

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Loamy 16-18" P.Z.

Site ID: R060AY041SD

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



Physiographic Features

This site occurs on gently undulating to rolling uplands.

Landform: terrace, pediment, plain

Aspect: N/A

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	2,500	4,300
Slope (percent):	0	15
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:	Low	Very high

Climatic Features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland steppes to the east. Annual precipitation ranges from 16 to 18 inches per year, with most occurring during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air masses from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring. The normal average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 18°F (Newell, South Dakota (SD)), to about 23°F (Oelrichs, SD). July is the warmest month with average temperatures ranging from about 72°F (Newell, SD), to about 74°F (Oelrichs, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 53°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):	124	135
Freeze-free period (days):	143	154
Mean Annual Precipitation (inches):	16	18

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.37	0.43	6.0	34.6
February	0.45	0.57	11.4	40.9
March	0.85	0.94	19.5	48.8
April	1.66	1.78	31.4	60.9
May	2.74	3.19	42.6	71.1
June	3.05	3.38	52.2	81.5
July	1.87	2.78	57.8	90.3
August	1.37	1.76	55.9	89.7
September	1.26	1.50	44.8	79.2
October	1.07	1.32	32.9	65.5
November	0.57	0.61	20.3	47.9
December	0.48	0.49	10.0	37.5

Climate Stations		Period	
Station ID	Location or Name	From	To
SD0236	Ardmore 2 N	1948	1999
SD0559	Belle Fourche	1948	1999
SD1124	Buffalo Gap	1951	1999
SD6054	Newell	1948	1999
SD6212	Oelrichs	1948	1999
SD8911	Wasta	1949	1999

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, alluvial materials, and eolian deposits. The surface layer is 4 to 11 inches thick. The texture of the subsurface soils range from loam to clay. The soils have a moderate infiltration rate. This site typically should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Subsurface soil layers are not restrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about nine percent. More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Parent Material Kind: alluvium, residuum
Parent Material Origin: sedimentary
Surface Texture: loam, clay loam, silt loam, silty clay loam
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments ≤3” (% Cover): 0
Surface Fragments >3” (%Cover): 0
Subsurface Fragments ≤3” (% Volume): 0-20
Subsurface Fragments >3” (% Volume): 0-10

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	well	well
Permeability Class:	moderately slow	moderate
Depth to Bedrock (inches):	20	80
Electrical Conductivity (mmhos/cm)*:	0	4
Sodium Absorption Ratio*:	0	5
Soil Reaction (1:1 Water)*:	6.1	9.0
Soil Reaction (0.1M CaCl2)*:	NA	NA
Available Water Capacity (inches)*:	6	8
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:

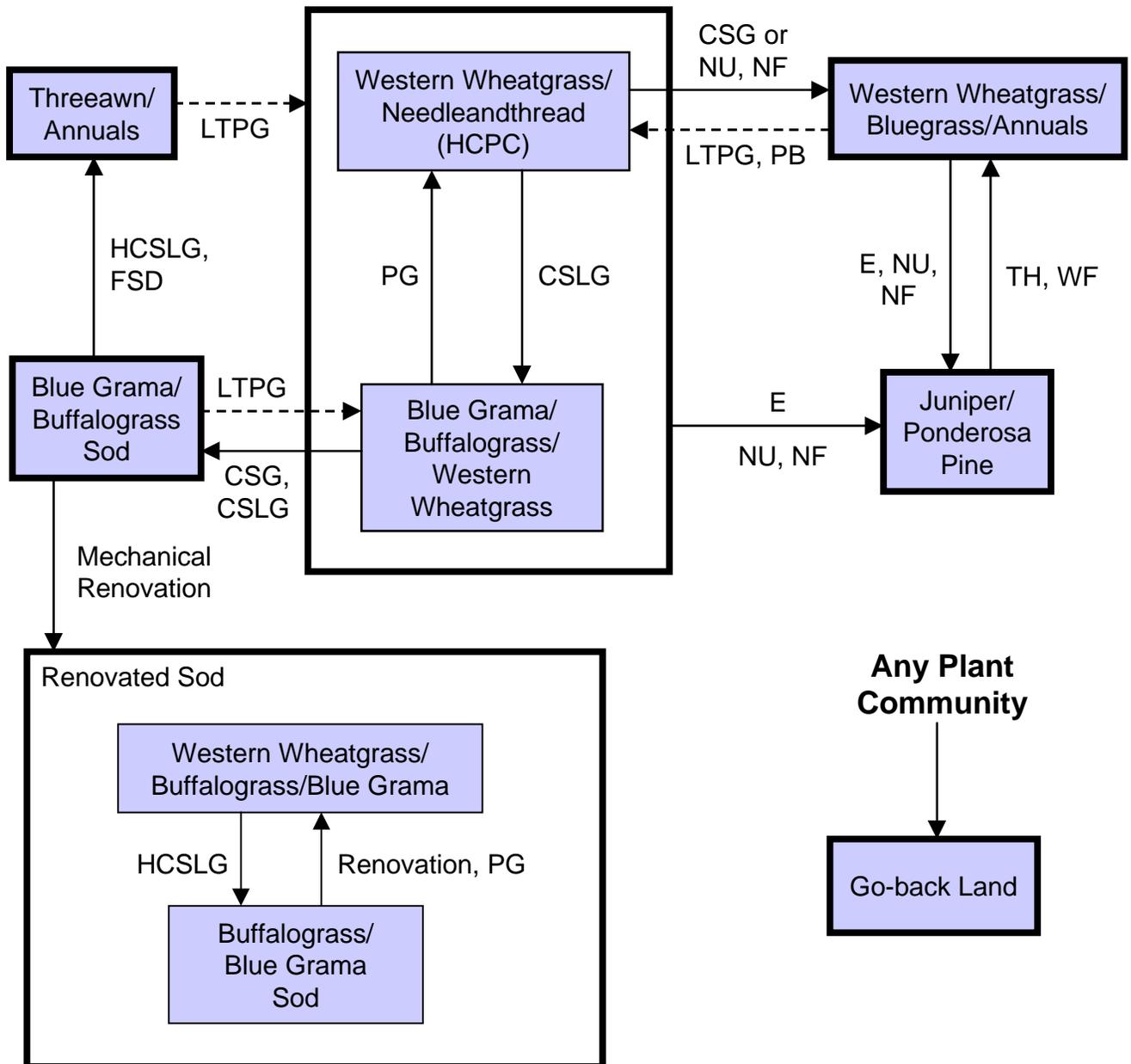
This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts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

Encroachment of ponderosa pine, Rocky Mountain juniper, and eastern red cedar may occur from associated sites and can shift site characteristics. These shifts can alter the site dynamics and potential. These species may occur in small amounts on several plant communities.

