

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Shallow to Gravel

Site ID: R055CY014SD

Major Land Resource Area (MLRA): 55C – Southern Black Glaciated Plains

Physiographic Features

This site occurs on nearly level to moderately sloping uplands.

Landform: outwash plain, outwash terrace **Aspect:** N/A



	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	1,300	2,000
Slope (percent):	1	15
Water Table Depth (inches):	80	80
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):	None	None
Frequency:	None	None
Duration:	None	None
Runoff Class:	Very low	Medium

Climatic Features

MLRA 55C 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 25 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 15°F (Howard, South Dakota (SD)), to about 20°F (Wagner, SD). July is the warmest month with temperatures averaging from about 73°F (Howard, SD), to about 77°F (Wagner, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 12 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 11 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.

	<u>Minimum</u>	<u>Maximum</u>
Frost-free period (days):	137	159
Freeze-free period (days):	156	180
Mean Annual Precipitation (inches):	19	25

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.42	0.54	3.4	31.0
February	0.51	0.81	8.1	36.3
March	1.00	1.61	20.5	47.7
April	2.05	2.50	33.6	62.7
May	2.85	3.47	44.8	74.6
June	3.35	4.15	54.9	84.1
July	2.38	2.97	59.9	91.1
August	2.23	2.87	57.7	88.8
September	1.61	2.71	48.2	79.4
October	1.39	1.76	36.1	65.9
November	0.62	1.09	21.7	47.4
December	0.42	0.65	9.4	34.8

Climate Stations		Period	
Station ID	Location or Name	From	To
SD4037	Howard	1893	2008
SD5228	Marion	1901	2008
SD5561	Miller	1902	2008
SD8767	Wagner	1916	2008

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 soils on this site are shallow to layers high in gravel. This abrupt change in texture and structure often responds like a restrictive layer even though roots can penetrate into the gravel layers. The high amounts of gravels in these layers are also very droughty and limit plant production. These soils are typically somewhat excessively drained and formed in loamy alluvium over gravelly sediments derived from glacial outwash. Surface soils have loam textures and are 5 to 10 inches in depth. Saturated hydraulic conductivity is typically moderate in the upper layers to very rapid in the underlying gravel layers and available water capacity is low to moderate. This site is on nearly level to moderately steep outwash plains and outwash terraces. Slope ranges from 1 to 15 percent.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 10 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: alluvium
Parent Material Origin:
Surface Texture: loam
Surface Texture Modifier: none
Subsurface Texture Group: sandy
Surface Fragments ≤3” (% Cover): 5-6
Surface Fragments >3” (%Cover): 0
Subsurface Fragments ≤3” (% Volume): 10-35
Subsurface Fragments >3” (% Volume): 0-2

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	somewhat excessive	somewhat excessive
Permeability Class:	moderate	moderately rapid
Depth (inches):	80	80
Electrical Conductivity (mmhos/cm)*:	0	2
Sodium Absorption Ratio*:	0	0
Soil Reaction (1:1 Water)*:	6.1	8.4
Soil Reaction (0.1M CaCl₂)*:	NA	NA
Available Water Capacity (inches)*:	4	4
Calcium Carbonate Equivalent (percent)*:	0	10

*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.

