10	0 - 30	0 - 3	10	0 - 21	0 - 3	
CRYPTOGAMS		11	0 - 14	0 - 1	11	0 - 30	0 - 3	11	0 - 56	0 - 8	
clubmoss	SEDE2	11	0 - 14	0 - 1	11	0 - 30	0 - 3	11	0 - 56	0 - 8	
Annual Production lbs./acre			LOW	RV	HIGH	LOW	RV	HIGH	LOW	RV	HIGH
GRASSES & GRASS-LIKES			770	1148	1625	510	810	1305	360	571	780
FORBS			65	105	145	45	75	105	10	32	50
SHRUBS			65	140	215	45	100	155	30	70	110
CRYPTOGAMS			0	7	15	0	15	35	0	28	60
TOTAL			900	1400	2000	600	1000	1600	400	700	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. Refer to PLANTS database for scientific names and codes: <http://plants.usda.gov>

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	Western Wheatgrass/ Blue Grama/Sagebrush			Big Sagebrush/Western Wheatgrass/Blue Grama			Big Sagebrush/Clubmoss			
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	
GRASSES & GRASS-LIKES			1050 - 1260	75 - 90		780 - 1020	65 - 85		500 - 800	50 - 80	
RHIZOMATOUS WHEATGRASS		1	350 - 560	25 - 40	1	60 - 300	5 - 25	1	0 - 100	0 - 10	
western wheatgrass	PASM	1	280 - 490	20 - 35	1	60 - 240	5 - 20	1	0 - 100	0 - 10	
thickspike wheatgrass	ELLAL	1	28 - 140	2 - 10	1	0 - 96	0 - 8	1	0 - 30	0 - 3	
Montana wheatgrass	ELAL7	1	28 - 140	2 - 10	1	0 - 96	0 - 8	1	0 - 30	0 - 3	
SHORT WARM-SEASON GRASSES		2	70 - 280	5 - 20	2	120 - 300	10 - 25	2	150 - 300	15 - 30	
blue grama	BOGR2	2	70 - 210	5 - 15	2	60 - 240	5 - 20	2	100 - 250	10 - 25	
buffalograss	BODA2	2	28 - 140	2 - 10	2	24 - 144	2 - 12	2	30 - 150	3 - 15	
inland saltgrass	DISP	2	0 - 70	0 - 5	2	12 - 96	1 - 8	2	10 - 100	1 - 10	
sand dropseed	SPCR	2	0 - 70	0 - 5	2	0 - 84	0 - 7	2	0 - 70	0 - 7	
COOL-SEASON BUNCHGRASSES		3	70 - 210	5 - 15	3	24 - 120	2 - 10	3	0 - 50	0 - 5	
needleandthread	HECOC8	3	70 - 210	5 - 15	3	24 - 120	2 - 10	3	0 - 50	0 - 5	
green needlegrass	NAV4	3	14 - 42	1 - 3	3	0 - 12	0 - 1				
slender wheatgrass	ELTR7	3	14 - 42	1 - 3	3	0 - 12	0 - 1				
SHORT COOL-SEASON GRASSES		4	14 - 112	1 - 8	4	24 - 60	2 - 5	4	10 - 50	1 - 5	
Sandberg bluegrass	POSE	4	14 - 70	1 - 5	4	12 - 60	1 - 5	4	10 - 50	1 - 5	
prairie junegrass	KOMA	4	14 - 28	1 - 2	4	12 - 24	1 - 2	4	10 - 20	1 - 2	
plains reedgrass	CAMO	4	0 - 42	0 - 3	4	0 - 12	0 - 1				
Cusick's bluegrass	POCU3	4	0 - 28	0 - 2	4	0 - 12	0 - 1				
WARM-SEASON GRASSES		5	14 - 42	1 - 3	5	0 - 24	0 - 2	5			
little bluestem	SCSC	5	0 - 28	0 - 2	5	0 - 12	0 - 1				
prairie sandreed	CALO	5	0 - 28	0 - 2	5	0 - 12	0 - 1				
ANNUAL GRASSES		6	14 - 28	1 - 2	6	12 - 36	1 - 3	6	10 - 50	1 - 5	
sixweeks fescue	VUOC	6	14 - 28	1 - 2	6	12 - 36	1 - 3	6	10 - 40	1 - 4	
tumblegrass	SCPA	6	0 - 14	0 - 1	6	0 - 24	0 - 2	6	0 - 30	0 - 3	
GRASS-LIKES		7	70 - 140	5 - 10	7	120 - 180	10 - 15	7	150 - 200	15 - 20	
needleleaf sedge	CADU6	7	42 - 140	3 - 10	7	60 - 180	5 - 15	7	80 - 200	8 - 20	
threadleaf sedge	CAFI	7	14 - 70	1 - 5	7	24 - 120	2 - 10	7	50 - 150	5 - 15	
rush	JUNCU	7	0 - 28	0 - 2	7	0 - 24	0 - 2	7	0 - 20	0 - 2	
other grass-likes	ZGL	7	0 - 42	0 - 3	7	0 - 36	0 - 3	7	0 - 30	0 - 3	
NON-NATIVE GRASSES		8			8	12 - 60	1 - 5	8	10 - 50	1 - 5	
bluegrass	POA	8			8	12 - 60	1 - 5	8	10 - 50	1 - 5	
cheatgrass	BRTE	8			8	12 - 60	1 - 5	8	10 - 50	1 - 5	
