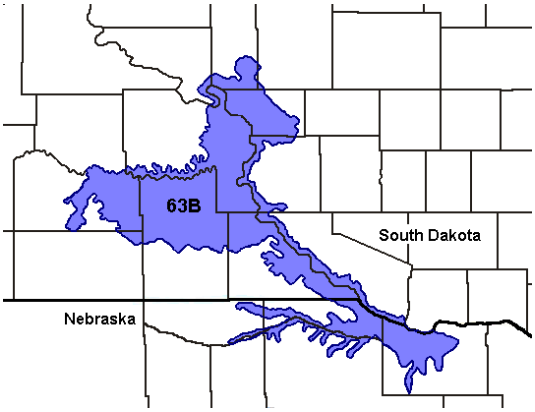
United States Department of Agriculture
Natural Resources Conservation Service

Ecological Site Description



Site Type: Rangeland

Site Name: Clayey

Site ID: R063BY011SD

Major Land Resource Area (MLRA): 63B – Southern Rolling Pierre Shale Plains

Physiographic Features

This site occurs on nearly level to steeply sloping uplands.

Landform: hill, plain, stream terrace

Aspect: N/A

	Minimum	Maximum
Elevation (feet):	1,300	2,000
Slope (percent):	0	25
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:	Medium	Very high

Climatic Features

MLRA 63B is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 19 to 24 inches per year. The average annual temperature is about 48°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, South Dakota (SD)), to about 22°F (Winner, SD). July is the warmest month with temperatures averaging from about 73°F (Stephan, SD), to about 76°F (Winner, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 56°F. This large annual range attests to the continental nature of this area's climate. 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 continue to early or mid-September. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

	Minimum	Maximum
Frost-free period (days):	130	162
Freeze-free period (days):	148	180
Mean Annual Precipitation (inches):	19	24

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.39	0.45	3.1	33.0
February	0.54	0.71	8.9	38.7
March	1.11	1.59	18.7	47.5
April	1.90	2.72	31.4	62.0
May	2.80	3.40	42.7	73.1
June	3.05	3.60	53.0	82.6
July	2.70	3.16	58.5	89.9
August	2.03	2.69	56.2	88.4
September	1.76	2.51	45.8	78.9
October	1.47	1.55	33.2	65.7
November	0.59	0.94	19.2	47.8
December	0.35	0.62	8.1	36.5

Climate Stations		Period	
Station ID	**Location or Name**	**From**	**To**
NE5040	Lynch	1948	2007
NE5960	Niobrara	1948	2005
SD7992	Stephan	1948	2007
SD9367	Winner	1948	2007

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

Riparian and Wetland Features

No riparian areas or wetland features are directly associated with this site.

Representative Soil Features

The common features of soils in this site are the clay loam to clay textured subsoils and slopes of 0 to 25 percent. The soils in this site are well-drained and formed in shale and clayey alluvium. The loam to clay surface layer is 3 to 18 inches thick. The soils have a slow to very slow infiltration rate. When dry, these soils crack. When the soils are wet, surface compaction can occur with heavy traffic. This site typically should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive 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 five percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production.

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

Parent Material Kind: residuum, alluvium
Parent Material Origin: shale, clayey
Surface Texture: clay, silty clay, silty clay loam
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments ≤3" (% Cover): 0
Surface Fragments >3" (%Cover): 0-3
Subsurface Fragments ≤3" (% Volume): 0-7
Subsurface Fragments >3" (% Volume): 0-5

	Minimum	Maximum
Drainage Class:	well	well
Permeability Class:	very slow	slow
Depth (inches):	25	80
Electrical Conductivity (mmhos/cm)*:	0	8
Sodium Absorption Ratio*:	0	6
Soil Reaction (1:1 Water)*:	6.1	9.0
Soil Reaction (0.1M CaCl2)*:	NA	NA
Available Water Capacity (inches)*:	4	6
Calcium Carbonate Equivalent (percent)*:	0	20

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

Plant Communities

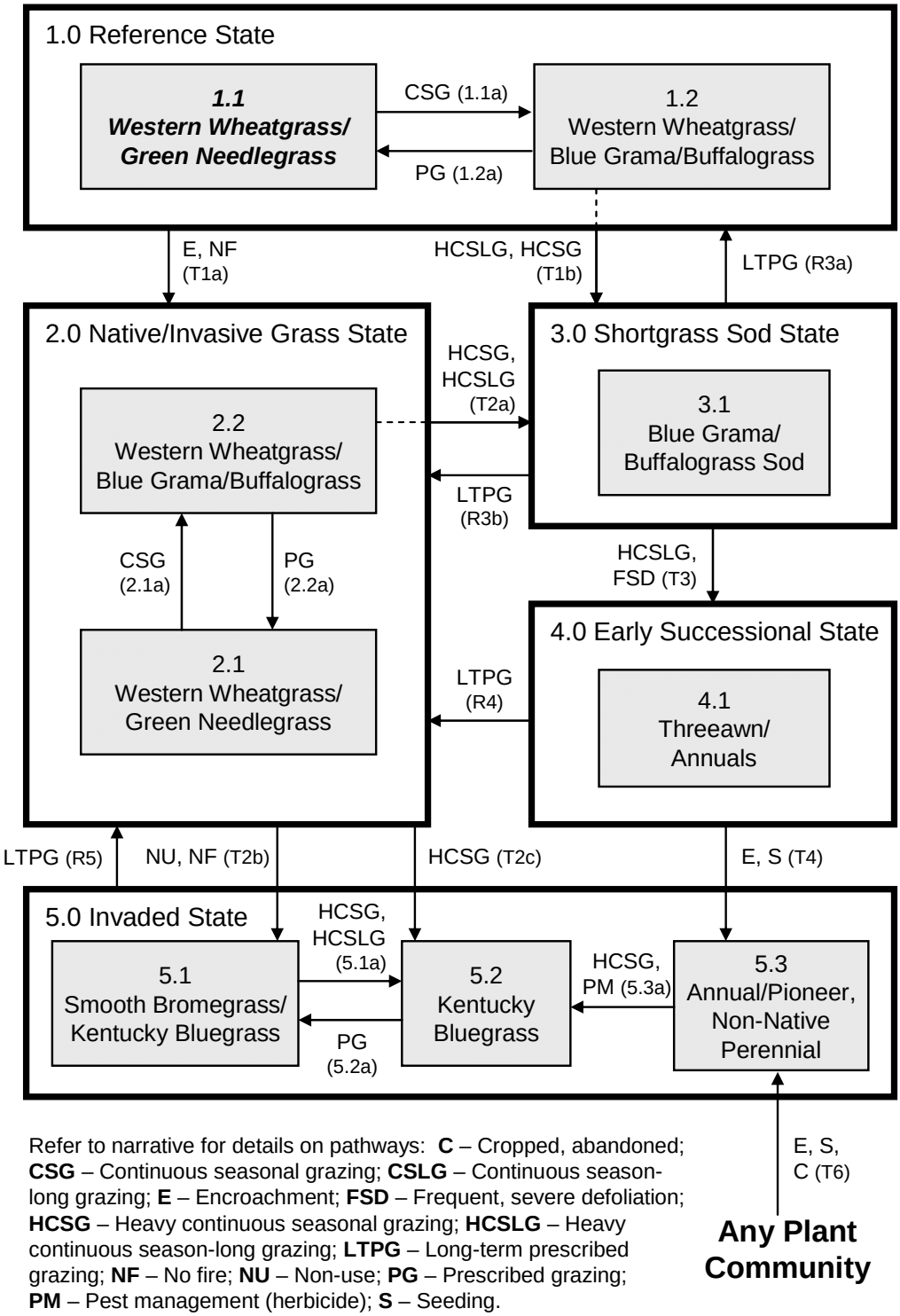
Ecological Dynamics of the Site
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition.

Continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence causes this site to depart from the Western Wheatgrass/Green Needlegrass Plant Community. Blue grama and buffalograss will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass, needleandthread, porcupine grass, sideoats grama, big bluestem, and little bluestem will decrease in frequency and production. Excessive defoliation can cause threeawns and annuals to increase and dominate the site. Extended periods of nonuse and/or lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as western wheatgrass, bluegrass, and cheatgrass.

Interpretations are primarily based on the Western Wheatgrass/Green Needlegrass Plant Community. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current knowledge and experience, and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

Plant Communities and Transitional Pathways



Refer to narrative for details on pathways: **C** – Cropped, abandoned; **CSG** – Continuous seasonal grazing; **CSLG** – Continuous season-long grazing; **E** – Encroachment; **FSD** – Frequent, severe defoliation; **HCSG** – Heavy continuous seasonal grazing; **HCSLG** – Heavy continuous season-long grazing; **LTPG** – Long-term prescribed grazing; **NF** – No fire; **NU** – Non-use; **PG** – Prescribed grazing; **PM** – Pest management (herbicide); **S** – Seeding.

Plant Community Composition and Group Annual Production

			1.1 Western Wheatgrass/ Green Needlegrass		
COMMON/GROUP NAME	**SCIENTIFIC NAME**	**SYMBOL**	**Group**	**lbs./acre**	**% Comp**
GRASSES & GRASS-LIKES				*2380 - 2660*	*85 - 95*
WHEATGRASS			**1**	**700 - 1260**	**25 - 45**
western wheatgrass	Pascopyrum smithii	PASM	1	700 - 1260	25 - 45
slender wheatgrass	Elymus trachycaulus	ELTR7	1	0 - 140	0 - 5
NEEDLEGRASS			**2**	**420 - 700**	**15 - 25**
green needlegrass	Nassella viridula	NAVI4	2	420 - 700	15 - 25
porcupine grass	Hesperostipa spartea	HESP11	2	28 - 280	1 - 10
needleandthread	Hesperostipa comata ssp. comata	HECOC8	2	0 - 84	0 - 3
TALL/MID WARM-SEASON GRASSES			**3**	**280 - 560**	**10 - 20**
big bluestem	Andropogon gerardii	ANGE	3	56 - 420	2 - 15
sideoats grama	Bouteloua curtipendula	BOCU	3	56 - 280	2 - 10
little bluestem	Schizachyrium scoparium	SCSC	3	28 - 280	1 - 10
tall dropseed	Sporobolus compositus var. compositus	SPCOC2	3	28 - 140	1 - 5
switchgrass	Panicum virgatum	PAVI2	3	0 - 84	0 - 3
plains muhly	Muhlenbergia cuspidata	MUCU3	3	0 - 84	0 - 3
prairie dropseed	Sporobolus heterolepis	SPHE	3	0 - 84	0 - 3
SHORT WARM-SEASON GRASSES			**4**	**140 - 420**	**5 - 15**
blue grama	Bouteloua gracilis	BOGR2	4	140 - 280	5 - 10
buffalograss	Bouteloua dactyloides	BODA2	4	56 - 224	2 - 8
threeawn	Aristida spp.	ARIST	4	0 - 84	0 - 3
sand dropseed	Sporobolus cryptandrus	SPCR	4	0 - 84	0 - 3
OTHER NATIVE GRASSES			**5**	**28 - 140**	**1 - 5**
prairie junegrass	Koeleria macrantha	KOMA	5	28 - 84	1 - 3
Scribner panicum	Dichanthelium oligosanthes var. scribnerianum	DIOLS	5	0 - 84	0 - 3
Wilcox panicum	Dichanthelium wilcoxianum	DIWI5	5	0 - 84	0 - 3
other grasses		2GRAM	5	0 - 140	0 - 5
GRASS-LIKES			**6**	**28 - 140**	**1 - 5**
sedge	Carex spp.	CAREX	6	28 - 140	1 - 5
other grass-likes		2GL	6	0 - 140	0 - 5
FORBS			*8*	*140 - 280*	*5 - 10*
American vetch	Vicia americana	VIAM	8	28 - 56	1 - 2
biscuitroot	Lomatium spp.	LOMAT	8	0 - 56	0 - 2
catclaw sensitive briar	Mimosa nuttallii	MINU6	8	0 - 56	0 - 2
cudweed sagewort	Artemisia ludoviciana	ARLU	8	28 - 84	1 - 3
deathcamas	Zigadenus spp.	ZIGAD	8	0 - 28	0 - 1
deervetch	Lotus unifoliolatus var. unifoliolatus	LOUNU	8	28 - 56	1 - 2
dotted gayfeather	Liatris punctata	LIPU	8	28 - 56	1 - 2
false boneset	Brickellia eupatorioides	BREU	8	0 - 84	0 - 3
goldenrod	Solidago spp.	SOLID	8	28 - 56	1 - 2
milkvetch	Astragalus spp.	ASTRA	8	0 - 56	0 - 2
penstemon	Penstemon spp.	PENST	8	28 - 56	1 - 2
prairie clover	Dalea spp.	DALEA	8	0 - 56	0 - 2
prairie coneflower	Ratibida columnifera	RACO3	8	28 - 56	1 - 2
prairie groundsel	Packera plattensis	PAPL12	8	0 - 28	0 - 1
pussytoes	Antennaria spp.	ANTEN	8	0 - 28	0 - 1
scarlet gaura	Gaura coccinea	GACO5	8	0 - 28	0 - 1
scarlet globemallow	Sphaeralcea coccinea	SPCO	8	28 - 56	1 - 2
scurfpea	Psoralidium spp.	PSORA2	8	28 - 56	1 - 2
spiny phlox	Phlox hoodii	PHHO	8	0 - 28	0 - 1
textile onion	Allium textile	ALTE	8	28 - 56	1 - 2
wavyleaf thistle	Cirsium undulatum	CIUN	8	0 - 56	0 - 2
western ragweed	Ambrosia psilostachya	AMPS	8	0 - 56	0 - 2
western wallflower	Erysimum capitatum var. capitatum	ERCAC	8	28 - 56	1 - 2
western yarrow	Achillea millefolium var. occidentalis	ACMIO	8	0 - 56	0 - 2
white prairie aster	Symphyotrichum falcatum	SYFA	8	28 - 56	1 - 2
wild parsley	Musineon divaricatum	MUDI	8	0 - 56	0 - 2
native forbs		2FN	8	28 - 84	1 - 3
SHRUBS			*9*	*56 - 140*	*2 - 5*
cactus	Opuntia spp.	OPUNT	9	0 - 28	0 - 1
fringed sagewort	Artemisia frigida	ARFR4	9	28 - 56	1 - 2
rose	Rosa spp.	ROSA5	9	28 - 56	1 - 2
western snowberry	Symphoricarpos occidentalis	SYOC	9	0 - 84	0 - 3
other shrubs		2SHRUB	9	0 - 84	0 - 3