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

The following 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



CSG - Continuous seasonal grazing; **CSLG** - Continuous season-long grazing; **E** - Encroachment or escaped; **FSD** - Frequent & severe defoliation (rodents, insects, etc.); **HCPC** - Historic Climax Plant Community; **HCSLG** - Heavy continuous season-long grazing; **LTPG** - Long-term prescribed grazing; **NF** - No fire; **NU** - Non-use; **PB** - Prescribed burn; **PG** - Prescribed grazing; **TH** - Timber harvest; **WF** - Wildfire.

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Western Wheatgrass/ Needleandthread (HCPC)			
			Group	lbs./acre	% Comp	
GRASSES & GRASS-LIKES				1870 - 1980	85 - 90	
RHIZOMATOUS WHEATGRASSES			1	550 - 770	25 - 35	
western wheatgrass	Pascopyrum smithii	PASM	1	440 - 660	20 - 30	
thickspike wheatgrass	Elymus lanceolatus ssp. lanceolatus	ELLAL	1	110 - 220	5 - 10	
NEEDLEGRASS			2	330 - 440	15 - 20	
needleandthread	Hesperostipa comata ssp. comata	HECOC8	2	220 - 440	10 - 20	
green needlegrass	Nassella viridula	NAVI4	2	0 - 220	0 - 10	
WARM-SEASON SHORT GRASSES			3	110 - 220	5 - 10	
blue grama	Bouteloua gracilis	BOGR2	3	110 - 220	5 - 10	
buffalograss	Buchloe dactyloides	BUDA	3	0 - 44	0 - 2	
NATIVE GRASSES & GRASS-LIKES			4	220 - 440	10 - 20	
little bluestem	Schizachyrium scoparium	SCSC	4	22 - 110	1 - 5	
sideoats grama	Bouteloua curtipendula	BOCU	4	110 - 220	5 - 10	
big bluestem	Andropogon gerardii	ANGE	4	0 - 110	0 - 5	
sedge	Carex spp.	CAREX	4	110 - 220	5 - 10	
Scribner panicum	Dichanthelium oligosanthes var. scribnerianum	DIOLS	4	0 - 22	0 - 1	
prairie junegrass	Koeleria macrantha	KOMA	4	0 - 44	0 - 2	
threeawn	Aristida spp.	ARIST	4	0 - 22	0 - 1	
other perennial grasses		2GP	4	0 - 66	0 - 3	
FORBS			6	110 - 220	5 - 10	
American vetch	Vicia americana	VIAM	6	22 - 66	1 - 3	
cudweed sagewort	Artemisia ludoviciana	ARLU	6	22 - 66	1 - 3	
dotted gayfeather	Liatris punctata	LIPU	6	0 - 22	0 - 1	
false boneset	Brickellia eupatorioides	BREU	6	0 - 22	0 - 1	
false gromwell	Onosmodium molle	ONMO	6	0 - 22	0 - 1	
goldenrod	Solidago spp.	SOLID	6	22 - 44	1 - 2	
green sagewort	Artemisia dracunculus	ARDR4	6	0 - 44	0 - 2	
gromwell	Buglossoides arvensis	BUAR3	6	0 - 22	0 - 1	
heath aster	Symphotrichum ericoides	SYER	6	0 - 22	0 - 1	
milkvetch	Astragalus spp.	ASTRA	6	0 - 22	0 - 1	
penstemon	Penstemon spp.	PENST	6	0 - 22	0 - 1	
prairie coneflower	Ratibida columnifera	RACO3	6	0 - 44	0 - 2	
purple coneflower	Echinacea angustifolia	ECAN2	6	0 - 22	0 - 1	
pussytoes	Antennaria spp.	ANTEN	6	0 - 66	0 - 3	
scarlet globemallow	Sphaeralcea coccinea	SPCO	6	0 - 44	0 - 2	
scurfpea	Psoralegium spp.	PSORA2	6	22 - 110	1 - 5	
spiderwort	Tradescantia spp.	TRADE	6	0 - 44	0 - 2	
textile onion	Allium textile	ALTE	6	0 - 22	0 - 1	
verbena	Verbena spp.	VERBE	6	0 - 66	0 - 3	
western ragweed	Ambrosia psilostachya	AMPS	6	22 - 66	1 - 3	
other perennial forbs		2FP	6	0 - 44	0 - 2	
SHRUBS			7	22 - 110	1 - 5	
broom snakeweed	Gutierrezia sarothrae	GUSA2	7	0 - 44	0 - 2	
cactus	Opuntia spp.	OPUNT	7	0 - 22	0 - 1	
fringed sagewort	Artemisia frigida	ARFR4	7	0 - 66	0 - 3	
leadplant	Amorpha canescens	AMCA6	7	0 - 110	0 - 5	
rose	Rosa spp.	ROSA5	7	0 - 66	0 - 3	
snowberry	Symphoricarpos spp.	SYMPH	7	22 - 110	1 - 5	
other shrubs		2SHRUB	7	0 - 44	0 - 2	
Annual Production lbs./acre				LOW	RV	HIGH
GRASSES & GRASS-LIKES				1375 -	1969 -	2560
FORBS				105 -	165 -	225
SHRUBS				20 -	66 -	115
TOTAL				1500 -	2200 -	2900