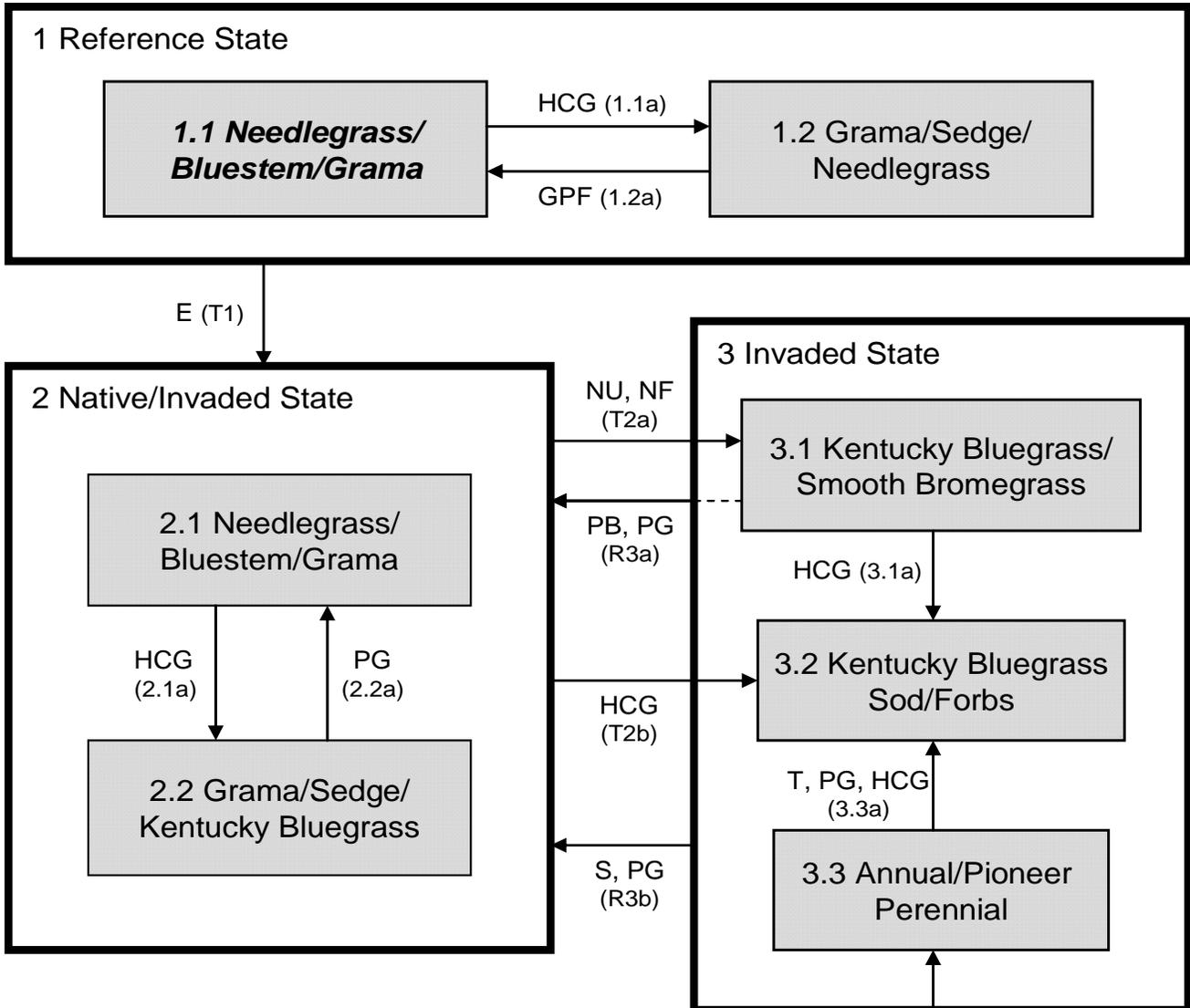
Heavy continuous grazing (season-long grazing during the typical growing season of April through October and/or repeated seasonal grazing during the same time of year each year) without adequate recovery periods following grazing events causes departure from the Needlegrass/Bluestem/Grama Plant Community Phase (2.1). Sedge and blue grama will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Needleandthread, porcupine grass, sideoats grama, big bluestem, and little bluestem will decrease in frequency and production. 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 Kentucky bluegrass, smooth brome grass, and cheatgrass.

Interpretations are primarily based on the 1.1 Needlegrass/Bluestem/Grama Plant Community Phase. 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: **CA** – Cropped, abandoned; **E** – Encroachment of introduced species; **GPF** – Grazing, precipitation, and/or fire returning to more normal disturbance regime levels and frequencies; **HCG** – Heavy continuous grazing; **NU, NF** – Non-use, no fire; **PB** – Prescribed burning; **PG** – Prescribed grazing; **S** – Seeding; **T** - Time.