Annual Production lbs./acre	LOW RV HIGH
GRASSES & GRASS-LIKES	1820 - 2492 - 3125
FORBS	125 - 210 - 320
SHRUBS	55 - 98 - 155
TOTAL	2000 - 2800 - 3600

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

		1.1 Western Wheatgrass/ Green Needlegrass			2.2 Western Wheatgrass/ Blue Grama/Buffalograss			3.1 Blue Grama/ Buffalograss Sod			4.1 Threeawn/Annuals		
COMMON/GROUP NAME	SYMBOL	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES			*2380 - 2660*	*85 - 95*		*1680 - 1890*	*80 - 90*		*1040 - 1170*	*80 - 90*		*400 - 640*	*50 - 80*
WHEATGRASS		**1**	**700 - 1260**	**25 - 45**	**1**	**315 - 420**	**15 - 20**	**1**	**65 - 195**	**5 - 15**	**1**	**8 - 40**	**1 - 5**
western wheatgrass	PASM	1	700 - 1260	25 - 45	1	315 - 420	15 - 20	1	65 - 130	5 - 10	1	8 - 40	1 - 5
slender wheatgrass	ELTR7	1	0 - 140	0 - 5	1	0 - 42	0 - 2	1	0 - 13	0 - 1			
NEEDLEGRASS		**2**	**420 - 700**	**15 - 25**	**2**	**105 - 315**	**5 - 15**	**2**	**26 - 65**	**2 - 5**	**2**	**0 - 40**	**0 - 5**
green needlegrass	NAVI4	2	420 - 700	15 - 25	2	105 - 315	5 - 15	2	0 - 26	0 - 2	2	0 - 8	0 - 1
porcupine grass	HESP11	2	28 - 280	1 - 10	2	0 - 105	0 - 5	2	0 - 26	0 - 2			
needleandthread	HECOC8	2	0 - 84	0 - 3	2	21 - 105	1 - 5	2	26 - 65	2 - 5	2	0 - 32	0 - 4
TALL/MID WARM-SEASON		**3**	**280 - 560**	**10 - 20**	**3**	**105 - 210**	**5 - 10**	**3**	**0 - 65**	**0 - 5**	**3**	**0 - 16**	**0 - 2**
big bluestem	ANGE	3	56 - 420	2 - 15	3	21 - 168	1 - 8	3	0 - 26	0 - 2			
sideoats grama	BOCU	3	56 - 280	2 - 10	3	21 - 147	1 - 7	3	0 - 39	0 - 3			
little bluestem	SCSC	3	28 - 280	1 - 10	3	0 - 168	0 - 8	3	0 - 39	0 - 3			
tall dropseed	SPCOC2	3	28 - 140	1 - 5	3	0 - 42	0 - 2	3	0 - 13	0 - 1	3	0 - 16	0 - 2
switchgrass	PAVI2	3	0 - 84	0 - 3	3	0 - 42	0 - 2	3	0 - 13	0 - 1			
plains muhly	MUCU3	3	0 - 84	0 - 3	3	0 - 42	0 - 2						
prairie dropseed	SPHE	3	0 - 84	0 - 3	3	0 - 42	0 - 2						
SHORT WARM-SEASON		**4**	**140 - 420**	**5 - 15**	**4**	**210 - 630**	**10 - 30**	**4**	**585 - 780**	**45 - 60**	**4**	**80 - 360**	**10 - 45**
blue grama	BOGR2	4	140 - 280	5 - 10	4	210 - 420	10 - 20	4	260 - 390	20 - 30	4	8 - 160	1 - 20
buffalograss	BODA2	4	56 - 224	2 - 8	4	105 - 210	5 - 10	4	325 - 455	25 - 35	4	8 - 160	1 - 20
threeawn	ARIST	4	0 - 84	0 - 3	4	0 - 105	0 - 5	4	13 - 130	1 - 10	4	80 - 280	10 - 35
sand dropseed	SPCR	4	0 - 84	0 - 3	4	0 - 105	0 - 5	4	13 - 65	1 - 5	4	8 - 64	1 - 8
OTHER NATIVE GRASSES		**5**	**28 - 140**	**1 - 5**	**5**	**0 - 105**	**0 - 5**	**5**	**0 - 65**	**0 - 5**	**5**	**0 - 40**	**0 - 5**
prairie junegrass	KOMA	5	28 - 84	1 - 3	5	0 - 105	0 - 5	5	0 - 65	0 - 5	5	0 - 16	0 - 2
Scribner panicum	DIOLS	5	0 - 84	0 - 3	5	0 - 63	0 - 3	5	0 - 39	0 - 3	5	0 - 8	0 - 1
Wilcox panicum	DIWI5	5	0 - 84	0 - 3	5	0 - 63	0 - 3	5	0 - 39	0 - 3	5	0 - 8	0 - 1
other grasses	2GRAM	5	0 - 140	0 - 5	5	0 - 63	0 - 3	5	0 - 39	0 - 3	5	0 - 40	0 - 5
GRASS-LIKES		**6**	**28 - 140**	**1 - 5**	**6**	**105 - 210**	**5 - 10**	**6**	**65 - 195**	**5 - 15**	**6**	**16 - 40**	**2 - 5**
sedge	CAREX	6	28 - 140	1 - 5	6	105 - 210	5 - 10	6	65 - 195	5 - 15	6	16 - 40	2 - 5
other grass-likes	2GL	6	0 - 140	0 - 5	6	0 - 21	0 - 1	6	0 - 26	0 - 2	6	0 - 8	0 - 1
