

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Very Shallow

Site ID: R102BY016SD

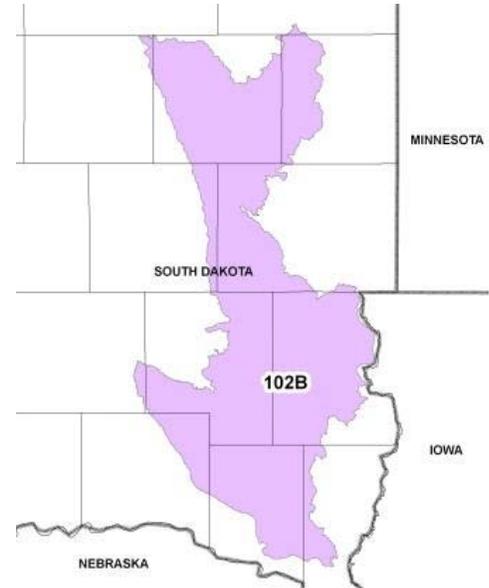
Major Land Resource Area (MLRA): 102B – Till Plains

Physiographic Features

This site occurs on gently to steeply sloping uplands.

Landform: outwash plain, moraine, outwash terrace

Aspect: N/A



	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	1,100	1,900
Slope (percent):	3	35
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:	Low	Medium

Climatic Features

MLRA 102B is considered to have a continental climate – cold winters and relatively hot summers, low to moderate 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 24 to 26 inches per year. The average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 14°F (Wentworth 2 WNW, South Dakota (SD)), to about 18°F (Canton 4 WNW, SD). July is the warmest month with temperatures averaging from about 72°F (Wentworth 2 WNW, SD), to about 73°F (Canton 4 WNW, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 57°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.

	<u>Minimum</u>	<u>Maximum</u>
Frost-free period (days):	145	147
Freeze-free period (days):	162	165
Mean Annual Precipitation (inches):	24	26

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.51	0.52	4.0	28.3
February	0.58	0.69	7.0	31.6
March	1.13	1.71	20.1	45.0
April	2.36	3.05	33.2	60.3
May	3.25	3.85	44.4	72.2
June	3.86	4.28	54.5	81.1
July	2.97	3.16	59.2	85.8
August	3.02	3.03	57.2	84.4
September	2.55	2.77	48.4	76.2
October	1.63	2.19	36.0	63.8
November	0.96	1.33	21.6	44.9
December	0.48	0.54	9.7	31.3

Climate Stations		Period	
Station ID	Location or Name	From	To
SD1392	Canton 4 WNW	1896	2009
SD1579	Centerville 6 SE	1897	2009
SD7667	Sioux Falls WSFO	1948	2009
SD9042	Wentworth 2 WNW	1893	2006

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 loamy sand to extremely gravelly sand textured subsoil and slopes of 3 to 35 percent. The soils in this site are excessively well-drained and formed in till outwash materials. The loam or gravelly loam surface layer is seven to nine inches thick. The soils have a moderate to rapid infiltration rate. This site should show 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 very unstable but intact. Subsurface soil layers are restrictive to root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 15 percent. Low available water capacity caused by the shallow rooting depth strongly influences the soil-water-plant relationship. With the high amounts of gravel throughout the profile, erosion is typically not a concern.

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

Parent Material Kind: outwash
Parent Material Origin:
Surface Texture: loam
Surface Texture Modifier: gravelly
Subsurface Texture Group: sandy
Surface Fragments ≤3” (% Cover): 5-13
Surface Fragments >3” (%Cover): 1-2
Subsurface Fragments ≤3” (% Volume): 30-41
Subsurface Fragments >3” (% Volume): 2-3

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	excessively well	excessively well
Permeability Class:	moderate	rapid
Depth (inches):	7	10
Electrical Conductivity (mmhos/cm)*:	0	2
Sodium Absorption Ratio*:	0	0
Soil Reaction (1:1 Water)*:	6.6	8.4
Soil Reaction (0.1M CaCl₂)*:	NA	NA
Available Water Capacity (inches)*:	3	3
Calcium Carbonate Equivalent (percent)*:	0	25