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/ Needleandthread (HCPC)			Blue Grama/Bufalograss/ Western Wheatgrass			Western Wheatgrass/ Bluegrass/Annals			Blue Grama/Bufalograss Sod		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES			1760 - 1980	80 - 90		1200 - 1350	80 - 90		1280 - 1440	80 - 90		640 - 720	80 - 90
RHIZOMATOUS WHEATGRASSES		1	550 - 770	25 - 35	1	150 - 300	10 - 20	1	320 - 800	20 - 50	1	16 - 40	2 - 5
western wheatgrass	PASM	1	440 - 660	20 - 30	1	150 - 300	10 - 20	1	240 - 640	15 - 40	1	16 - 40	2 - 5
thickspike wheatgrass	ELLAL	1	110 - 220	5 - 10	1	0 - 75	0 - 5	1	80 - 240	5 - 15	1	0 - 8	0 - 1
NEEDLEGRASS		2	330 - 440	15 - 20	2	30 - 150	2 - 10	2	80 - 320	5 - 20	2	0 - 40	0 - 5
needleandthread	HECOC8	2	220 - 440	10 - 20	2	30 - 120	2 - 8	2	32 - 160	2 - 10	2	0 - 40	0 - 5
green needlegrass	NAVI4	2	22 - 220	1 - 10	2	0 - 75	0 - 5	2	32 - 160	2 - 10	2	0 - 8	0 - 1
WARM-SEASON SHORT GRASSES		3	110 - 220	5 - 10	3	300 - 525	20 - 35	3	16 - 128	1 - 8	3	320 - 480	40 - 60
blue grama	BOGR2	3	110 - 220	5 - 10	3	225 - 450	15 - 30	3	16 - 80	1 - 5	3	160 - 440	20 - 55
bufalograss	BUDA	3	0 - 44	0 - 2	3	75 - 150	5 - 10	3	0 - 80	0 - 5	3	80 - 240	10 - 30
NATIVE GRASSES & GRASS-LIKES		4	220 - 440	10 - 20	4	75 - 225	5 - 15	4	80 - 320	5 - 20	4	80 - 160	10 - 20
little bluestem	SCSC	4	22 - 110	1 - 5	4	0 - 45	0 - 3	4	0 - 48	0 - 3	4	0 - 8	0 - 1
sideoats grama	BOCU	4	110 - 220	5 - 10	4	15 - 75	1 - 5	4	16 - 80	1 - 5	4	8 - 64	1 - 8
big bluestem	ANGE	4	0 - 110	0 - 5	4	0 - 30	0 - 2	4	0 - 48	0 - 3	4	0 - 8	0 - 1
sedge	CAREX	4	110 - 220	5 - 10	4	75 - 150	5 - 10	4	32 - 80	2 - 5	4	40 - 80	5 - 10
Scribner panicum	DIOLS	4	0 - 22	0 - 1	4	0 - 15	0 - 1	4	32 - 80	2 - 5	4	0 - 8	0 - 1
prairie junegrass	KOMA	4	0 - 44	0 - 2	4	15 - 30	1 - 2	4	16 - 80	1 - 5	4	8 - 16	1 - 2
sixweeks fescue	VUOC							4	0 - 32	0 - 2	4	0 - 24	0 - 3
Canada wildrye	ELCA4							4	0 - 16	0 - 1			
threeawn	ARIST	4	0 - 22	0 - 1	4	0 - 45	0 - 3	4	0 - 16	0 - 1	4	8 - 40	1 - 5
dropseed	SPORO							4	0 - 32	0 - 2	4	8 - 40	1 - 5
other perennial grasses	2GP	4	0 - 66	0 - 3	4	0 - 45	0 - 3	4	0 - 48	0 - 3	4	0 - 24	0 - 3
NON-NATIVE GRASSES		5			5	15 - 120	1 - 8	5	240 - 640	15 - 40	5	16 - 80	2 - 10
cheatgrass	BRTE				5	15 - 75	1 - 5	5	16 - 160	1 - 10	5	16 - 80	2 - 10
Kentucky bluegrass	POPR				5	0 - 75	0 - 5	5	240 - 640	15 - 40	5	0 - 40	0 - 5
smooth brome	BRIN2							5	0 - 80	0 - 5			
FORBS		6	110 - 330	5 - 15	6	75 - 225	5 - 15	6	80 - 240	5 - 15	6	40 - 120	5 - 15
American vetch	VIAM	6	22 - 66	1 - 3	6	15 - 45	1 - 3	6	16 - 48	1 - 3	6	8 - 24	1 - 3
cudweed sagewort	ARLU	6	22 - 66	1 - 3	6	15 - 45	1 - 3	6	32 - 80	2 - 5	6	8 - 24	1 - 3
dotted gayfeather	LIPU	6	0 - 22	0 - 1	6	0 - 15	0 - 1	6	0 - 16	0 - 1	6	0 - 8	0 - 1
false bonaset	BREU	6	0 - 22	0 - 1	6	0 - 15	0 - 1	6	0 - 16	0 - 1			
false gromwell	ONMO	6	0 - 22	0 - 1	6	0 - 15	0 - 1	6	0 - 16	0 - 1			
fetid marigold	DYPA										6	0 - 8	0 - 1
goldenrod	SOLID	6	22 - 44	1 - 2	6	0 - 15	0 - 1	6	16 - 48	1 - 3	6	0 - 8	0 - 1
green sagewort	ARDR4	6	0 - 44	0 - 2	6	15 - 30	1 - 2	6	0 - 32	0 - 2	6	8 - 40	1 - 5
gromwell	BUAR3	6	0 - 22	0 - 1	6	0 - 15	0 - 1	6	0 - 16	0 - 1	6	0 - 8	0 - 1
heath aster	SYER	6	0 - 22	0 - 1	6	0 - 30	0 - 2	6	16 - 48	1 - 3	6	8 - 24	1 - 3
milkvetch	ASTRA	6	0 - 22	0 - 1	6	0 - 15	0 - 1	6	0 - 16	0 - 1	6	0 - 8	0 - 1
penstemon	PENST	6	0 - 22	0 - 1	6	0 - 15	0 - 1	6	0 - 16	0 - 1			
prairie coneflower	RACO3	6	0 - 44	0 - 2	6	15 - 30	1 - 2	6	0 - 16	0 - 1	6	8 - 24	1 - 3
purple coneflower	ECAN2	6	0 - 22	0 - 1	6	0 - 15	0 - 1	6	0 - 16	0 - 1	6	0 - 8	0 - 1
pussytoes	ANTEN	6	0 - 66	0 - 3	6	15 - 60	1 - 4	6	0 - 32	0 - 2	6	8 - 40	1 - 5
salsify	TRAGO				6	15 - 30	1 - 2	6	16 - 32	1 - 2	6	8 - 24	1 - 3
scarlet globemallow	SPCO	6	0 - 44	0 - 2	6	0 - 30	0 - 2	6	0 - 32	0 - 2	6	0 - 16	0 - 2
scurfpea	PSORA2	6	22 - 110	1 - 5	6	15 - 75	1 - 5	6	16 - 80	1 - 5	6	16 - 40	2 - 5
spiderwort	TRADE	6	0 - 44	0 - 2	6	0 - 30	0 - 2	6	0 - 32	0 - 2			
textile onion	ALTE	6	0 - 22	0 - 1	6	15 - 30	1 - 2	6	16 - 32	1 - 2	6	8 - 16	1 - 2
verbena	VERBE	6	0 - 66	0 - 3	6	15 - 45	1 - 3	6	32 - 64	2 - 4	6	8 - 24	1 - 3
western ragweed	AMPS	6	22 - 66	1 - 3	6	15 - 45	1 - 3	6	16 - 128	1 - 8	6	8 - 24	1 - 3
other perennial forbs	2FP	6	0 - 44	0 - 2	6	0 - 30	0 - 2	6	0 - 32	0 - 2	6	0 - 16	0 - 2
SHRUBS		7	22 - 110	1 - 5	7	15 - 75	1 - 5	7	16 - 80	1 - 5	7	8 - 40	1 - 5
broom snakeweed	GUSA2	7	0 - 44	0 - 2	7	0 - 30	0 - 2	7	0 - 32	0 - 2	7	8 - 24	1 - 3
cactus	OPUNT	7	0 - 22	0 - 1	7	0 - 15	0 - 1	7	0 - 32	0 - 2	7	8 - 24	1 - 3
fringed sagewort	ARFR4	7	0 - 66	0 - 3	7	15 - 75	1 - 5	7	0 - 32	0 - 2	7	8 - 40	1 - 5
leadplant	AMCA6	7	0 - 110	0 - 5									
rose	ROSA5	7	0 - 66	0 - 3	7	0 - 45	0 - 3	7	0 - 32	0 - 2			
snowberry	SYMPH	7	22 - 110	1 - 5	7	15 - 75	1 - 5	7	16 - 80	1 - 5	7	0 - 40	0 - 5
other shrubs	2SHRUB	7	0 - 44	0 - 2	7	0 - 30	0 - 2	7	0 - 32	0 - 2	7	0 - 8	0 - 1
TREES		8			8	0 - 15	0 - 1	8	0 - 48	0 - 3	8		
juniper	JUNIP				8	0 - 15	0 - 1	8	0 - 48	0 - 3			
ponderosa pine	PIPO				8	0 - 15	0 - 1	8	0 - 48	0 - 3			
Annual Production lbs./acre			LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH
GRASSES & GRASS-LIKES			1375 - 1914 - 2435		1020 - 1298 - 1570		710 - 1368 - 1815		460 - 696 - 830				
FORBS			105 - 220 - 350		70 - 150 - 230		75 - 160 - 250		35 - 80 - 125				
SHRUBS			20 - 66 - 115		10 - 45 - 80		15 - 48 - 85		5 - 24 - 45				
TREES			0 - 8 - 20		0 - 8 - 20		0 - 24 - 50						
TOTAL			1500 - 2200 - 2900		1100 - 1500 - 1900		800 - 1600 - 2200		500 - 800 - 1000				