FORBS		9	70 - 140	5 - 10	9	60 - 120	5 - 10	9	20 - 70	2 - 7	
American vetch	VIAM	9	0 - 28	0 - 2	9	0 - 12	0 - 1				
bighead pygmyweed	EVPR	9	14 - 28	1 - 2	9	12 - 36	1 - 3	9	10 - 30	1 - 3	
biscuitroot	LOMAT	9	14 - 28	1 - 2	9	12 - 24	1 - 2	9	0 - 10	0 - 1	
cinquefoil	POTEN	9	0 - 14	0 - 1	9	0 - 12	0 - 1				
cudweed sagewort	ARLU	9	14 - 42	1 - 3	9	12 - 48	1 - 4	9	10 - 40	1 - 4	
heath aster	SYER	9	0 - 28	0 - 2	9	0 - 24	0 - 2	9	0 - 10	0 - 1	
Lambert crazyweed	OXLA3	9	0 - 28	0 - 2	9	0 - 24	0 - 2	9	0 - 10	0 - 1	
littlepod false flax	CAMI2	9	0 - 14	0 - 1	9	0 - 12	0 - 1	9	0 - 10	0 - 1	
milkvetch	ASTRA	9	0 - 28	0 - 2	9	0 - 12	0 - 1				
Missouri goldenrod	SOMI2	9	14 - 28	1 - 2	9	0 - 12	0 - 1				
Nuttall's violet	VINU2	9	14 - 28	1 - 2	9	0 - 12	0 - 1				
prairie clover	DALEA	9	0 - 28	0 - 2	9	0 - 12	0 - 1				
prairie coneflower	RACO3	9	0 - 28	0 - 2	9	0 - 24	0 - 2	9	0 - 10	0 - 1	
rose pussytoes	ANRO2	9	0 - 28	0 - 2	9	0 - 24	0 - 2	9	0 - 20	0 - 2	
rush skeletonweed	LYJU	9	0 - 14	0 - 1	9	0 - 12	0 - 1	9	0 - 10	0 - 1	
scarlet gaura	GACO5	9	14 - 28	1 - 2	9	0 - 12	0 - 1				
scarlet globemallow	SPCO	9	14 - 28	1 - 2	9	12 - 24	1 - 2	9	10 - 20	1 - 2	
scurppa	PSORA2	9	14 - 42	1 - 3	9	12 - 48	1 - 4	9	10 - 40	1 - 4	
slenderleaf collomia	COLI2	9	0 - 14	0 - 1	9	0 - 12	0 - 1	9	0 - 10	0 - 1	
spiny phlox	PHHO	9	0 - 14	0 - 1	9	0 - 12	0 - 1	9	0 - 10	0 - 1	
wavyleaf thistle	CIUN	9	14 - 42	1 - 3	9	12 - 24	1 - 2	9	0 - 10	0 - 1	
western yarrow	ACMIO	9	14 - 28	1 - 2	9	12 - 36	1 - 3	9	10 - 30	1 - 3	
wild onion	ALLIU	9	0 - 14	0 - 1	9	0 - 12	0 - 1				
wild parsley	MUDI	9	14 - 28	1 - 2	9	12 - 24	1 - 2	9	0 - 10	0 - 1	
wooly Indianwheat	PLPA2	9	14 - 28	1 - 2	9	12 - 36	1 - 3	9	10 - 30	1 - 3	
native forbs	2FN	9	14 - 56	1 - 4	9	12 - 48	1 - 4	9	10 - 30	1 - 3	
introduced forbs	2FI	9			9	12 - 36	1 - 3	9	10 - 40	1 - 4	
SHRUBS		10	70 - 210	5 - 15	10	120 - 300	10 - 25	10	150 - 350	15 - 35	
big sagebrush	ARTR2	10	28 - 140	2 - 10	10	60 - 180	5 - 15	10	50 - 250	5 - 25	
black greasewood	SAVE4	10	0 - 28	0 - 2	10	0 - 12	0 - 1				
brittle cactus	OPFR	10	14 - 28	1 - 2	10	12 - 36	1 - 3	10	10 - 40	1 - 4	
broom snakeweed	GUSA2	10	0 - 28	0 - 2	10	0 - 36	0 - 3	10	0 - 30	0 - 3	
fringed sagewort	ARFR4	10	14 - 42	1 - 3	10	12 - 48	1 - 4	10	10 - 50	1 - 5	
plains pricklypear	OPPO	10	14 - 42	1 - 3	10	12 - 48	1 - 4	10	10 - 50	1 - 5	
purple pincushion	ESVIV	10	0 - 14	0 - 1	10	0 - 12	0 - 1	10	0 - 10	0 - 1	
rose	ROSA5	10	0 - 28	0 - 2	10	0 - 24	0 - 2				
saltbush	ATRP	10	14 - 42	1 - 3	10	0 - 24	0 - 2				
silver sagebrush	ARCA13	10	14 - 98	1 - 7	10	48 - 144	4 - 12	10	50 - 200	5 - 20	
winterfat	KRLA2	10	0 - 42	0 - 3	10	0 - 12	0 - 1				
other shrubs	2SHRUB	10	0 - 42	0 - 3	10	0 - 36	0 - 3	10	0 - 30	0 - 3	
CRYPTOGAMS		11	0 - 14	0 - 1	11	12 - 36	1 - 3	11	10 - 70	1 - 7	
clubmoss	SEDE2	11	0 - 14	0 - 1	11	12 - 36	1 - 3	11	10 - 70	1 - 7	
Annual Production lbs./acre			LOW	RV	HIGH	LOW	RV	HIGH	LOW	RV	HIGH
GRASSES & GRASS-LIKES			770	1148	1590	630	876	1285	445	665	840
FORBS			65	105	155	55	90	130	15	45	75
SHRUBS			65	140	240	105	210	345	135	250	410
CRYPTOGAMS			0	7	15	10	24	40	5	40	75
TOTAL			900	1400	2000	800	1200	1800	600	1000	1400