NON-NATIVE GRASSES		**7**			**7**	**21 - 420**	**1 - 20**	**7**	**0 - 65**	**0 - 5**	**7**	**0 - 64**	**0 - 8**
bluegrass	POA				7	21 - 210	1 - 10	7	0 - 65	0 - 5	7	0 - 16	0 - 2
smooth bromegrass	BRIN2				7	0 - 315	0 - 15	7	0 - 65	0 - 5	7	0 - 16	0 - 2
cheatgrass	BRTE				7	21 - 105	1 - 5	7	0 - 65	0 - 5	7	8 - 64	1 - 8
FORBS		*8*	*140 - 280*	*5 - 10*	*8*	*105 - 210*	*5 - 10*	*8*	*65 - 130*	*5 - 10*	*8*	*80 - 200*	*10 - 25*
American vetch	VIAM	8	28 - 56	1 - 2	8	0 - 42	0 - 2	8	0 - 13	0 - 1			
biscuitroot	LOMAT	8	0 - 56	0 - 2	8	0 - 42	0 - 2	8	0 - 13	0 - 1			
catclaw sensitive briar	MINU6	8	0 - 56	0 - 2	8	0 - 21	0 - 1						
cudweed sagewort	ARLU	8	28 - 84	1 - 3	8	21 - 84	1 - 4	8	13 - 52	1 - 4	8	8 - 40	1 - 5
deathcamas	ZIGAD	8	0 - 28	0 - 1	8	0 - 42	0 - 2	8	0 - 26	0 - 2	8	0 - 8	0 - 1
deervetch	LOUNU	8	28 - 56	1 - 2	8	0 - 21	0 - 1						
dotted gayfeather	LIPU	8	28 - 56	1 - 2	8	0 - 42	0 - 2	8	0 - 26	0 - 2	8	0 - 8	0 - 1
false boneset	BREU	8	0 - 84	0 - 3	8	0 - 42	0 - 2	8	0 - 13	0 - 1			
fetid marigold	DYPA							8	0 - 13	0 - 1	8	8 - 40	1 - 5
goldenrod	SOLID	8	28 - 56	1 - 2	8	21 - 63	1 - 3	8	0 - 26	0 - 2	8	0 - 16	0 - 2
milkvetch	ASTRA	8	0 - 56	0 - 2	8	0 - 42	0 - 2	8	0 - 13	0 - 1			
penstemon	PENST	8	28 - 56	1 - 2	8	0 - 42	0 - 2	8	0 - 13	0 - 1			
prairie clover	DALEA	8	0 - 56	0 - 2	8	0 - 21	0 - 1	8	0 - 13	0 - 1			
prairie coneflower	RACO3	8	28 - 56	1 - 2	8	0 - 42	0 - 2	8	0 - 13	0 - 1			
prairie groundsel	PAPL12	8	0 - 28	0 - 1	8	0 - 42	0 - 2	8	0 - 39	0 - 3	8	0 - 8	0 - 1
pussytoes	ANTEN	8	0 - 28	0 - 1	8	0 - 42	0 - 2	8	0 - 26	0 - 2	8	0 - 16	0 - 2
scarlet gaura	GACO5	8	0 - 28	0 - 1	8	0 - 21	0 - 1						
scarlet globemallow	SPCO	8	28 - 56	1 - 2	8	21 - 63	1 - 3	8	13 - 52	1 - 4	8	8 - 16	1 - 2
scurfpea	PSORA2	8	28 - 56	1 - 2	8	0 - 42	0 - 2	8	0 - 26	0 - 2			
spiny phlox	PHHO	8	0 - 28	0 - 1	8	0 - 42	0 - 2	8	0 - 26	0 - 2	8	0 - 24	0 - 3
textile onion	ALTE	8	28 - 56	1 - 2	8	0 - 42	0 - 2	8	0 - 13	0 - 1			
wavyleaf thistle	CIUN	8	0 - 56	0 - 2	8	0 - 42	0 - 2	8	0 - 26	0 - 2			
western ragweed	AMPS	8	0 - 56	0 - 2	8	21 - 63	1 - 3	8	13 - 26	1 - 2	8	16 - 40	2 - 5
western wallflower	ERCAC	8	28 - 56	1 - 2	8	0 - 42	0 - 2	8	0 - 26	0 - 2			
western yarrow	ACMIO	8	0 - 56	0 - 2	8	21 - 63	1 - 3	8	13 - 39	1 - 3	8	8 - 32	1 - 4
white prairie aster	SYFA	8	28 - 56	1 - 2	8	21 - 63	1 - 3	8	13 - 26	1 - 2	8	0 - 8	0 - 1
wild parsley	MUDI	8	0 - 56	0 - 2	8	0 - 21	0 - 1	8	0 - 13	0 - 1			
native forbs	2FN	8	28 - 84	1 - 3	8	0 - 42	0 - 2	8	0 - 26	0 - 2	8	0 - 40	0 - 5
introduced forbs	2FI				8	0 - 42	0 - 2	8	0 - 52	0 - 4	8	0 - 80	0 - 10
SHRUBS		*9*	*56 - 140*	*2 - 5*	*9*	*105 - 210*	*5 - 10*	*9*	*65 - 130*	*5 - 10*	*9*	*40 - 200*	*5 - 25*
cactus	OPUNT	9	0 - 28	0 - 1	9	0 - 63	0 - 3	9	13 - 65	1 - 5	9	8 - 80	1 - 10
fringed sagewort	ARFR4	9	28 - 56	1 - 2	9	0 - 105	0 - 5	9	0 - 65	0 - 5	9	16 - 120	2 - 15
rose	ROSA5	9	28 - 56	1 - 2	9	0 - 63	0 - 3	9	0 - 26	0 - 2	9	0 - 8	0 - 1
western snowberry	SYOC	9	0 - 84	0 - 3	9	0 - 63	0 - 3	9	0 - 26	0 - 2	9	0 - 8	0 - 1
other shrubs	2SHRUB	9	0 - 84	0 - 3	9	0 - 42	0 - 2	9	0 - 26	0 - 2	9	0 - 8	0 - 1