Any Plant Community

Plant Community Composition and Group Annual Production

			1.1 Needlegrass/Bluestem/Grama			
COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Group	lbs./acre	% Comp	
GRASSES & GRASS-LIKES				1600 - 1800	80 - 90	
NEEDLEGRASS			1	300 - 600	15 - 30	
needleandthread	Hesperostipa comata ssp. comata	HECOC8	1	300 - 600	15 - 30	
green needlegrass	Nassella viridula	NAVI4	1	20 - 100	1 - 5	
porcupine grass	Hesperostipa spartea	HESP11	1	20 - 100	1 - 5	
MID WARM-SEASON GRASSES			2	200 - 400	10 - 20	
little bluestem	Schizachyrium scoparium	SCSC	2	100 - 300	5 - 15	
sideoats grama	Bouteloua curtipendula	BOCU	2	20 - 160	1 - 8	
prairie dropseed	Sporobolus heterolepis	SPHE	2	0 - 160	0 - 8	
plains muhly	Muhlenbergia cuspidata	MUCU3	2	0 - 100	0 - 5	
SHORT WARM-SEASON GRASSES			3	200 - 400	10 - 20	
blue grama	Bouteloua gracilis	BOGR2	3	100 - 300	5 - 15	
hairy grama	Bouteloua hirsuta	BOHI2	3	40 - 200	2 - 10	
sand dropseed	Sporobolus cryptandrus	SPCR	3	20 - 100	1 - 5	
threeawn	Aristida spp.	ARIST	3	0 - 40	0 - 2	
TALL WARM-SEASON GRASSES			4	60 - 200	3 - 10	
big bluestem	Andropogon gerardii	ANGE	4	40 - 200	2 - 10	
prairie sandreed	Calamovilfa longifolia	CALO	4	20 - 100	1 - 5	
OTHER NATIVE GRASSES			5	40 - 160	2 - 8	
prairie junegrass	Koeleria macrantha	KOMA	5	20 - 100	1 - 5	
western wheatgrass	Pascopyrum smithii	PASM	5	20 - 100	1 - 5	
Wilcox panicum	Dichanthelium wilcoxianum	DIWI5	5	0 - 60	0 - 3	
other grasses		2GRAM	5	0 - 100	0 - 5	
GRASS-LIKES			6	40 - 200	2 - 10	
sedge	Carex spp.	CAREX	6	40 - 200	2 - 10	
other grass-likes		2GL	6	0 - 60	0 - 3	
FORBS			8	100 - 200	5 - 10	
American pasqueflower	Pulsatilla patens ssp. multifida	PUPAM	8	20 - 40	1 - 2	
bracted spiderwort	Tradescantia bracteata	TRBR	8	20 - 40	1 - 2	
cudweed sagewort	Artemisia ludoviciana	ARLU	8	20 - 40	1 - 2	
cutleaf ironplant	Machaeranthera pinnatifida	MAPI	8	0 - 20	0 - 1	
dotted gayfeather	Liatris punctata	LIPU	8	20 - 40	1 - 2	
false boneset	Brickellia eupatorioides	BREU	8	0 - 40	0 - 2	
green sagewort	Artemisia campestris	ARCA12	8	20 - 40	1 - 2	
hairy goldaster	Heterotheca villosa	HEVI4	8	20 - 40	1 - 2	
heath aster	Symphotrichum ericoides	SYER	8	20 - 40	1 - 2	
lemon scurfpea	Psoraleidum lanceolatum	PSLA3	8	0 - 20	0 - 1	
milkvetch	Astragalus spp.	ASTRA	8	0 - 20	0 - 1	
Missouri goldenrod	Solidago missouriensis	SOMI2	8	20 - 40	1 - 2	
penstemon	Penstemon spp.	PENST	8	0 - 40	0 - 2	
prairie coneflower	Ratibida columnifera	RACO3	8	20 - 40	1 - 2	
purple coneflower	Echinacea angustifolia	ECAN2	8	0 - 40	0 - 2	
purple prairie clover	Dalea purpurea	DAPU5	8	20 - 40	1 - 2	
rush skeletonweed	Lygodesmia juncea	LYJU	8	0 - 20	0 - 1	
scarlet gaura	Gaura coccinea	GACO5	8	20 - 40	1 - 2	
scarlet globemallow	Sphaeralcea coccinea	SPCO	8	20 - 40	1 - 2	
slimflower scurfpea	Psoraleidum tenuiflorum	PSTE5	8	0 - 40	0 - 2	
spiny phlox	Phlox hoodii	PHHO	8	0 - 20	0 - 1	
stiff sunflower	Helianthus pauciflorus	HEPA19	8	20 - 40	1 - 2	
sundrops	Calylophus spp.	CALYL	8	0 - 20	0 - 1	
textile onion	Allium textile	ALTE	8	0 - 20	0 - 1	
western ragweed	Ambrosia psilostachya	AMPS	8	0 - 40	0 - 2	
woolly verbena	Verbena stricta	VEST	8	0 - 20	0 - 1	
native forbs		2FN	8	20 - 60	1 - 3	
SHRUBS			9	100 - 200	5 - 10	
brittle cactus	Opuntia fragilis	OPFR	9	0 - 20	0 - 1	
fringed sagewort	Artemisia frigida	ARFR4	9	20 - 40	1 - 2	
leadplant	Amorpha canescens	AMCA6	9	20 - 60	1 - 3	
plains pricklypear	Opuntia polyacantha	OPPO	9	20 - 40	1 - 2	
rose	Rosa spp.	ROSA5	9	20 - 60	1 - 3	
other shrubs		2SHRUB	9	20 - 60	1 - 3	
Annual Production lbs./acre				LOW	RV	HIGH
GRASSES & GRASS-LIKES				1210 -	1700	-2150
FORBS				95 -	150	-225
SHRUBS				95 -	150	-225
TOTAL				1400 -	2000	-2600