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

Plant Communities

Ecological Dynamics of the Site

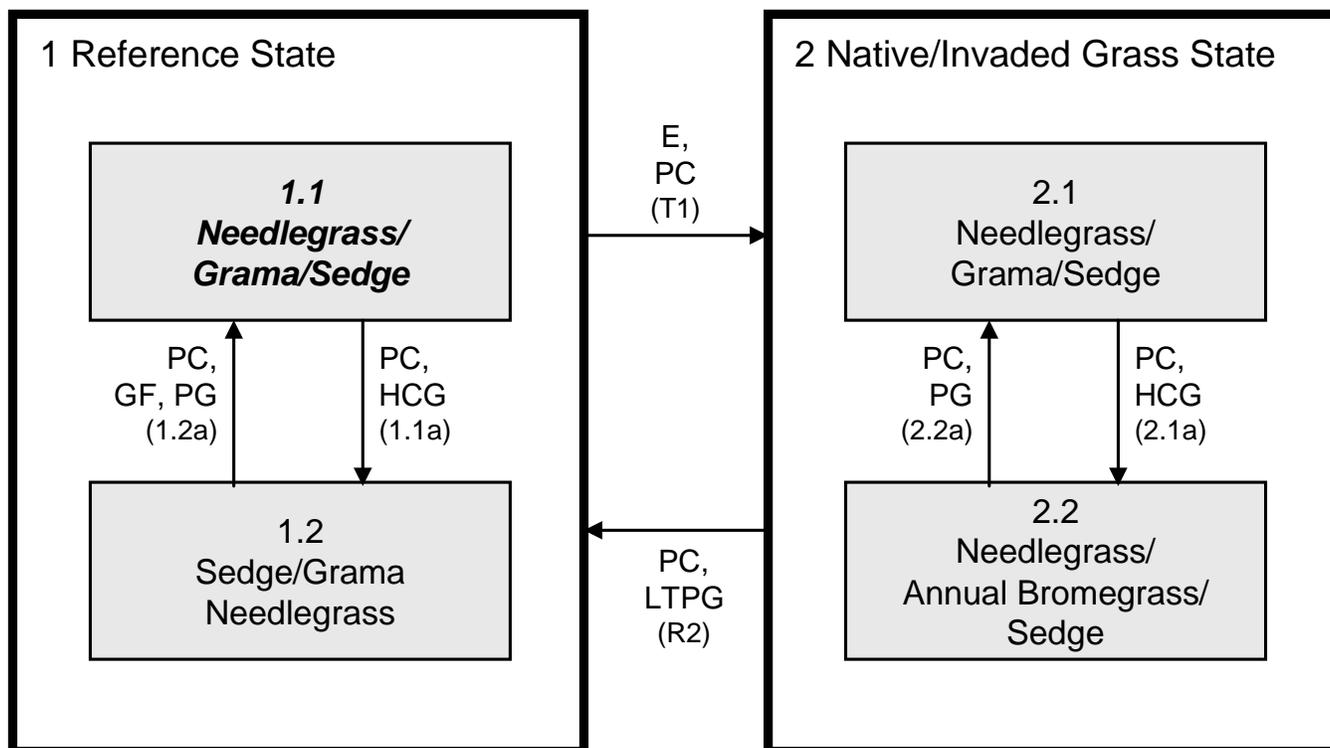
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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.

This ecological site (ES) is naturally resilient, and quite resistant to change. Also, due to the relatively steep slopes and naturally low fertility of the soils, this site generally avoids more intensive disturbances such as farming. However, 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 can cause this site to depart from the Needlegrass/Grama/Western Wheatgrass Plant Community Phase. Sedges and gramas can increase and eventually develop into a sod while many of the tall and mid-statured grasses will decrease (e.g., little bluestem, green needlegrass, needleandthread, porcupine grass, and western wheatgrass). Even with these disturbances, many of the tall and mid-statured grasses will remain in the community at reduced levels, allowing recovery to occur once the disturbances are removed.

Interpretations are primarily based on the Needlegrass/Grama/Western Wheatgrass Plant Community Phase (1.1). 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: **E** – Encroachment of non-native species; **GF** – Grazing and fire returned to normal disturbance regime levels and frequencies; **HCG** – Heavy continuous grazing (repeated grazing during the growing season without adequate recovery periods; **LTPG** – Long-term prescribed grazing; **PC** – Precipitation cycles; **PG** – Prescribed grazing.