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/Sagebrush Plant Community

The interpretive plant community for this site is the Western Wheatgrass/Blue Grama/Sagebrush Plant Community. This is also considered to be climax. This plant community can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of deferment. The potential vegetation is about 75-90 percent grasses or grass-like plants, 5-10 percent forbs, 5-15 percent shrubs, and 0-1 percent cryptogams. Cool-season grasses dominate this plant community. The major grasses include western wheatgrass and blue grama. Other grasses or grass-likes occurring on the site include needleandthread, prairie Junegrass, buffalograss, and sedge. Significant forbs include scarlet globemallow, prairie coneflower, prairie clover, and American vetch. The significant shrubs that occur include big sagebrush, winterfat, saltbush, and silver sagebrush.

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). The diversity in plant species allows for high drought tolerance. This is a healthy and sustainable plant community. Moderate or high available water capacity provides a favorable soil-water-plant relationship. Overall, the interpretive plant community has the appearance of being stable, diverse, and productive. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low.

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 or continuous seasonal grazing with fire will shift this plant community to the *Blue Grama/Western Wheatgrass Plant Community*. This occurs with grazing for extended periods during the same part of the growing season each year at moderate stocking rates.
- No fire for extended periods of time typically accompanied by grazing with inadequate recovery periods will shift this plant community to the *Big Sagebrush/Western Wheatgrass/Blue Grama 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 made up of approximately 75-85 percent grasses and grass-like species, 5-10 percent forbs, 5-15 percent shrubs, and 0-3 percent cryptogams. The dominant grasses include blue grama and western wheatgrass. Other grasses or grass-likes may include sedge, buffalograss, needleandthread, and prairie Junegrass. Significant forbs include cudweed sagewort, scarlet globemallow, scurfpea, and western yarrow. The dominant shrubs that occur include silver sagebrush, cactus, rose, and fringed sagewort.