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	1.1 Needlegrass/ Bluestem/Grama			2.2 Grama/Sedge/ Kentucky Bluegrass			3.1 Kentucky Bluegrass/ Smooth Bromegrass			3.2 Kentucky Bluegrass Sod/Forbs		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES													
NEEDLEGRASS													
needleandthread	HECOC8	1	300 - 600	15 - 30	1	70 - 210	5 - 15	1	0 - 190	0 - 10	1	0 - 22	0 - 2
green needlegrass	NAVI4	1	20 - 100	1 - 5	1	0 - 42	0 - 3	1	0 - 95	0 - 5			
porcupine grass	HESP11	1	20 - 100	1 - 5				1	0 - 19	0 - 1			
MID WARM-SEASON GRASSES													
little bluestem	SCSC	2	100 - 300	5 - 15	2	0 - 70	0 - 5	2	0 - 57	0 - 3	2		
sideoats grama	BOCU	2	20 - 160	1 - 8	2	14 - 140	1 - 10	2	0 - 57	0 - 3			
prairie dropseed	SPHE	2	0 - 160	0 - 8	2	0 - 14	0 - 1						
plains muhly	MUCU3	2	0 - 100	0 - 5									
SHORT WARM-SEASON GRASSES													
blue grama	BOGR2	3	100 - 300	5 - 15	3	140 - 350	10 - 25	3	0 - 95	0 - 5	3	0 - 165	0 - 15
hairy grama	BOHI2	3	40 - 200	2 - 10	3	28 - 210	2 - 15	3	0 - 38	0 - 2	3	0 - 55	0 - 5
sand dropseed	SPCR	3	20 - 100	1 - 5	3	14 - 140	1 - 10	3	0 - 95	0 - 5	3	0 - 55	0 - 5
threeawn	ARIST	3	0 - 40	0 - 2	3	0 - 56	0 - 4	3	0 - 57	0 - 3	3	0 - 88	0 - 8
TALL WARM-SEASON GRASSES													
big bluestem	ANGE	4	40 - 200	2 - 10	4	0 - 42	0 - 3						
prairie sandreed	CALO	4	20 - 100	1 - 5									
OTHER NATIVE GRASSES													
prairie junegrass	KOMA	5	20 - 100	1 - 5	5	14 - 70	1 - 5	5	0 - 57	0 - 3	5	0 - 22	0 - 2
western wheatgrass	PASM	5	20 - 100	1 - 5	5	0 - 28	0 - 2	5	0 - 57	0 - 3			
Wilcox panicum	DIWI5	5	0 - 60	0 - 3	5	0 - 42	0 - 3	5	0 - 38	0 - 2	5	0 - 11	0 - 1
other grasses	2GRAM	5	0 - 100	0 - 5	5	0 - 70	0 - 5	5	0 - 95	0 - 5	5	0 - 55	0 - 5
GRASS-LIKES													
sedge	CAREX	6	40 - 200	2 - 10	6	140 - 350	10 - 25	6	19 - 190	1 - 10	6	0 - 165	0 - 15
other grass-likes	2GL	6	0 - 60	0 - 3	6	0 - 70	0 - 5	6	0 - 38	0 - 2	6	0 - 22	0 - 2
NON-NATIVE GRASSES													
annual bromegrass	BROMU	7			7	70 - 280	5 - 20	7	760 - 1235	40 - 65	7	275 - 605	25 - 55
Kentucky bluegrass	POPR				7	28 - 210	2 - 15	7	380 - 950	20 - 50	7	220 - 550	20 - 50
smooth bromegrass	BRIN2				7	0 - 70	0 - 5	7	285 - 760	15 - 40	7	0 - 110	0 - 10
FORBS													
American pasqueflower	PUPAM	8	20 - 40	1 - 2	8	70 - 140	5 - 10	8	95 - 190	5 - 10	8	55 - 165	5 - 15
bracted spiderwort	TRBR	8	20 - 40	1 - 2	8	0 - 14	0 - 1						
cudweed sagewort	ARLU	8	20 - 40	1 - 2	8	14 - 56	1 - 4	8	19 - 76	1 - 4	8	11 - 55	1 - 5