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

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	Western Wheatgrass/ Needleandthread (HCPC)			Juniper/Ponderosa Pine			Threawn/Annuals			
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	
GRASSES & GRASS-LIKES			1870 - 1980	85 - 90		240 - 480	30 - 60		420 - 560	60 - 80	
RHIZOMATOUS WHEATGRASSES		1	550 - 770	25 - 35	1	40 - 120	5 - 15	1	7 - 35	1 - 5	
western wheatgrass	PASM	1	440 - 660	20 - 30	1	40 - 120	5 - 15	1	7 - 35	1 - 5	
thickspike wheatgrass	ELLAL	1	110 - 220	5 - 10	1	0 - 40	0 - 5	1	0 - 7	0 - 1	
NEEDLEGRASS		2	330 - 440	15 - 20	2	40 - 80	5 - 10	2	0 - 35	0 - 5	
needleandthread	HECOC8	2	220 - 440	10 - 20	2	16 - 80	2 - 10	2	0 - 35	0 - 5	
green needlegrass	NAVI4	2	0 - 220	0 - 10	2	0 - 40	0 - 5	2	0 - 7	0 - 1	
WARM-SEASON SHORT GRASSES		3	110 - 220	5 - 10	3	8 - 40	1 - 5	3	0 - 35	0 - 5	
blue grama	BOGR2	3	110 - 220	5 - 10	3	8 - 24	1 - 3	3	0 - 35	0 - 5	
buffalograss	BUDA	3	0 - 44	0 - 2	3	0 - 16	0 - 2	3	0 - 14	0 - 2	
NATIVE GRASSES & GRASS-LIKES		4	220 - 440	10 - 20	4	240 - 520	30 - 65	4	280 - 525	40 - 75	
little bluestem	SCSC	4	22 - 110	1 - 5	4	16 - 80	2 - 10	4	0 - 14	0 - 2	
sideoats grama	BOCU	4	110 - 220	5 - 10	4	8 - 40	1 - 5				
big bluestem	ANGE	4	0 - 110	0 - 5	4	0 - 80	0 - 10				
sedge	CAREX	4	110 - 220	5 - 10	4	16 - 80	2 - 10	4	0 - 7	0 - 1	
Scribner panicum	DIOLS	4	0 - 22	0 - 1	4	0 - 24	0 - 3	4	0 - 35	0 - 5	
prairie junegrass	KOMA	4	0 - 44	0 - 2	4	16 - 40	2 - 5				
sixweeks fescue	VUOC							4	0 - 7	0 - 1	
Canada wildrye	ELCA4				4	8 - 80	1 - 10				
threawn	ARIST	4	0 - 22	0 - 1				4	350 - 490	50 - 70	
dropseed	SPORO				4	0 - 40	0 - 5				
other perennial grasses	ZGP	4	0 - 66	0 - 3	4	8 - 40	1 - 5	4	0 - 14	0 - 2	
NON-NATIVE GRASSES		5			5	40 - 160	5 - 20	5	14 - 70	2 - 10	
cheatgrass	BRTE				5	8 - 80	1 - 10	5	14 - 70	2 - 10	
Kentucky bluegrass	POPR				5	40 - 120	5 - 15	5	0 - 14	0 - 2	
smooth bromegrass	BRIN2				5	0 - 8	0 - 1				
FORBS		6	110 - 220	5 - 10	6	40 - 80	5 - 10	6	70 - 140	10 - 20	
American vetch	VIAM	6	22 - 66	1 - 3	6	0 - 16	0 - 2				
cutweed sagewort	ARLU	6	22 - 66	1 - 3	6	8 - 24	1 - 3	6	7 - 21	1 - 3	
dotted gayfeather	LIPU	6	0 - 22	0 - 1	6	0 - 16	0 - 2				
false bonaset	BREU	6	0 - 22	0 - 1	6	0 - 8	0 - 1				
false gromwell	ONMO	6	0 - 22	0 - 1	6	0 - 16	0 - 2				
fetid marigold	DYPA							6	14 - 56	2 - 8	
goldenrod	SOLID	6	22 - 44	1 - 2	6	0 - 24	0 - 3				
green sagewort	ARDR4	6	0 - 44	0 - 2				6	0 - 7	0 - 1	
gromwell	BUAR3	6	0 - 22	0 - 1							
heath aster	SYER	6	0 - 22	0 - 1	6	0 - 8	0 - 1	6	0 - 14	0 - 2	
milkvetch	ASTRA	6	0 - 22	0 - 1	6	0 - 8	0 - 1	6	0 - 7	0 - 1	
penstemon	PENST	6	0 - 22	0 - 1							
prairie coneflower	RACO3	6	0 - 44	0 - 2	6	0 - 8	0 - 1	6	0 - 7	0 - 1	
purple coneflower	ECAN2	6	0 - 22	0 - 1	6	0 - 8	0 - 1				
pussytoes	ANTEN	6	0 - 66	0 - 3	6	8 - 16	1 - 2	6	0 - 35	0 - 5	
salsify	TRAGO				6	0 - 8	0 - 1	6	0 - 7	0 - 1	
scarlet globemallow	SPCO	6	0 - 44	0 - 2				6	0 - 7	0 - 1	
scurfpea	PSORA2	6	22 - 110	1 - 5	6	0 - 16	0 - 2				
spiderwort	TRADE	6	0 - 44	0 - 2	6	0 - 16	0 - 2				
textile onion	ALTE	6	0 - 22	0 - 1	6	0 - 8	0 - 1	6	0 - 21	0 - 3	
verbena	VERBE	6	0 - 66	0 - 3	6	8 - 24	1 - 3	6	14 - 70	2 - 10	
western ragweed	AMPS	6	22 - 66	1 - 3	6	8 - 24	1 - 3	6	0 - 35	0 - 5	
other perennial forbs	ZFP	6	0 - 44	0 - 2	6	8 - 24	1 - 3	6	0 - 70	0 - 10	
SHRUBS		7	22 - 110	1 - 5	7	40 - 160	5 - 20	7	35 - 140	5 - 20	
broom snakeweed	GUSA2	7	0 - 44	0 - 2				7	7 - 21	1 - 3	
cactus	OPUNT	7	0 - 22	0 - 1				7	0 - 14	0 - 2	
fringed sagewort	ARFR4	7	0 - 66	0 - 3	7	0 - 24	0 - 3	7	35 - 105	5 - 15	
leadplant	AMCA6	7	0 - 110	0 - 5	7	0 - 8	0 - 1				
rose	ROSA5	7	0 - 66	0 - 3	7	8 - 40	1 - 5				
snowberry	SYMPH	7	22 - 110	1 - 5	7	16 - 40	2 - 5				
other shrubs	ZSHRUB	7	0 - 44	0 - 2	7	0 - 80	0 - 10				
TREES		8			8	80 - 160	10 - 20	8			
juniper	JUNIP				8	80 - 160	10 - 20				
ponderosa pine	PIPO				8	16 - 80	2 - 10				
Annual Production lbs./acre			LOW	RV	HIGH	LOW	RV	HIGH	LOW	RV	HIGH
GRASSES & GRASS-LIKES			1375	1969	2560	355	520	685	305	508	710
FORBS			105	165	225	35	60	85	65	105	145
SHRUBS			20	66	115	35	100	165	30	88	145
TREES						75	120	165			
TOTAL			1500	2200	2900	500	800	1100	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.