Plant Community Composition and Group Annual Production

			1.1 Needlegrass/Grama/Sedge		
COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Group	lbs./acre	% Comp
GRASSES & GRASS-LIKES				1575 - 1785	75 - 85
NEEDLEGRASS			1	420 - 945	20 - 45
needleandthread	Hesperostipa comata ssp. comata	HECOC8	1	210 - 630	10 - 30
porcupine grass	Hesperostipa spartea	HESP11	1	105 - 420	5 - 20
green needlegrass	Nassella viridula	NAV14	1	0 - 168	0 - 8
SHORT WARM-SEASON GRASSES			2	210 - 525	10 - 25
blue grama	Bouteloua gracilis	BOGR2	2	105 - 420	5 - 20
hairy grama	Bouteloua hirsuta	BOH12	2	42 - 210	2 - 10
threeawn	Aristida spp.	ARIST	2	21 - 63	1 - 3
MID WARM-SEASON GRASSES			3	105 - 315	5 - 15
plains muhly	Muhlenbergia cuspidata	MUCU3	3	42 - 210	2 - 10
sideoats grama	Bouteloua curtipendula	BOCU	3	42 - 210	2 - 10
little bluestem	Schizachyrium scoparium	SCSC	3	0 - 105	0 - 5
OTHER NATIVE GRASSES			4	21 - 105	1 - 5
prairie junegrass	Koeleria macrantha	KOMA	4	21 - 63	1 - 3
Scribner panicum	Dichanthelium oligosanthes var. scribnerianum	DIOLS	4	0 - 42	0 - 2
Wilcox panicum	Dichanthelium wilcoxianum	DIW15	4	0 - 42	0 - 2
other grasses		2GRAM	4	0 - 84	0 - 4
GRASS-LIKES			5	105 - 315	5 - 15
threadleaf sedge	Carex filifolia	CAFI	5	42 - 210	2 - 10
needleleaf sedge	Carex duriuscula	CADU6	5	21 - 105	1 - 5
sun sedge	Carex inops ssp. heliophila	CAINH2	5	0 - 105	0 - 5
FORBS			7	105 - 315	5 - 15
American vetch	Vicia americana	VIAM	7	21 - 42	1 - 2
cudweed sagewort	Artemisia ludoviciana	ARLU	7	21 - 63	1 - 3
cutleaf ironplant	Machaeranthera pinnatifida	MAPI	7	0 - 21	0 - 1
dotted gayfeather	Liatris punctata	LIPU	7	21 - 42	1 - 2
false boneset	Brickellia eupatorioides	BREU	7	0 - 42	0 - 2
green sagewort	Artemisia campestris	ARCA12	7	21 - 42	1 - 2
hairy goldaster	Heterotheca villosa	HEV14	7	21 - 63	1 - 3
heath aster	Symphyotrichum ericoides	SYER	7	21 - 42	1 - 2
milkvetch	Astragalus spp.	ASTRA	7	0 - 21	0 - 1
prairie coneflower	Ratibida columnifera	RACO3	7	0 - 21	0 - 1
prairie spiderwort	Tradescantia occidentalis	TROC	7	21 - 42	1 - 2
purple coneflower	Echinacea angustifolia	ECAN2	7	21 - 63	1 - 3
purple prairie clover	Dalea purpurea	DAPU5	7	21 - 42	1 - 2
pussytoes	Antennaria spp.	ANTEN	7	0 - 21	0 - 1
scarlet gaura	Gaura coccinea	GACO5	7	0 - 21	0 - 1
scarlet globemallow	Sphaeralcea coccinea	SPCO	7	0 - 21	0 - 1
silverleaf scurfpea	Pediomelum argophyllum	PEAR6	7	21 - 42	1 - 2
slimflower scurfpea	Psoralidium tenuiflorum	PSTE5	7	0 - 21	0 - 1
white prairie clover	Dalea candida	DACA7	7	0 - 21	0 - 1
woolly Indianwheat	Plantago patagonica	PLPA2	7	0 - 21	0 - 1
native forbs		2FN	7	21 - 63	1 - 3
SHRUBS			8	105 - 210	5 - 10
cactus	Opuntia spp.	OPUNT	8	0 - 21	0 - 1
fringed sagewort	Artemisia frigida	ARFR4	8	21 - 63	1 - 3
leadplant	Amorpha canescens	AMCA6	8	21 - 63	1 - 3
rose	Rosa spp.	ROSA5	8	21 - 42	1 - 2
skunkbush sumac	Rhus trilobata	RHTR	8	0 - 21	0 - 1
snowberry	Symphoricarpos spp.	SYMPH	8	21 - 42	1 - 2
other shrubs		2SHRUB	8	0 - 42	0 - 2