cutleaf ironplant	MAPI	8	0 - 20	0 - 1									
dotted gayfeather	LIPU	8	20 - 40	1 - 2	8	0 - 14	0 - 1	8	0 - 19	0 - 1			
false boneset	BREU	8	0 - 40	0 - 2									
green sagewort	ARCA12	8	20 - 40	1 - 2	8	14 - 42	1 - 3	8	19 - 57	1 - 3	8	11 - 44	1 - 4
hairy goldaster	HEVI4	8	20 - 40	1 - 2	8	0 - 14	0 - 1						
heath aster	SYER	8	20 - 40	1 - 2	8	14 - 42	1 - 3	8	19 - 57	1 - 3	8	11 - 33	1 - 3
lemon scurfpea	PSLA3	8	0 - 20	0 - 1									
milkvetch	ASTRA	8	0 - 20	0 - 1	8	0 - 14	0 - 1	8	0 - 19	0 - 1			
Missouri goldenrod	SOMI2	8	20 - 40	1 - 2	8	14 - 28	1 - 2	8	19 - 57	1 - 3	8	11 - 33	1 - 3
penstemon	PENST	8	0 - 40	0 - 2				8	0 - 19	0 - 1			
prairie coneflower	RACO3	8	20 - 40	1 - 2	8	0 - 14	0 - 1	8	0 - 19	0 - 1			
purple coneflower	ECAN2	8	0 - 40	0 - 2									
purple prairie clover	DAPU5	8	20 - 40	1 - 2	8	0 - 14	0 - 1	8	0 - 19	0 - 1			
rush skeletonweed	LYJU	8	0 - 20	0 - 1	8	0 - 14	0 - 1	8	0 - 19	0 - 1			
scarlet gaura	GACO5	8	20 - 40	1 - 2									
scarlet globemallow	SPCO	8	20 - 40	1 - 2	8	0 - 14	0 - 1	8	0 - 19	0 - 1	8	0 - 11	0 - 1
slimflower scurfpea	PSTE5	8	0 - 40	0 - 2	8	0 - 14	0 - 1	8	0 - 38	0 - 2			
spiny phlox	PHHO	8	0 - 20	0 - 1	8	0 - 14	0 - 1	8	0 - 19	0 - 1	8	0 - 11	0 - 1
stiff sunflower	HEPA19	8	20 - 40	1 - 2									
sundrops	CALYL	8	0 - 20	0 - 1									
textile onion	ALTE	8	0 - 20	0 - 1	8	0 - 14	0 - 1	8	0 - 19	0 - 1			
western ragweed	AMPS	8	0 - 40	0 - 2	8	14 - 42	1 - 3	8	19 - 38	1 - 2	8	11 - 44	1 - 4
woolly verbena	VEST	8	0 - 20	0 - 1	8	14 - 28	1 - 2	8	0 - 19	0 - 1	8	0 - 22	0 - 2
native forbs	2FN	8	20 - 60	1 - 3	8	14 - 42	1 - 3	8	19 - 57	1 - 3	8	0 - 33	0 - 3
introduced forbs	2FI				8	0 - 56	0 - 4	8	19 - 76	1 - 4	8	11 - 55	1 - 5
SHRUBS													
brittle cactus	OPFR	9	0 - 200	5 - 10	9	70 - 140	5 - 10	9	38 - 95	2 - 5	9	55 - 143	5 - 13
fringed sagewort	ARFR4	9	20 - 40	1 - 2	9	14 - 56	1 - 4	9	0 - 57	0 - 3	9	22 - 88	2 - 8
leadplant	AMCA6	9	20 - 60	1 - 3				9	0 - 19	0 - 1			
plains pricklypear	OPPO	9	20 - 40	1 - 2	9	14 - 42	1 - 3	9	19 - 38	1 - 2	9	11 - 33	1 - 3
rose	ROSA5	9	20 - 60	1 - 3	9	14 - 28	1 - 2	9	19 - 57	1 - 3	9	0 - 22	0 - 2
other shrubs	2SHRUB	9	20 - 60	1 - 3	9	0 - 28	0 - 2	9	0 - 38	0 - 2	9	0 - 22	0 - 2
Annual Production lbs./acre													
GRASSES & GRASS-LIKES			LOW	RV	HIGH		LOW	RV	HIGH		LOW	RV	HIGH
FORBS			1310	1700	2050		770	1190	1590		1175	1691	2085
SHRUBS			95	150	225		65	105	155		90	143	215
TOTAL			1500	2000	2500		900	1400	1900		1300	1900	2400