Plant Community and Vegetation State Narratives

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

Western Wheatgrass/Needleandthread Plant Community

The plant community upon which interpretations are primarily based is the Western Wheatgrass/Needleandthread Plant Community. This is also considered the HCPC. 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 85-90 percent grasses or grass-like plants, 5-10 percent forbs, and 1-5 percent shrubs. Cool-season grasses dominate the plant community. Major grasses include western wheatgrass and needleandthread. Other grasses occurring on the site include green needlegrass, blue grama, little bluestem, sideoats grama, and sedge. Significant forbs include American vetch, cudweed sagewort, scurfpea, western ragweed, and goldenrod. The significant shrub that occurs in patchy mosaics is western snowberry. Other shrubs include rose, leadplant, and broom snakeweed.

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). Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Moderate or high available water capacity provides a favorable soil-water-plant relationship.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:

Growth curve number: SD6001

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

Growth curve description: Cool-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	4	12	25	36	10	5	4	4	0	0

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

- Continuous season-long grazing will lead to *Blue Grama/Buffalograss/Western Wheatgrass Plant Community*.
- Continuous seasonal grazing, or nonuse and no fire will lead to the *Western Wheatgrass/Bluegrass/Annuals Plant Community*.
- Encroachment (or escaped), nonuse, and no fire will lead to a *Juniper/Ponderosa Pine Plant Community*. This occurs when this plant community is protected from natural fires, or controlled burning.

Blue Grama/Buffalograss/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 80-90 percent grasses and grass-like species, 5-15 percent forbs, and 1-5 percent shrubs. The dominant grasses include blue grama, buffalograss, western wheatgrass, needleandthread, and threadleaf sedge. Other grasses may include needleandthread, sideoats grama, prairie Junegrass, red threeawn, bluegrass, little bluestem, and big bluestem. The dominant forbs include scurfpeas, western ragweed, cudweed sagewort, scarlet globemallow, and other perennial aster species. Dominant shrubs in this community include western snowberry and wild rose. Broom snakeweed may also be present in significant amounts. Compared to the Western Wheatgrass/Needleandthread Plant Community, the shortgrass species including blue grama and buffalograss have increased. The cool-season species including western wheatgrass and needlegrasses have decreased in composition. Annual bromes, woolly Indianwheat, and other annual grasses and forbs can invade the site. While plant diversity is relatively high, the structure of the community is dominated by short grasses.

This plant community is resistant to change. The dominant herbaceous species are mid- to tall grasses and are very adapted to grazing; however, these grass species and the more palatable forbs will decrease in the community through long-term overgrazing. Soil erosion is low to moderate. Because of the sod forming habit of the dominant shortgrass species, water infiltration is low and runoff is moderate to high. Typically, the runoff is very clean because of the low potential for soil erosion.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:

Growth curve number: SD6003

Growth curve name: Pierre Shale Plains, cool-season/warm-season codominant.

Growth curve description: Cool-season, warm-season codominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	20	28	21	10	5	3	0	0

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

- With prescribed grazing, which includes moderate grazing pressure during the early spring (prior to May 1) and fall seasons (cool-season regrowth) and with favorable growing conditions this plant community will move towards the *Western Wheatgrass/Needleandthread Plant Community*. Periods of nonuse or deferment may be a management option to reach the HCPC. With favorable climatic conditions and proper management, this plant community can move to the *Western Wheatgrass/Needleandthread Plant Community* within four to eight years.
- With continuous seasonal grazing this plant community will move towards the *Blue Grama/Buffalo-grass Sod Plant Community*. This would be typical of calving/lambing pastures where the unit is continuously utilized during the late winter through midspring. This transition will result in decreased forage production and plant species diversity. This transition can also occur with continuous season-long grazing at high utilization levels. A blue grama, buffalograss sod will require significant economic inputs (i.e., high animal impact, mechanical renovation, etc.) and time to move it back to the *Blue Grama/Buffalograss/Western Wheatgrass Plant Community*.