Annual Production lbs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	1310	1733	2095
FORBS	95	210	365
SHRUBS	95	158	240
TOTAL	1500	2100	2700

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/Grama/Sedge			1.2 Sedge/Grama/Needlegrass			2.2 Needlegrass/Annual Bromegrass/Sedge		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES			1575 - 1785	75 - 85		1050 - 1190	75 - 85		675 - 765	75 - 85
NEEDLEGRASS		1	420 - 735	20 - 35	1	70 - 210	5 - 15	1	45 - 180	5 - 20
needleandthread	HECOC8	1	210 - 525	10 - 25	1	0 - 210	0 - 15	1	0 - 180	0 - 20
porcupine grass	HESP11	1	105 - 420	5 - 20	1	0 - 210	0 - 15	1	0 - 180	0 - 20
green needlegrass	NAV14	1	105 - 420	5 - 20	1	0 - 210	0 - 15	1	0 - 180	0 - 20
SHORT WARM-SEASON GRASSES		2	210 - 420	10 - 20	2	210 - 420	15 - 30	2	45 - 135	5 - 15
blue grama	BOGR2	2	105 - 315	5 - 15	2	140 - 350	10 - 25	2	18 - 90	2 - 10
hairy grama	BOH12	2	42 - 210	2 - 10	2	42 - 210	3 - 15	2	0 - 63	0 - 7
threeawn	ARIST	2	21 - 63	1 - 3	2	28 - 112	2 - 8	2	18 - 108	2 - 12
MID WARM-SEASON GRASSES		3	105 - 315	5 - 15	3	14 - 140	1 - 10	3	0 - 27	0 - 3
plains muhly	MUCU3	3	105 - 315	5 - 15	3	14 - 140	1 - 10	3	0 - 27	0 - 3
sideoats grama	BOCU	3	42 - 147	2 - 7	3	0 - 70	0 - 5			
little bluestem	SCSC	3	0 - 105	0 - 5	3	0 - 28	0 - 2			
OTHER NATIVE GRASSES		4	21 - 105	1 - 5	4	14 - 56	1 - 4	4	0 - 27	0 - 3
prairie junegrass	KOMA	4	21 - 63	1 - 3	4	14 - 28	1 - 2	4	0 - 18	0 - 2
Scribner panicum	DIOLS	4	0 - 42	0 - 2	4	0 - 14	0 - 1			
Wilcox panicum	DIW15	4	0 - 42	0 - 2	4	0 - 14	0 - 1			
other grasses	2GRAM	4	0 - 84	0 - 4	4	0 - 42	0 - 3	4	0 - 27	0 - 3
GRASS-LIKES		5	105 - 210	5 - 10	5	210 - 420	15 - 30	5	135 - 270	15 - 30
threadleaf sedge	CAFI	5	42 - 168	2 - 8	5	140 - 280	10 - 20	5	90 - 180	10 - 20
needleleaf sedge	CADU6	5	21 - 105	1 - 5	5	70 - 210	5 - 15	5	45 - 135	5 - 15
sun sedge	CAINH2	5	0 - 84	0 - 4	5	0 - 140	0 - 10	5	0 - 90	0 - 10
NON-NATIVE GRASSES		6			6	0 - 140	0 - 10	6	90 - 270	10 - 30
bluegrass	POA				6	0 - 140	0 - 10	6	0 - 90	0 - 10
cheatgrass	BRTE				6	0 - 140	0 - 10	6	45 - 180	5 - 20
Japanese bromegrass	BRAR5				6	0 - 140	0 - 10	6	45 - 180	5 - 20
smooth bromegrass	BRIN2				6	0 - 70	0 - 5	6	0 - 45	0 - 5
FORBS		7	105 - 315	5 - 15	7	70 - 210	5 - 15	7	45 - 135	5 - 15
American vetch	VIAM	7	21 - 42	1 - 2	7	0 - 14	0 - 1			
cudweed sagewort	ARLU	7	21 - 63	1 - 3	7	14 - 70	1 - 5	7	9 - 63	1 - 7
cutleaf ironplant	MAPI	7	0 - 21	0 - 1	7	0 - 14	0 - 1			
dotted gayfeather	LIPU	7	21 - 42	1 - 2	7	0 - 14	0 - 1			
false boneset	BREU	7	0 - 42	0 - 2						
green sagewort	ARCA12	7	21 - 42	1 - 2	7	14 - 56	1 - 4	7	9 - 54	1 - 6
hairy goldaster	HEV14	7	21 - 63	1 - 3	7	0 - 28	0 - 2			
heath aster	SYER	7	21 - 42	1 - 2	7	14 - 42	1 - 3	7	9 - 36	1 - 4
milkvetch	ASTRA	7	0 - 21	0 - 1						
prairie coneflower	RACO3	7	0 - 21	0 - 1	7	0 - 14	0 - 1			
prairie spiderwort	TROC	7	21 - 42	1 - 2	7	0 - 14	0 - 1			