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 dominated the dynamics of this ecological site (ES). This state was codominated by warm- and cool-season grasses. 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. Mid- and tall stature grass species can decline and a corresponding increase in short stature warm-season grasses and cool-season grass-like species will occur.

1.1 Needlegrass/Bluestem/Grama Plant Community Phase

Interpretations are based primarily on the 1.1 Needlegrass/Bluestem/Grama Plant Community Phase (this is also considered to be climax). This community phase was the most dominant both temporally and spatially. The prevailing climate and weather patterns favor the development of this community phase dominated by mid- and tall cool- and warm-season grasses such as needleandthread, little bluestem, sideoats grama, and blue grama. Other grass and grass-like species occurring include big bluestem, threadleaf sedge, porcupine grass, plains muhly, western wheatgrass, prairie dropseed, prairie Junegrass, and sand dropseed. The vegetation consists of about 80 percent grass and grass-like species, 10 percent forbs, and 10 percent shrubs. A variety of leguminous and nonleguminous perennial forbs are present in minor amounts. This is a naturally nitrogen deficient plant community.

This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high drought tolerance. This was 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: SD5503

Growth curve name: Southern Black Glaciated 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 were as follows:

- 1.1a – Heavy continuous grazing which included herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods or a combination of disturbances such as extended periods of below average precipitation coupled with periodic or chronic heavy grazing would have shifted this community to the *1.2 Grama/Sedge/Needlegrass Plant Community Phase*.

1.2 Grama/Sedge/Needlegrass Plant Community Phase

This plant community evolved under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs. Dominant grass and grass-like species included blue grama, sideoats grama, sedge, and needleandthread. Grasses of secondary importance included green needlegrass, sand dropseed, little bluestem, western wheatgrass, hairy grama, and threeawn. Forbs commonly found in this plant community included cudweed sagewort, prairie coneflower, and western ragweed.

This plant community had similar plant composition to the 2.2 Grama/Sedge/Kentucky Bluegrass Plant Community Phase (refer to the plant composition tables). The main difference is that this plant community phase did not have the presence of nonnative invasive species such as Kentucky bluegrass and smooth brome grass.

When compared to the Needlegrass/Bluestem/Grama Plant Community Phase (1.1), sedge and blue grama increased. Big bluestem and needlegrasses decreased and production of mid- and tall warm-season grasses were also reduced. This plant community was moderately resistant to change. The herbaceous species present were well adapted to grazing; however, species composition could be altered through long-term overgrazing. If the herbaceous component was intact, it tended to be resilient if the disturbance was 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: SD5503

Growth curve name: Southern Black Glaciated 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:

- 1.2a – Grazing, precipitation, and/or fire returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the *1.1 Needlegrass/Bluestem/Grama Plant Community Phase*.

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

- T1 – Encroachment of non-native grasses such as Kentucky bluegrass and smooth brome grass, and disruption of natural disturbance regimes (typically as a result of fire suppression following settlement) led this state over a threshold to the *Native/Invaded State (State 2)*.

Native/Invaded State (State2)

This state is very similar to the Reference State. The invasion of introduced cool-season sod grasses has altered the natural range of variability for this ES. This state still has strong components of both warm- and cool-season grass species but invasive introduced cool-season sod grasses are now present in all community phases of this state. The primary disturbance mechanisms for this state include grazing by domestic livestock and a lack of fire. Timing of fires and grazing coupled with weather events dictate the dynamics that occur within this state. The mid- and tall warm- and cool-season native grasses can decline and an increase in introduced sod grasses will occur. Many times this state appears as a mosaic of community phases caused primarily by continuous season-long grazing.

2.1 Needlegrass/Bluestem/Grama Plant Community Phase

This community phase most closely resembles the Reference State in appearance and ecological functions (e.g., hydrologic, biotic, and soil/site stability). The warm- and cool-season codominated community is maintained with grazing systems that allow for adequate recovery periods following grazing events and potentially the combination of grazing and prescribed burning which closely mimics the natural disturbance regime.

This community phase closely resembles the 1.1 Needlegrass/Bluestem/Grama Plant Community Phase (refer to plant composition table and the narrative for the 1.1 plant community phase). The basic difference is the presence of minor amounts of introduced cool-season grasses and forbs. This is likely a naturally nitrogen deficient plant community. A change in the nutrient cycle on this ES possibly due to the introduction of nonnative species may be a causative factor leading to the eventual dominance of cool-season introduced grasses in the Invaded State.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year.