- Encroachment (or escaped), nonuse, no fire will lead to a *Juniper/Ponderosa Pine Plant Community*. This occurs when this plant community is protected from natural fires or controlled burning.

Western Wheatgrass/Bluegrass/Annuals Plant Community

This plant community developed under continuous seasonal grazing or under extended periods of nonuse and no fire where a heavy litter layer builds up that can favor cool-season species and invasion of bluegrass, annual brome, and other invaders. Initially, the dominant grasses include bluegrass, western wheatgrass, needleandthread, and green needlegrass. Other grasses may include blue grama, buffalograss, threeawn, and prairie Junegrass. With continued seasonal grazing and/or nonuse and no fire, the plant community becomes dominated by bluegrass, annual brome, and other annual grasses and less palatable forbs. Sedges will flourish in the understory. The dominant forbs include western ragweed, scurfpeas, cudweed sagewort, and verbenas. Dominant shrubs in this community include snowberry, rose, and plains pricklypear. Compared to the Western Wheatgrass/Needleandthread Plant Community, bluegrass increases significantly. Western wheatgrass and blue grama decrease in composition. Plant diversity declines.

This plant community is resistant to change, and if disturbed, it is resilient. Bluegrass will increase under grazing pressure. Cool, moist climatic conditions will also tend to increase bluegrass production. Soil erosion is low. Compared to the HCPC, infiltration is reduced and runoff increases. Once this plant community is reached, time and external resources will be needed to see any immediate recovery in the diversity of the site.

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: SD6001

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

Growth curve description: Cool-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	4	12	25	36	10	5	4	4	0	0

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

- With prescribed grazing, or prescribed burning followed by prescribed grazing, this plant community will move toward the *Western Wheatgrass/Needleandthread Plant Community*. This would require long-term prescribed grazing at moderate rates with favorable climatic conditions.
- Encroachment (or escaped), nonuse and no fire will lead to a *Juniper/Ponderosa Pine Plant Community*. This occurs when this plant community is protected from natural fires or controlled burning.

Blue Grama/Buffalograss Sod Plant Community

This plant community is the result of heavy overuse and/or continuous seasonal grazing. Blue grama and buffalograss are the dominant species with the balance being a few species of cool-season grasses, warm-season grasses, and miscellaneous forbs. Some of the minor species are western wheatgrass, threeawn, sedges, needleandthread, prairie Junegrass, sideoats grama, and annual brome. There are a few forbs such as western ragweed, cudweed sagewort, green sagewort, and scarlet globemallow. The dominant shrubs include broom snakeweed and fringed sagewort. There is usually less than 10 percent bare ground.

When compared to the Western Wheatgrass/Needleandthread Plant Community, blue grama and buffalograss have increased significantly. The mid- to tall grasses have declined dramatically. There is a chance that cheatgrass has invaded the site. Annual production has decreased significantly.

This plant community is resistant to change, as the dominant shortgrass species are very resistant to over-grazing. The thick sod prevents other species from getting established. This area provides reduced grazing use for livestock or wildlife. The quickest means to make this a productive site again is to do some sort of mechanical treatment, such as interseeding or chiseling. Most landowners; however, will farm the area for two or three years and then replant the area to mixture of tame or native grasses. Runoff will increase and infiltration will decrease. Soil erosion will be minimal due to the sod forming habit of blue grama and buffalograss. This could be advantageous for heavy use areas such as calving/lambing units; however, nutrient runoff could be a potential problem.

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: SD6005

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

Growth curve description: Warm-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	2	5	15	25	30	15	7	1	0	0

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

- Long-term prescribed grazing, will allow the site to return to the *Blue Grama/Buffalograss/Western Wheatgrass Plant Community*. This method of treatment will allow the site to return to the *Western Wheatgrass/Needleandthread Plant Community*. This method will take a long period of time (10+ years) and intensive management.
- With heavy continuous season-long grazing or severe defoliation, this plant community will move toward the *Threeawn/Annuals Plant Community*. Forage production, species diversity, and ground cover will decrease.
- Mechanical treatment such as interseeding or chiseling will move this to the *Renovated Sod Western Wheatgrass/Buffalograss/Blue Grama Plant Community*. This will likely improve the productivity of this site. Mechanical renovation is not likely to take you back to the *Western Wheatgrass/Needleandthread Plant Community*.

Juniper/Ponderosa Pine Plant Community

Historically, ponderosa pine was confined to ridges and steep shallow slopes located adjacent to this ecological site. Currently, ponderosa pine and juniper are expanding on to this ecological site due to the suppression of fire. Juniper/pine canopy is greater than 30 percent of mature trees. The understory production is made up of about 30-60 percent grasses and grass-like species, 5-10 percent forbs, and 5-20 percent shrubs. Dominant grasses include western wheatgrass, bluegrass, and needleandthread. Other grasses present include little bluestem, green needlegrass, threeawn, prairie Junegrass, Canada wildrye, and annual brome. Forbs commonly found include western ragweed, verbena, cudweed sagewort, fringed sagewort, and pussytoes.

When compared to the Western Wheatgrass/Needleandthread Plant Community, ponderosa pine or juniper increases significantly. The grass component decreases dramatically. Annual production also decreases significantly. While the juniper/pine canopy provides excellent protection from the weather

for both livestock and wildlife, it is not capable of supporting large numbers of wildlife and livestock due to decreased production.

This vegetation state is resistant to change. A significant reduction of juniper/pine can only be accomplished through timber harvest or crown fire. The vegetation in the understory is capable of enduring fire; however, very hot crown fires will have a detrimental effect to the plant community. Reclamation of juniper/pine dominated areas can be costly and prove to be temporary without proper management (i.e., prescribed burning and prescribed grazing).

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: SD6011

Growth curve name: Pierre Shale Plains, heavy conifer canopy.

Growth curve description: Mature ponderosa pine/juniper overstory.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	3	7	11	24	27	12	5	4	3	2	1

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

- Wildfire (hot, crown fires) will move this plant community to the *Western Wheatgrass/Bluegrass/Annuals Plant Community*.
- Removal of juniper/pine by timber harvest will allow the understory to develop and convert to the *Western Wheatgrass/Bluegrass/Annuals Plant Community*.