Annual Production lbs./acre	LOW RV HIGH	LOW RV HIGH	LOW RV HIGH	LOW RV HIGH
GRASSES & GRASS-LIKES	1820 - 2492 - 3125	1310 - 1785 - 2220	680 - 1105 - 1410	290 - 540 - 650
FORBS	125 - 210 - 320	95 - 158 - 240	60 - 98 - 145	75 - 140 - 225
SHRUBS	55 - 98 - 155	95 - 158 - 240	60 - 98 - 145	35 - 120 - 225
TOTAL	2000 - 2800 - 3600	1500 - 2100 - 2700	800 - 1300 - 1700	400 - 800 - 1100

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon precipitation or other climatic factors. RV = Representative value. Refer to PLANTS database for scientific names and codes: http://plants.usda.gov

Plant Community Composition and Group Annual Production

		1.1 Western Wheatgrass/ Green Needlegrass			5.1 Smooth Bromegrass/ Kentucky Bluegrass			5.2 Kentucky Bluegrass		
COMMON/GROUP NAME	SYMBOL	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES			*2380 - 2660*	*85 - 95*		*2210 - 2470*	*85 - 95*			
WHEATGRASS		**1**	**700 - 1260**	**25 - 45**	**1**	**0 - 520**	**0 - 20**	**1**	**0 - 80**	**0 - 5**
western wheatgrass	PASM	1	700 - 1260	25 - 45	1	0 - 520	0 - 20	1	0 - 80	0 - 5
slender wheatgrass	ELTR7	1	0 - 140	0 - 5						
NEEDLEGRASS		**2**	**420 - 700**	**15 - 25**	**2**	**0 - 390**	**0 - 15**	**2**	**0 - 240**	**0 - 15**
green needlegrass	NAVI4	2	420 - 700	15 - 25	2	0 - 390	0 - 15	2	0 - 240	0 - 15
porcupine grass	HESP11	2	28 - 280	1 - 10	2	0 - 78	0 - 3	2	0 - 48	0 - 3
needleandthread	HECOC8	2	0 - 84	0 - 3						
TALL/MID WARM-SEASON		**3**	**280 - 560**	**10 - 20**	**3**	**0 - 130**	**0 - 5**	**3**		
big bluestem	ANGE	3	56 - 420	2 - 15	3	0 - 52	0 - 2			
sideoats grama	BOCU	3	56 - 280	2 - 10	3	0 - 52	0 - 2			
little bluestem	SCSC	3	28 - 280	1 - 10						
tall dropseed	SPCOC2	3	28 - 140	1 - 5	3	0 - 130	0 - 5			
switchgrass	PAVI2	3	0 - 84	0 - 3						
plains muhly	MUCU3	3	0 - 84	0 - 3						
prairie dropseed	SPHE	3	0 - 84	0 - 3						
SHORT WARM-SEASON		**4**	**140 - 420**	**5 - 15**	**4**	**0 - 130**	**0 - 5**	**4**	**32 - 320**	**2 - 20**
blue grama	BOGR2	4	140 - 280	5 - 10	4	0 - 130	0 - 5	4	16 - 160	1 - 10
buffalograss	BODA2	4	56 - 224	2 - 8		0 - 26	0 - 1	4	0 - 48	0 - 3
threeawn	ARIST	4	0 - 84	0 - 3	4	0 - 78	0 - 3	4	16 - 240	1 - 15
sand dropseed	SPCR	4	0 - 84	0 - 3	4	0 - 78	0 - 3	4	0 - 80	0 - 5
OTHER NATIVE GRASSES		**5**	**28 - 140**	**1 - 5**	**5**	**0 - 130**	**0 - 5**	**5**	**0 - 80**	**0 - 5**
prairie junegrass	KOMA	5	28 - 84	1 - 3	5	0 - 52	0 - 2	5	0 - 16	0 - 1
Scribner panicum	DIOLS	5	0 - 84	0 - 3	5	0 - 26	0 - 1	5	0 - 16	0 - 1
Wilcox panicum	DIWI5	5	0 - 84	0 - 3	5	0 - 26	0 - 1	5	0 - 16	0 - 1
other grasses	2GRAM	5	0 - 140	0 - 5	5	0 - 130	0 - 5	5	0 - 80	0 - 5
GRASS-LIKES		**6**	**28 - 140**	**1 - 5**	**6**	**0 - 78**	**0 - 3**	**6**	**16 - 160**	**1 - 10**
sedge	CAREX	6	28 - 140	1 - 5	6	0 - 78	0 - 3	6	16 - 128	1 - 8
other grass-likes	2GL	6	0 - 140	0 - 5	6	0 - 78	0 - 3	6	0 - 80	0 - 5
NON-NATIVE GRASSES		**7**			**7**	**910 - 2080**	**35 - 80**	**7**	**400 - 1120**	**25 - 70**
bluegrass	POA				7	130 - 780	5 - 30	7	320 - 960	20 - 60
smooth bromegrass	BRIN2				7	390 - 1950	15 - 75	7	0 - 240	0 - 15
cheatgrass	BRTE				7	52 - 390	2 - 15	7	32 - 240	2 - 15
FORBS		*8*	*140 - 280*	*5 - 10*	*8*	*130 - 260*	*5 - 10*	*8*	*80 - 240*	*5 - 15*
American vetch	VIAM	8	28 - 56	1 - 2						
biscuitroot	LOMAT	8	0 - 56	0 - 2						
catclaw sensitive briar	MINU6	8	0 - 56	0 - 2						
cudweed sagewort	ARLU	8	28 - 84	1 - 3	8	0 - 104	0 - 4	8	0 - 64	0 - 4
deathcamas	ZIGAD	8	0 - 28	0 - 1						
deervetch	LOUNU	8	28 - 56	1 - 2	8	0 - 26	0 - 1			
dotted gayfeather	LIPU	8	28 - 56	1 - 2	8	0 - 26	0 - 1			
false boneset	BREU	8	0 - 84	0 - 3						
fetid marigold	DYPA									
goldenrod	SOLID	8	28 - 56	1 - 2	8	0 - 130	0 - 5	8	0 - 80	0 - 5
milkvetch	ASTRA	8	0 - 56	0 - 2	8	0 - 26	0 - 1			
penstemon	PENST	8	28 - 56	1 - 2						
prairie clover	DALEA	8	0 - 56	0 - 2						