Growth curve number: SD5503

Growth curve name: Southern Black Glaciated 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:

- 2.1a – Heavy continuous grazing which included herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods or a combination of disturbances such as extended periods of below average precipitation coupled with periodic or chronic heavy grazing will shift this community to the *2.2 Grama/Sedge/Kentucky Bluegrass Plant Community Phase*.

2.2 Grama/Sedge/Kentucky Bluegrass Plant Community Phase

Grazing pressure reduces the mid/tall, less grazing tolerant species, while the shorter more grazing tolerant species increase. Litter amounts are reduced and energy capture shifts to slightly earlier in the growing season due to a decline in the later maturing native grass component and an increase in the earlier maturing grass-like and nonnative grasses. Kentucky bluegrass increases and may approach dominance in this community. Vegetation consists of about 80 percent grass and grass-like species, 10 percent forbs, and 10 percent shrubs. Blue grama, sedge, Kentucky bluegrass, and fringed sagewort are the dominant species in the early stages of this community phase. Significant grass species include Kentucky bluegrass, needleandthread, red threeawn, and sand dropseed. Other grasses present include western wheatgrass, green needlegrass, and prairie Junegrass. The common forbs include cudweed sagewort, goldenrod, green sagewort, heath aster, and scurfpea. Fringed sagewort, brittle cactus, plains pricklypear, and rose are the principal shrubs.

This community phase is often dispersed throughout the pasture, in an overgrazed/undergrazed pattern, typically referred to as patch grazing. Some areas (overgrazed) will exhibit the impacts of heavy use, while other areas (undergrazed) will have a build-up of litter and a high amount of plant decadence. This is a typical pattern found in properly stocked pastures grazed season-long. In the undergrazed patches, litter buildup reduces plant vigor and density, and native seedling recruitment declines. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to small colonies. In the overgrazed patches, plant vigor is reduced and the competitive advantage goes towards the grazing tolerant short statured species such as Kentucky bluegrass and sedge.

This community phase is approaching the threshold which would readily lead to the Invaded State. If management is significantly altered, this community phase can still be reverted back to the 2.1 Needlegrass/Bluestem/Grama community. Grazing management that allows for adequate recovery periods will tend to restore the ecological functions of this site.

Fire can play a role in reducing the introduced cool-season species. The combination of grazing and fire may be the most effective in moving this community phase towards a community resembling the interpretive plant community. Soil erosion is low. Infiltration is reduced, while runoff is increased compared to the interpretive plant community.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year.

Growth curve number: SD5503

Growth curve name: Southern Black Glaciated 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:

- 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 Needlegrass/Bluestem/Grama Plant Community Phase*.

Transitions from Native/Invaded State (State 2) to the Invaded State (State 3)

- T2a – 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 *3.1 Kentucky Bluegrass/Smooth Bromegrass Plant Community Phase* within the *Invaded State (State 3)*.
- T2b – Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season and at the same time of year each year) will cause a shift across a threshold leading to the *3.2 Kentucky Bluegrass Sod/Forbs Plant Community Phase* within the *Invaded State (State 3)*.

Invaded State (State 3)

This state is the result of invasion and dominance of introduced cool-season sod grasses. This state is characterized by the dominance of Kentucky bluegrass and/or smooth bromegrass and an increasing thatch layer that effectively blocks introduction of other plants into the system. Once the state is well established, even drastic events such as high intensity fires driven by high fuel loads of litter and thatch will not result in more than a very short-term reduction of these two species. These events may reduce the dominance of the sod grasses but due to the large amount of rhizomes in the soil there is no opportunity for the native species to establish and dominate before the sod grasses rebound and again dominate the system. Plant litter accumulation tends to favor the more shade tolerant introduced grass species. The nutrient cycle is also impaired and the result is typically a higher level of nitrogen which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns thereby shifting competitive advantage to shade tolerant introduced grass species. Studies indicate that soil biological activity is altered and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in sodgrass dominance. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition.

3.1 Kentucky Bluegrass/Smooth Bromegrass 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: SD5501

Growth curve name: Southern Black Glaciated 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:

- 3.1a – Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season and at the same time of year each year) will convert this plant community to the *3.2 Kentucky Bluegrass Sod/Forbs Plant Community Phase*.