Compared to the Western Wheatgrass/Blue Grama/Sagebrush Plant Community, the shortgrass species including blue grama and sedge have increased. The cool-season species including western wheatgrass and green needlegrass have decreased in composition. Annual bromes, curlycup gumweed, sweetclover, and other annual grasses and forbs can invade the site. This plant community can occur in a mosaic with patchy, slightly used areas occurring adjacent to and intermingled with this plant community.

This plant community is somewhat resistant to change. The dominant herbaceous species are very adapted to grazing; however, the midgrass species and the more palatable forbs will decrease. 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 is lower and runoff is moderate to high. Typically, the runoff is very clean because of the low potential for onsite soil erosion. However, offsite areas may be affected by increased runoff.

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/Sagebrush Plant Community*.
- With heavy seasonal grazing this plant community will move towards the *Blue Grama/Clubmoss Plant Community*.

Blue Grama/Clubmoss Plant Community

This plant community develops under heavy seasonal grazing. It is made up of approximately 70-90 percent grasses, 2-7 percent forbs, 5-15 percent shrubs, and 0-8 percent cryptogams. The dominant grasses/grass-likes include blue grama and sedge. Other grasses may include western wheatgrass, prairie Junegrass, buffalograss, and cheatgrass. The dominant forbs include common pepperweed, curlycup gumweed, cudweed sagewort, sweetclover, and western yarrow. The dominant shrubs include silver sagebrush, fringed sagewort, and cactus. Compared to the Western Wheatgrass/Blue Grama/Sagebrush Plant Community, blue grama and sedge have increased, and the cool-season mid-grasses have diminished greatly. Nonpalatable forbs and cactus have increased and nonnative

species have invaded the site. Plant diversity is low.

This plant community is very stable. Generally, this plant community will require significant management inputs (i.e., high animal impact, long-term prescribed grazing, favorable climatic conditions, etc.) and time to move it towards the Blue Grama/Western Wheatgrass Plant Community. Onsite soil erosion is low. Infiltration is low and runoff is high. Typically, the runoff is very clean because of the low potential for onsite soil erosion. However, offsite areas can be significantly impacted due to the increased runoff.

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: SD5804

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

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

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	7	18	25	25	15	7	1	0	0

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

- Long-term prescribed grazing, possibly including prescribed burning, and favorable climatic conditions, which allow for adequate plant recovery periods, may cause a shift to the *Blue Grama/Western Wheatgrass Plant Community*.

Big Sagebrush/Western Wheatgrass/Blue Grama Plant Community

This plant community develops after an extended period of 10 or more years of nonuse by herbivores and exclusion of fire. Nonnative grasses, such as Kentucky bluegrass and Canada bluegrass, tend to invade. Grasses and grass-like species present include western wheatgrass, blue grama, green needlegrass, cheatgrass, and sedge. The common forbs include cudweed sagewort, western yarrow, and scurfpea. Big sagebrush and silver sagebrush are the principal shrubs and tend to increase in density and cover.

Litter buildup reduces plant vigor and density, and native seedling recruitment declines. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to small colonies. This plant community is dispersed throughout the pasture, encircling spot grazed areas, and areas distant from water sources. This plant community may be found intermingled in a mosaic with the Blue Grama/Western Wheatgrass Plant Community in properly stocked pastures grazed season-long.

This plant community is resistant to change without prescribed grazing or fire. The combination of both grazing and fire is most effective in moving this plant community towards the Western Wheatgrass/Blue Grama/Sagebrush Plant Community. Soil erosion is low. Runoff is similar to the interpretive 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:

- Under prescribed grazing and brush management, including adequate recovery periods, this plant community may eventually move towards a plant community resembling the *Western Wheatgrass/Blue Grama/Sagebrush Plant Community*.
- Under heavy continuous season long grazing w/ no fire, this plant community will move towards the *Big Sagebrush/Clubmoss Plant Community*.
- With brush management or fire, or with continuous seasonal grazing and heavy browsing, this plant community will shift to the *Blue Grama/Western Wheatgrass Plant Community*. Silver sagebrush will often still be a significant component of the resulting plant community.