prairie coneflower	RACO3	8	28 - 56	1 - 2	8	0 - 26	0 - 1			
prairie groundsel	PAPL12	8	0 - 28	0 - 1						
pussytoes	ANTEN	8	0 - 28	0 - 1	8	0 - 26	0 - 1	8	0 - 32	0 - 2
scarlet gaura	GACO5	8	0 - 28	0 - 1						
scarlet globemallow	SPCO	8	28 - 56	1 - 2	8	0 - 26	0 - 1			
scurfpea	PSORA2	8	28 - 56	1 - 2	8	0 - 52	0 - 2	8	0 - 16	0 - 1
spiny phlox	PHHO	8	0 - 28	0 - 1				8	0 - 32	0 - 2
textile onion	ALTE	8	28 - 56	1 - 2						
wavyleaf thistle	CIUN	8	0 - 56	0 - 2	8	0 - 26	0 - 1			
western ragweed	AMPS	8	0 - 56	0 - 2	8	26 - 104	1 - 4	8	16 - 80	1 - 5
western wallflower	ERCAC	8	28 - 56	1 - 2						
western yarrow	ACMIO	8	0 - 56	0 - 2	8	0 - 52	0 - 2	8	16 - 64	1 - 4
white prairie aster	SYFA	8	28 - 56	1 - 2	8	0 - 78	0 - 3	8	0 - 48	0 - 3
wild parsley	MUDI	8	0 - 56	0 - 2						
native forbs	2FN	8	28 - 84	1 - 3	8	0 - 78	0 - 3	8	0 - 32	0 - 2
introduced forbs	2FI				8	52 - 208	2 - 8	8	32 - 128	2 - 8
SHRUBS		*9*	*56 - 140*	*2 - 5*	*9*	*26 - 130*	*1 - 5*	*9*	*16 - 160*	*1 - 10*
cactus	OPUNT	9	0 - 28	0 - 1	9	0 - 52	0 - 2	9	16 - 64	1 - 4
fringed sagewort	ARFR4	9	28 - 56	1 - 2	9	0 - 52	0 - 2	9	16 - 128	1 - 8
rose	ROSA5	9	28 - 56	1 - 2	9	0 - 52	0 - 2	9	0 - 32	0 - 2
western snowberry	SYOC	9	0 - 84	0 - 3	9	0 - 130	0 - 5	9	0 - 48	0 - 3
other shrubs	2SHRUB	9	0 - 84	0 - 3	9	0 - 78	0 - 3	9	0 - 32	0 - 2

Annual Production lbs./acre	LOW RV HIGH	LOW RV HIGH	LOW RV HIGH
GRASSES & GRASS-LIKES	1820 - 2492 - 3125	1660 - 2327 - 2960	710 - 1352 - 1545
FORBS	125 - 210 - 320	115 - 195 - 295	75 - 160 - 275
SHRUBS	55 - 98 - 155	25 - 78 - 145	15 - 88 - 180
TOTAL	2000 - 2800 - 3600	1800 - 2600 - 3400	800 - 1600 - 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. Refer to PLANTS database for scientific names and codes: http://plants.usda.gov

Plant Community and Vegetation State Narratives

Reference State (State 1)

This state represents the natural range of variability that dominates the dynamics of this ecological site (ES). This state is dominated by cool-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included frequent fire and grazing by large herding ungulates. Timing of fires and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Today, this state can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. Cool-season species can decline and a corresponding increase in short, warm-season grasses will occur.

An alternate plant community phase dominated by tall and mid-warm-season grasses such as big bluestem, sideoats grama, and little bluestem may also occur in this state. This plant community phase could occur as a result of frequent spring fire or repeated high intensity grazing in the early part of the growing season. As this community phase is not as common, it is not described in detail in this document.

1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase

Interpretations are based primarily on the Western Wheatgrass/Green Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by cool-season grasses. The major grasses include western wheatgrass, green needlegrass, big bluestem, and sideoats grama. Other grasses include blue grama, buffalograss, sedges, and porcupine grass. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

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: SD6302
Growth curve name: Pierre Shale Plains, cool-season dominant, warm-season subdominant.
Growth curve description: Cool-season dominant, warm-season subdominant.

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

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

- <u>1.1a – Continuous seasonal grazing</u> which includes grazing at moderate to heavy stocking levels at the same time of year each year, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the *1.2 Western Wheatgrass/ Blue Grama/Buffalograss Plant Community Phase*.