Threeawn/Annuals Plant Community

This plant community developed under continuous heavy grazing and/or disturbance. The potential plant community is made up of approximately 60-80 percent grasses and grass-like species, 10-20 percent forbs, and 5-20 percent shrubs. The dominant grasses include red threeawn, annual brome grasses, and Scribner panicum. Other grasses may include little bluestem, blue grama, buffalograss, sedges, western wheatgrass, and sixweeks fescue. The dominant forbs include fringed sagewort, fetid marigold, western ragweed, pussytoes, prostrate verbena, and other annual invader-like species. Other plant species, from adjacent ecological sites, can become minor components of this plant community. This plant community is susceptible to invasion of Canada thistle and other nonnative species because of the relatively high percent of bare ground. Compared to the Western Wheatgrass/Needleandthread Plant Community, red threeawn, annual brome grasses, and percent of bare ground has increased. Western wheatgrass, needlegrasses, and other cool-season grasses and grass-like species have decreased as have the warm-season species including big bluestem, sideoats grama, blue grama, and buffalograss. Many annual and perennial forbs, including native and nonnative species, have invaded the site. Plant diversity is low.

This plant community is very resistant to change because of the loss of plant diversity and overall soil disturbance. It is very susceptible to invasion of nonnative plant species. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor.

This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community and the plant communities

on adjacent sites. This site can be renovated to improve the production capability; however, if management changes are not made the vegetation could revert back to a threeawn/annual 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: SD6003

Growth curve name: Pierre Shale Plains, cool-season/warm-season codominant.

Growth curve description: Cool-season, warm-season codominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	20	28	21	10	5	3	0	0

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

- Under long-term prescribed grazing, including adequate recovery periods, this plant community will move through the successional stages leading to the *Western Wheatgrass/Needleandthread Plant Community*. Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly. This method will take a long period of time (10+ years) and intensive management.
- Mechanical treatment such as interseeding or chiseling will help improve the productivity of this site. This will be the fastest way to return to a productive site. The landowner can plant a variety of different species he/she deems to be desirable. This pathway will not take you back to the *Western Wheatgrass/Needleandthread Plant Community*.

Go-back Land

The **Go-back** plant community can be reached whenever severe mechanical disturbance occurs (e.g., tilled and abandoned land, either past or present). 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 species vary greatly, sometimes being dominated by threeawn, annual brome, crested wheatgrass, buffalograss, dropseeds, broom snakeweed, verbena, sweet clover, mullein, and nonnative thistles. Other plants that commonly occur on the site include western wheatgrass, deathcamas, prickly lettuce, maretail, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health.

Renovated Sod Vegetation State

An altered vegetation community can be achieved through mechanical renovation. Renovation creates microrelief that alters the water cycle by increasing infiltration and decreasing runoff. The renovation reduces the sod-bound conditions, increasing the vegetative production potential. These factors favor cool-season species such as western wheatgrass, green needlegrass, and a variety of forbs.

The renovated **Western Wheatgrass/Buffalograss/Blue Grama Plant Community** will have similar plant composition and growth curve characteristics as the Blue Grama/Buffalograss/Western Wheatgrass Plant Community or possibly the HCPC. However, the production will likely be higher, depending on the degree of alteration. Proper grazing management must be implemented to maintain this plant community.

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

- Heavy, continuous season-long grazing will shift this plant community to the renovated *Buffalograss/Blue Grama Sod Plant Community*. Proper grazing management must be included in order to derive the benefits of renovation.

The renovated **Buffalograss/Blue Grama Sod Plant Community** is similar to the nonrenovated Blue Grama/Buffalograss Plant Community in most respects. The main difference is the microrelief created by the renovation.

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

- Mechanical renovation (specifically contour furrowing), or prescribed grazing will move this plant community to the renovated *Western Wheatgrass/Buffalograss/Blue Grama Plant Community*. Proper grazing management must be included in order to derive the benefits of renovation.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

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

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

Within MLRA 60A, the Loamy 16-18" P.Z. Ecological Site provides upland grassland cover with an associated forb and shrub component. It was typically part of an expansive grassland landscape that included combinations of Shallow Loamy, Shallow Clayey, Thin Loamy, Claypan, Sandy, Sandy Claypan, Clayey, and Thin Claypan Ecological Sites. This site provided habitat for species requiring unfragmented grassland. Important habitat features and components found commonly or exclusively on this site may include greater sage-grouse and sharp-tailed grouse leks; upland nesting habitat for grassland birds, forbs and insects for brood habitat; and a forage source for small and large herbivores. Many grassland and shrub steppe nesting bird populations are declining. Extirpated

species include free-ranging American bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Loamy 16-18" P.Z. Ecological Site remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, 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/Needleandthread (HCPC): The predominance of grasses plus high diversity of forbs and shrubs in this community favors grazers and mixed-feeders, such as deer and pronghorn. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. The complex plant structural diversity provides habitat for a wide array of migratory and resident birds. Grasshopper sparrow, lark bunting, western meadowlark, 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 sharp-tailed grouse. Species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail will rarely use this site. 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 squirrel, white-tailed jackrabbit, and deer. This ecological site provides excellent wintering habitat for pronghorn. The moderate stature of this plant community provides suitable thermal, protective, and escape cover for small herbivores and grassland birds. Predators utilizing this plant community 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/Buffalograss/Western Wheatgrass: Resulting from continuous seasonal grazing or from overutilization during extended drought periods, blue grama, buffalograss, and western wheatgrass will dominate. Both the forb and shrub components of the plant community remain relatively unchanged. This plant community may provide areas suitable for grouse lek site development. Species such as the horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will increase. Species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail will rarely use this site.

Scattered juniper and ponderosa pine provide habitat for various small mammals and songbirds when present on the site. The shift to shorter plant structure will favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, tiger salamander, and swift fox. The short stature of this plant community limits thermal, protective, and escape cover. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel.

Western Wheatgrass/Bluegrass/Annuals: Resulting from continuous seasonal grazing or nonuse or no fire, western wheatgrass, bluegrass, and annuals will dominate. The forb diversity and abundance remains relatively unchanged. Shrub diversity decreases. A grass diversity shift to favor invasive species and excessive litter buildup substantially diminishes wildlife habitat quality for grassland nesting songbirds. Scattered juniper and ponderosa pine provide habitat for various small mammals and songbirds when present on the site.