3.2 Kentucky Bluegrass Sod/Forbs 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, sedge, and blue grama. 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: SD5501

Growth curve name: Southern Black Glaciated 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

Transition Pathway from Any Plant Community to the 3.3 Annual/Pioneer Perennial Plant Community Phase within the Invaded State (State 3)

- T4 – Cropping followed by abandonment may lead this plant community phase over a threshold to the *Invaded State (State 3)* and more specifically to the *3.3 Annual/Pioneer Perennial Plant Community Phase*.

3.3 Annual/Pioneer Perennial 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 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and 0 to 5 percent shrubs. The species present in this phase are highly variable, but often include nonnative invasive and/or early seral species. 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.

Transitions or pathways leading to other states are as follows:

- 3.3a – This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again. This pathway will likely occur with either prescribed grazing or heavy continuous grazing and lead to the 3.2 *Kentucky Bluegrass Sod/Forbs Plant Community Phase*.

Restoration Pathways from the Invaded State (State 3) to the Native/Invaded State (State 2)

- R3a – Prescribed burning, combined with high levels of prescribed grazing management (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 *Native/Invaded State (State 2)*. Pest management (i.e., herbicide) may also be needed to suppress cool-season invasive grasses. 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.
- R3b – Seeding of native species followed by 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 *Native/Invaded State (State 2)*. Pest management (i.e., herbicide) may also be needed to suppress cool-season invasive grasses. After establishment of the native grasses, management objectives must include the maintenance of those species, the associated reference state functions and continued treatment of the introduced sod grasses.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

Needlegrass/Bluestem/Grama Plant Community Phases (1.1 & 2.1):

Grama/Sedge/Kentucky Bluegrass Plant Community Phases (2.2):

Kentucky Bluegrass/Smooth Bromegrass Plant Community Phase (3.1):

Kentucky Bluegrass Sod/Forbs Plant Community Phase (3.2):

Annual/Pioneer Perennial Plant Community Phase (3.3):

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
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
hairy 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
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
prairie sandreed	U D D U	U D U U	U D D U	U U D U	U U D U	U D D U	U D D U
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
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
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 pasqueflower	N N N N	N U N N	N N N N	N U N N	N U N N	N N N N	N N N N
bracted 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
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
cutleaf ironplant	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
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
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
hairy goldaster	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
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
lemon 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
milkvetch	U U U U	U D U U	U U U U	U D U U	U D U U	U U U U	U D U U
Missouri goldenrod	U U D U	N U U N	U U D U	N U U N	N U U N	U U D U	N U U N
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
purple 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
rush skeletonweed	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
scarlet gaura	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
scarlet globemallow	U U D U	U D D U	U U D U	U D D U	U D D U	U U D U	U D D U
slimflower 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
stiff sunflower	U D P U	U D P U	U D P U	U D P U	U D P U	U D P U	U D P U
sundrops	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
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
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
woolly verbena	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
Shrubs							
brittle cactus	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
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
plains pricklypear	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
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

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)
Needlegrass/Bluestem/Grama (1.1 & 2.1)	2,000	0.55
Grama/Sedge/Kentucky Bluegrass (2.2)	1,400	0.38
Kentucky Bluegrass/Smooth Bromegrass (3.1)	1,900	0.52
Kentucky Bluegrass Sod/Forbs (3.2)	1,100	0.30
Annual/Pioneer Perennial (3.3)	600	0.16

*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 B. Infiltration is typically high and runoff low on this site 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, sedge, 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 (R055CY010SD), Thin Upland (R055CY012SD), Sandy (R055CY009SD)

Similar Sites

(R055CY009SD) – Sandy [more big bluestem; higher production]

(R055CY010SD) – Loamy [more green needlegrass and western wheatgrass; less 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: Stan Boltz, Range Management Specialist, NRCS.

<u>Data Source</u>	<u>Number of Records</u>	<u>Sample Period</u>	<u>State</u>	<u>County</u>
SCS-RANGE-417	2	2006	SD	Hand

State Correlation

This site has been correlated in SD in MLRA 55C.

Field Offices/Counties

Armour	Douglas	Huron	Beadle	Plankinton	Aurora
Chamberlain	Brule	Lake Andes	Charles Mix	Redfield	Spink
Clark	Clark	Madison	Lake	Salem	McCook
De Smet	Kingsbury	Miller	Hand	Tyndall	Bon Homme
Faulkton	Faulk	Mitchell	Davison/Hanson	Wessington Springs	Jerauld
Highmore	Hyde	Parker	Turner	Woonsocket	Sanborn
Howard	Miner	Parkston	Hutchinson	Yankton	Yankton

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 42e – Southern Missouri Coteau, 42f – Southern Missouri Coteau Slope, 46n – James River Lowland.

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