1.2 Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phase

This plant community evolved under continuous seasonal grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs. Dominant grasses include western wheatgrass, blue grama, and buffalograss. Grasses of secondary importance include sideoats grama, sedge, green needlegrass, and needleandthread. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, and western yarrow.

This plant community will have similar plant composition to 2.2 Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phase (refer to the plant composition tables). The main difference is that this plant community phase does not have the presence of nonnative invasive species such as Kentucky bluegrass and smooth bromegrass.

When compared to the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), blue grama and buffalograss have increased. Green needlegrass and sideoats grama have decreased, and production of mid- and tall warm-season grasses has also been reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

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: SD6303
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

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

- T1b – Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning early in the season) or heavy continuous season-long grazing will convert this plant community to the *3.1 Blue Grama/Buffalograss Sod Plant Community Phase* and the *Shortgrass Sod State*.

- 1.2a – Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the *1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase*.

3.1 Blue Grama/Buffalograss Sod Plant Community

This plant community evolved under heavy continuous season-long grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs. Dominant grasses include blue grama and buffalograss. Grasses of secondary importance include sedge and western wheatgrass. Forbs commonly found in this plant community include wild parsley and scarlet globemallow. When compared to the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), blue grama and buffalograss are dominant on this plant community. Cool-season grasses have decreased significantly. This vegetation state is very resistant to change. The herbaceous species present are well adapted to grazing; however, composition can be altered through long-term prescribed grazing.

This plant community is less productive than most other phases. The thick sod prevents other species from getting established. Lack of litter and reduced plant vigor causes higher soil temperatures, poor water infiltration rates, and high evapotranspiration which gives blue grama a competitive advantage over cool-season mid-grasses. Soil erosion will be minimal due to the sod forming habit of blue grama and buffalograss.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:
Growth curve number: SD6305
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

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

- R3a – Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the *2.0 Native/Invasive Grass State*. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable. This pathway may be more likely than R3b if the heavy grazing that lead to the shortgrass sod was concentrated later in the growing season.

- R3b – Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the *1.0 Reference State*. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable. Under certain circumstances, the harsh conditions created by the shortgrass sod can lead to the elimination of invasive grass species such as Kentucky bluegrass and smooth bromegrass.

- T3 – Heavy continuous season-long grazing and/or frequent severe defoliation as a result of rodent occupation will likely move this plant community to the *4.1 Threeawn/Annuals Plant Community Phase* and the *4.0 Early Successional State*.

4.1 Threeawn/Annuals Plant Community Phase

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, defoliation by rodents, etc.). The potential plant community is made up of approximately 50 to 80 percent grasses and grass-like species, 10 to 25 percent forbs, and 5 to 25 percent shrubs. The dominant grass is threeawn. Other grasses may include cheatgrass, little bluestem, blue grama, buffalograss, sand dropseed, sedges, and western wheatgrass. The dominant forbs include fetid marigold, western ragweed, cudweed sagewort, pussytoes, and other invader-like species. The dominant shrubs include fringed sagewort and cactus. Other plant species, from adjacent ESs, 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/Green Needlegrass Plant Community Phase (1.1), 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, little bluestem, plains muhly, and prairie dropseed. Plant diversity is low (plant richness may be high but areas are often dominated by a few species).

The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. 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 community 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: SD6303
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

Transitions or restoration pathways leading to other states are as follows:

- R4 - Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the *2.0 Native/Invasive Grass State*. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable. Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly.

- T4 – Encroachment of non-native invasive/noxious species or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the *5.0 Invaded State* and more specifically to the *5.3 Annual/Pioneer, Non-native Perennial Plant Community Phase*. In the case of a seeding, refer to the corresponding Forage Suitability Group description for adapted species and expected production (production estimates in the Forage Suitability Group description may be unrealistically high due to the degraded condition of the site at this phase).

Transition from Reference State (State 1) to the Native/Invasive Grass State (State 2)

- T1a – Encroachment of non-native grasses such as Kentucky bluegrass and smooth bromegrass, and disruption of natural disturbance regimes such as periodic fire followed by short-term high intensity grazing will lead this plant community phase over a threshold to the *2.0 Native/Invasive Grass State*.

Native/Invasive Grass State (State 2)

This state represents the more common range of variability that exists with higher levels of grazing management but in the absence of periodic fire followed by short-term intensive grazing. This state is dominated by cool-season grasses. It can be found on areas that are properly managed with grazing and/or prescribed burning and sometimes on areas receiving occasional short periods of rest. Cool-season species can decline and a corresponding increase in short, warm-season grasses will occur.

An alternate plant community phase dominated by tall and mid-warm-season grasses such as big bluestem, sideoats grama, and little bluestem may also occur in this state. This plant community phase could occur as a result of frequent spring fire or repeated high intensity grazing in the early part of the growing season. As this community phase is not as common, it is not described in detail in this document.

2.1 Western Wheatgrass/Green Needlegrass Plant Community Phase

This plant community phase is similar to 1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase, but it also contains minor amounts of nonnative invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 15 percent by air-dry weight). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by cool-season grasses. The major grasses include western wheatgrass, green needlegrass, big bluestem, and sideoats grama. Other grasses include blue grama, buffalograss, sedges, and porcupine grass. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

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: SD6302
Growth curve name: Pierre Shale Plains, cool-season dominant, warm-season subdominant.
Growth curve description: Cool-season dominant, warm-season subdominant.

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

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

- 2.1a – Continuous seasonal grazing which includes grazing at moderate to heavy stocking levels at the same time of year each year, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the *2.2 Western Wheatgrass/ Blue Grama/Buffalograss Plant Community Phase*.

2.2 Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phase

This plant community is a result of continuous seasonal grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs. Dominant grasses include western wheatgrass, blue grama, and buffalograss. Grasses of secondary importance include sideoats grama, sedge, green needlegrass, Kentucky bluegrass, smooth bromegrass, and needleandthread. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, and western yarrow.

When compared to the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), blue grama and buffalograss have increased. Green needlegrass and sideoats grama have decreased, and production of mid and tall warm-season grasses has also been reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

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: SD6303
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

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

- T2a – Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning early in the season) or heavy continuous season-long grazing will convert this plant community to the *3.1 Blue Grama/Buffalograss Sod Plant Community Phase* and the *Shortgrass Sod State*.