Big Sagebrush/Clubmoss Plant Community

This plant community develops from heavy continuous season-long grazing and the absence of fire. It is made up of 50-80 percent grass and grass-likes species, 2-7 percent forbs, 15-35 percent shrubs, and 1-7 percent cryptogams. The dominant grasses and grass-likes include blue grama, sedge, and buffalograss. Forbs commonly found on this plant community include cudweed sagewort, scarlet globemallow, and scurfpea. Sagebrush canopy typically ranges from 20-40 percent. Fringed sagewort is also common. As conditions deteriorate, desirable species are replaced by big sagebrush. Blue grama increases in the plant community. Cheatgrass, other annuals, and bluegrass can invade the plant community.

When compared to the Western Wheatgrass/Blue Grama/Sagebrush Plant Community, sagebrush has increased while most of the grass species have either remained the same or declined in production. The sagebrush canopy provides some protection to the cool-season midgrasses, by making them unavailable for grazing. Without fire, this plant community is stable. The soil erosion is low to moderate. Infiltration is low and runoff is high. Subsoil moisture conditions are typically drier due to the high water demand of the big sagebrush. This makes big sagebrush highly competitive with other species.

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:

- With prescribed burning and long term prescribed grazing, this plant community will move towards the *Big Sagebrush/Western Wheatgrass/Blue Grama Plant Community*, or eventually will resemble the *Western Wheatgrass/Blue Grama/Sagebrush Plant Community*. This will take long periods with proper management and requires a remnant diverse native species population.

Non-disturbed, Go-Back, Introduced, or Invaded States

This group includes four separate vegetation states that are highly variable in nature. They are derived through distinct management scenarios, and are not related successionaly. Infiltration, runoff, and soil erosion varies depending on the vegetation present on the site.

The **Go-back** state can be reached whenever severe mechanical disturbance (i.e., abandoned farmland) 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 three-awn, annual brome, 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.

The **Non-Disturbed** state develops from extended periods of exclusion by large herbivores, fire suppression, and lack of other surface disturbance. Plant litter accumulates in large amounts when this community first develops. Litter buildup reduces mature plant vigor and density and seedling recruitment declines. Eventually litter levels become high enough that plant density decreases. Interspaces are commonly filled by annual forbs, annual grasses, and cryptogams. Typically, rhizomatous grasses form small colonies because of a lack of tiller stimulation. This state is typically dominated by introduced bluegrasses.

The **Introduced** state is normally those areas seeded to crested wheatgrass, pubescent, or intermediate wheatgrass and alfalfa. It requires considerable investment to establish and has a variable life expectancy.

The **Invaded** state includes areas that have been invaded and are dominated by species such as smooth brome, Kentucky bluegrass, crested wheatgrass, nonnative thistles, field bindweed, knapweeds, leafy spurge, hoary cress, and other introduced species.

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 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, Thin Claypan, Sandy, Sandy Claypan, 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 Claypan ES 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/Big Sagebrush: The predominance of grasses plus the 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 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. Many wide ranging predators utilize 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.

Big Sagebrush/Western Wheatgrass/Blue Grama: This plant community develops after an extended fire free period favoring species such as big sagebrush. This increases habitat diversity and quality for species such as greater sage-grouse, Brewer's sparrow, and desert cottontail. This site provides excellent habitat for wintering pronghorn and greater sage-grouse. Chestnut-collared longspur may decrease with the increase of big sagebrush while vesper sparrow and western meadowlark are still common. Prey populations are still available for grassland raptors such as golden eagle, ferruginous hawk, Swainson's hawk, and northern harrier.

Blue Grama/Western Wheatgrass: Resulting from continued heavy continuous season-long grazing without adequate recovery periods between grazing events or increased fire frequency, blue grama, and western wheatgrass will dominate. The forb diversity has decreased. 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 will increase due to the loss of big sagebrush. Density of species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail will greatly decline. However, 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.

Blue Grama/Clubmoss: Resulting from continued heavy continuous season-long grazing without adequate recovery periods between grazing events or increased fire frequency, blue grama and clubmoss will dominate. The forb diversity has decreased. A shift to short plant structure will favor prairie dog expansion with prairie dog town sites and associate species such as ferruginous hawk and burrowing owl. Species such as horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will increase due to the loss of big sagebrush. Species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail will rarely use this site.