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

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

Buffalograss/Blue Grama Sod: This plant community develops under heavy continuous season-long grazing, and with continuous seasonal grazing with concentrated use in the spring. Both forb and shrub diversity and abundance 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 the horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will continue to use this site. 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 thermal, protective, and escape cover. Prey populations are reduced but are more vulnerable to predation by raptors and mammalian predators. 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 and nutrient loads. Elevated surface temperatures resulting from reduced cover and litter will greatly reduce habitat for most amphibian species, grassland birds, and mammals.

Threeawn/Annuals: Resulting from heavy continuous season-long grazing over many years or frequent and severe defoliation, threeawn and annuals will dominate. Both forb and shrub abundance increases; however, forb and shrub diversity significantly decrease. A shift to short plant structure and relatively high percent of bare ground 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. 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.

Juniper/Ponderosa Pine: Resulting from no fire, nonuse, and/or encroachment, juniper and Ponderosa pine will expand from ridges and steep shallow slopes. Forb diversity has decreased while shrub abundance has increased. Juniper and Ponderosa pine increase significantly. Grass species decline dramatically and species composition shifts and can become dominated by invasive species. Juniper and Ponderosa pine stands provide nesting cover, escape cover, and den sites for a variety of species. Species such as mule deer, white-footed mice, bushy-tailed woodrat, black-billed magpie, Townsend's solitaire, western meadowlark, Bohemian waxwing, dark-eyed junco, brown thrasher, lark sparrow, and white-crowned sparrow will increase. Species such as meadow voles, thirteen-lined ground squirrel, northern grasshopper mice, and western harvest mice will not utilize

this site. Grassland nesting songbirds will be significantly reduced. Raptors such as the long-eared owl will increase.

If the tree canopy is high enough then bare ground will likely increase and excessive runoff, nutrient and sediment loads may impact offsite aquatic habitat.

Go-back, Introduced, and/or Invaded States

This group includes 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 brome grasses, 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.

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.

Western Wheatgrass/Buffalograss/Blue Grama Plant Community (Renovated): See the description for the Blue Grama/Buffalograss/Western Wheatgrass Plant Community.

Buffalograss/Blue Grama Sod Plant Community (Renovated): See the description for the Blue Grama/Buffalograss Sod Plant Community.

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses & Grass-likes							
big bluestem	U D P D	U U D U	U D P D	U D U U	U D U U	U D P D	U D P D
blue grama	U D P D	D P P D	U D P U	D P P D	D P P D	U D P U	U D P U
buffalograss	U U P D	U U P D	U U D U	N U D U	N U D U	U U D U	U U D U
green needlegrass	U P U D	N P N P	U P U D	N P N P	N P N P	U P U D	U P U D
little bluestem	U D D U	U U D U	U D D U	N D N N	N D N N	U D D U	U D D U
needleandthread	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
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
Scribner panicum	U U D U	N U N N	U U D U	N U N N	N U N N	U U D U	U U D U
sedge	U P U D	U P U D	U D U D	U D U D	U D U D	U D U D	U D U D
sideoats grama	U D P D	U P D D	U D P U	U P D U	U P D U	U D P U	U D P U
thickspike wheatgrass	U D D U	U D U U	U D D U	N D N N	N D N N	U D D U	U D D U
threeawn	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
western wheatgrass	U P D D	U D U U	U P D U	N D N N	N D N N	U P D U	U P D U
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
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
dotted gayfeather	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
false boneset	U U D U	N D U N	U U D U	N D U N	N D U N	U U D U	N D U N
false gromwell	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
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
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
gromwell	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
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
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
penstemon	U U U U	U P P U	U U U U	U P P U	U P P U	U U U U	U P P U
prairie coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
purple coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
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
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
spiderwort	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
textile 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
verbena	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
western ragweed	U U U U	U U U U	U U U U	N N N N	N N N N	U U U U	N N N N
Shrubs							
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
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
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
leadplant	U P D U	U P D U	U P D U	U P D U	U P D U	U P D U	U P D U
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
snowberry	U U U U	U U U U	U U U U	D U D D	U U U U	U U U U	D U U U

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

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

Animal Community – Grazing Interpretations

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this Ecological Site Description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community	Average Annual Production (lbs./acre, air-dry)	Stocking Rate* (AUM/acre)
Western Wheatgrass/Needleandthread (HCPC)	2,200	0.60 – 0.70
Blue Grama/Buffalograss/Western Wheatgrass	1,500	0.45 – 0.53
Western Wheatgrass/Bluegrass/Annuals	1,600	**
Blue Grama/Buffalograss Sod	800	0.20 – 0.30
Renovated Western Wheatgrass/Green Needlegrass/ Buffalograss/Blue Grama	2,500	0.80**
Renovated Buffalograss/Blue Grama	900	0.30**
Juniper/Ponderosa Pine	800	**
Threawn/Annuals	700	0.12 – 0.18**

*Based on 790 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to USDA NRCS, National Range and Pasture Handbook).

**Highly variable; stocking rate needs to be determined onsite.

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 groups B and C. Infiltration is generally moderate and runoff potential varies from low to moderate 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

Other Products

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

Supporting Information

Associated Sites

- (060AY024SD) – Shallow Loamy
- (060AY020SD) – Loamy Overflow
- (060AY009SD) – Sandy
- (060AY012SD) – Thin Upland
- (060AY040SD) – Clayey 16-18" P.Z.

Similar Sites

- (060AY040SD) – Clayey 16-18" P.Z.
[green needlegrass dominant; needleandthread minor component]
- (060AY020SD) – Loamy Overflow
[less needleandthread; more big bluestem; more productive]

Inventory Data References

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used. Those involved in developing this site description include: Stan Boltz, Range Management Specialist (RMS), NRCS; Brandon Brazee, RMS, NRCS; Darrel DuVall, RMS, NRCS; Jill Epley, RMS, NRCS; Cheryl Nielsen, RMS, NRCS; Rick Peterson, RMS, NRCS; Maxine Rasmussen, RMS, NRCS; and Mike Stirling, RMS, NRCS.

<u>Data Source</u>	<u>Number of Records</u>	<u>Sample Period</u>	<u>State</u>	<u>County</u>
SCS-RANGE-417	3	1981 – 1989	SD	Pennington

State Correlation

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

Field Offices

Belle Fourche, SD	Custer, SD	Martin, SD	Rapid City, SD	Sturgis, SD
Chadron, NE	Hot Springs, SD	Pine Ridge, SD	Rushville, NE	Wall, SD

Relationship to Other Established Classifications

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

Other References

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

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

USDA, NRCS. National Range and Pasture Handbook, September 1997.

USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (<http://soils.usda.gov/technical/nasis>)

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

USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

USDA, NRCS, Various Published Soil Surveys.

Site Description Approval

NE, State Range Management Specialist Date

SD, State Range Management Specialist Date