- 2.2a – Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the *2.1 Western Wheatgrass/Green Needlegrass Plant Community Phase*.

Transitions from Native/Invasive Grass State (State 2) to the Invaded State (State 5)

- T2b – Non-use and no fire for extended periods of time (typically for 10 or more years) will likely lead this state over a threshold resulting in the *5.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase* within the *5.0 Invaded State*.

- T2c – Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning after early cool-season grasses have reached boot stage) will likely lead this state over a threshold to the *5.2 Kentucky Bluegrass Plant Community Phase* within the *5.0 Invaded State*.

5.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase

This plant community phase is a result of extended periods of nonuse and no fire. It is characterized by a dominance of smooth bromegrass and Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. When dominated by smooth bromegrass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short, as these cool-season species mature rapidly. Energy capture is also reduced.

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: SD6301
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

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

- 5.1a – Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year) or heavy continuous season-long grazing will convert this plant community to the *5.2 Kentucky Bluegrass Plant Community Phase*.

5.2 Kentucky Bluegrass Plant Community Phase

This plant community phase is a result of heavy, continuous seasonal grazing or heavy, continuous season-long grazing. It is characterized by a dominance of Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short, as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

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: SD6301
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

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

- 5.2a – Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest may convert this plant community to the *5.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase*.

Restoration Pathway from the Invaded State (State 5) to the Native/Invasive Grass State (State 2)

- R4 - Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the *2.0 Native/Invasive Grass State*. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable. Success depends on whether native reproductive propagules remain intact on the site.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

Western Wheatgrass/Green Needlegrass Plant Community Phases (1.1 & 2.1):

Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phases (1.2 & 2.2):

Blue Grama/Buffalograss Sod Plant Community Phase (3.1):

Threeawn/Annuals Plant Community Phase (4.1):

Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase (5.1):

Kentucky Bluegrass Plant Community Phase (5.2):

Annual/Pioneer, Non-native Perennial Plant Community Phase (5.3):

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses and Grass-likes							
big bluestem	U D P D	U D U 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 U	D P P D	U D P U	D P P D	D P P D	U D P U	U D P U
buffalograss	U U D U	N U D U	U U D U	N U D U	N U D U	U U D U	U U D U
green needlegrass	U P U D	N P N P	U P U D	N P N P	N P N P	U P U D	U P U D
little bluestem	U D D U	N D N N	U D D U	N D N N	N D N N	U D D U	U D D U
needleandthread	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
plains muhly	U U D U	U U D U	U U D U	N N N N	N N N N	U U D U	U U D U
porcupine grass	U P U D	N D N U	U P U D	N D N U	N D N U	U P U D	U P U D
prairie dropseed	N U P U	N U D U	N U P U	N U D U	N U D U	N U P U	N U P U
prairie junegrass	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
sand dropseed	N U N N	N U N N	N U N N	N U N N	N U N N	N U N N	N U N N
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 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
sideoats grama	U D P U	U P D U	U D P U	U P D U	U P D U	U D P U	U D P U
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
switchgrass	U D D U	U D U U	U D D U	N N N N	N N N N	U D D U	U D D U
tall 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
threeawn	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
western wheatgrass	U P D U	N D N N	U P D U	N D N N	N D N N	U P D U	U P D U
Wilcox panicum	U U U U	N U N N	U U U U	N U N N	N U N N	U U U U	U U U 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
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
catclaw sensitive briar	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
deathcamas	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T
deervetch	U U U U	U D D U	U U U U	U D D U	U D D U	U U U U	U D 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
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
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 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
prairie groundsel	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
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 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
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
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
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 ragweed	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 wallflower	U D U U	N U U N	U D U U	N U U N	N U U N	U D U U	N U U 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
white prairie aster	U U D U	N N N N	U U D U	N N N N	N N N N	U U D U	N N N N
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
Shrubs							
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
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
western 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 ES description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community	Average Annual Production (lbs./acre, air-dry)	Stocking Rate* (AUM/acre)
Western Wheatgrass/Green Needlegrass (1.1 & 2.1)	2,800	0.77
Western Wheatgrass/Blue Grama/Buffalograss (1.2 & 2.2)	2,100	0.58
Smooth Bromegrass/Kentucky Bluegrass (5.1)	2,600	0.71
Kentucky Bluegrass (5.2)	1,600	0.44
Blue Grama/Buffalograss Sod (3.1)	1,300	0.36
Threeawn/Annuals (4.1)	800	0.22

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), National Range and Pasture Handbook).

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

Hydrology Functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D, with localized areas in hydrologic group C. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, bluegrass, and/or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational Uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood Products

No appreciable wood products are typically present on this site.

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

Supporting Information

Associated Sites
Loamy (R063BY010SD), Thin Upland (R063BY012SD), Shallow Clay (R063BY017SD), Clayey Overflow (R063BY021SD)

Similar Sites
(R063BY021SD) – Clayey Overflow [more big bluestem; higher production]
(R063BY010SD) – Loamy [less green needlegrass; more needleandthread]

Inventory Data References
Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; and Dana Larsen, RMS, NRCS.

Data Source	Number of Records	Sample Period	State	County
SCS-RANGE-417	15	1969 – 1987	NE, SD	Boyd, Buffalo, Gregory, Hyde, Knox Tripp

State Correlation
This site has been correlated with Nebraska (NE) and SD in MLRA 63B.

Field Offices/Counties

Ainsworth, NE	Keya Paha/Rock	Highmore, SD	Hyde	Pierre, SD	Hughes
Bloomfield, NE	Knox	Kennebec, SD	Lyman	Spencer, NE	Boyd
Burke, SD	Gregory	Lake Andes, SD	Charles Mix	White River, SD	Todd/Mellette
Chamberlain, SD	Brule/Buffalo	O'Neill, NE	Holt		

Relationship to Other Established Classifications
Level IV Ecoregions of the Conterminous United States: 42h - Southern River Breaks.

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://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.

Site Description Approval

SD, State Range Management Specialist	Date
NE, State Range Management Specialist	Date