The short stature of this plant community limits suitable thermal, protective, and escape cover. Prey populations are reduced and are more vulnerable to raptor and mammalian predation. Predators utilizing this plant community include the 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 greatly reduce habitat for most amphibian species, grassland birds, and mammals.

Big Sagebrush/Clubmoss: In comparison to the big sagebrush/western wheatgrass/blue grama plant community, this plant community develops after an extended fire free period and extended periods of heaving grazing favoring species such as big sagebrush and clubmoss. The loss of understory grasses limits this vegetative community for big sage brush associated species such as greater sage-grouse, Brewer's sparrow, and desert cottontail. Prey populations are limited reducing availability for grassland raptors such as golden eagle, ferruginous hawk, and Swainson's hawk.

Extreme impairment of the ecological processes impacts offsite aquatic habitats through excessive runoff, nutrient, and sediment loads. Increased amount of bare ground causes elevated surface temperatures resulting from reduced cover and litter will greatly reduce habitat for most amphibian species, grassland birds, and mammals.

Non-disturbed, Go-back, Introduced, and/or Invaded States

This group includes four separate vegetation states that are highly variable in nature. They are derived through distinct management scenarios. These plant communities have been or are highly susceptible to invasion of annual bromegrasses, bluegrasses, crested wheatgrass, and other nonnative species.

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.

The **Non-Disturbed** state is typically dominated by introduced bluegrasses. Bird species typically associated with bluegrasses include those species that prefer limited vegetative structure such as horned lark. Mammal species typically associated with increasing amounts of litter include voles,

thirteen-lined ground squirrels, northern pocket gopher, and American badger. Increased prey populations are more vulnerable to predation by raptors and mammalian predators. Lack of forbs reduces insect populations including but not limited to pollinators.

The **Go-back** state can be reached whenever severe mechanical disturbance (i.e., abandoned farmland) is eliminated. Early successional plant communities include annual and perennial weedy type species first to occupy the site. These sites provide diverse foraging, reproductive, and escape cover favoring multiple edge species. This pioneer plant community provides abundant opportunity for insect, bird, and small mammal foraging due to abundant flowers and seed sources.

The **Introduced** state provides increased forage and; therefore, a potential for increased herbivore populations such as deer, pronghorn, and various small mammals. These sites provide diverse foraging, reproductive, and escape cover favoring multiple edge species.

The **Invaded** state includes areas that have been invaded and are dominated by species such as smooth brome, Kentucky bluegrass, crested wheatgrass, nonnative thistles, field bindweed, knapweeds, leafy spurge, hoary cress, and other introduced species. These sites greatly reduce foraging, reproductive, and escape cover for grassland nesting bird species.

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
Cusick's bluegrass	U P U D	D P U D	U P U D	U P N D	U P N D	U P U D	U P U D
green needlegrass	U P U D	N P N P	U P U D	N P N P	N P N P	U P U D	U P U D
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	N D N N	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
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
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
rush	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
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
sixweeks fescue	N N N N	N U N N	N N N N	N U N N	N U N N	N N N N	N N 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
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
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
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
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
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
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
prairie clover	U D P U	U P P U	U D P U	U P P U	U P P U	U D P U	U P P U
prairie coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
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
slenderleaf collomia	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
black greasewood	U D D U	T T T T	U D D U	D U U D	D U U D	U D D 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
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
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 Blue Grama/Clubmoss and Go-Back Plant Communities are 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 varieties 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), Loamy (R058DY010SD), Loamy Overflow (R058DY020SD), Sandy (R058DY009SD), Thin Claypan (R058DY015SD).

Similar Sites

(R058DY011SD) – Clayey [more green needlegrass; more western wheatgrass; more productive]
(R058DY010SD) – Loamy [more green needlegrass; more western wheatgrass; more productive]
(R058DY020SD) – Loamy Overflow [more big bluestem; more western wheatgrass; 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, United States 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	8	1985 – 2004	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 & 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>)
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

_____ MT, State Range Management Specialist	_____ Date
_____ ND, State Range Management Specialist	_____ Date
_____ SD, State Range Management Specialist	_____ Date