purple coneflower	ECAN2	7	21 - 63	1 - 3	7	14 - 56	1 - 4	7	9 - 18	1 - 2
purple prairie clover	DAPU5	7	21 - 42	1 - 2	7	0 - 14	0 - 1			
pussytoes	ANTEN	7	0 - 21	0 - 1	7	0 - 14	0 - 1	7	0 - 9	0 - 1
scarlet gaura	GACO5	7	0 - 21	0 - 1						
scarlet globemallow	SPCO	7	0 - 21	0 - 1	7	0 - 14	0 - 1	7	0 - 9	0 - 1
silverleaf scurfpea	PEAR6	7	21 - 42	1 - 2	7	14 - 28	1 - 2	7	0 - 9	0 - 1
slimflower scurfpea	PSTE5	7	0 - 21	0 - 1	7	0 - 14	0 - 1			
white prairie clover	DACA7	7	0 - 21	0 - 1						
woolly Indianwheat	PLPA2	7	0 - 21	0 - 1	7	0 - 14	0 - 1	7	0 - 9	0 - 1
native forbs	2FN	7	21 - 63	1 - 3	7	14 - 42	1 - 3	7	0 - 18	0 - 2
introduced forbs	2FI				7	0 - 56	0 - 4	7	9 - 72	1 - 8
SHRUBS		8	105 - 210	5 - 10	8	70 - 140	5 - 10	8	45 - 90	5 - 10
cactus	OPUNT	8	0 - 21	0 - 1	8	0 - 28	0 - 2	8	0 - 36	0 - 4
fringed sagewort	ARFR4	8	21 - 63	1 - 3	8	14 - 70	1 - 5	8	18 - 72	2 - 8
leadplant	AMCA6	8	21 - 63	1 - 3	8	0 - 14	0 - 1			
rose	ROSA5	8	21 - 42	1 - 2	8	0 - 14	0 - 1			
skunkbush sumac	RHTR	8	0 - 21	0 - 1						
snowberry	SYMPH	8	21 - 42	1 - 2	8	0 - 28	0 - 2	8	0 - 9	0 - 1
other shrubs	2SHRUB	8	0 - 42	0 - 2	8	0 - 28	0 - 2	8	0 - 27	0 - 3
Annual Production lbs./acre			LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH	
GRASSES & GRASS-LIKES			1310 · 1733 · 2095		770 · 1155 · 1505		420 · 743 · 1055			
FORBS			95 · 210 · 365		65 · 140 · 240		40 · 90 · 150			
SHRUBS			95 · 158 · 240		65 · 105 · 155		40 · 68 · 95			
TOTAL			1500 · 2100 · 2700		900 · 1400 · 1900		500 · 900 · 1300			

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 with warm-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included grazing by large herding ungulates and fluctuations in levels of precipitation. 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. The dominant tall and mid-grass species can decline and a corresponding increase in short-statured species will occur.

1.1 Needlegrass/Grama/Sedge Plant Community Phase

The Needlegrass/Grama/Sedge Plant Community Phase is the plant community upon which interpretations are primarily based. This is also considered to be climax. This plant community can be found on areas that are properly managed with prescribed grazing that allows for proper utilization, changes in season of use and adequate recovery periods following each grazing event. The potential vegetation is about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. Cool-season grass and grass-like species dominate this plant community, with warm-season grasses being subdominant. The major grass or grass-like species include needlegrasses (needleandthread, green needlegrass, and/or porcupine grass), blue and/or hairy grama, sideoats grama, threadleaf sedge, and needleleaf sedge. Other grasses occurring on the site include threeawn, plains muhly, little bluestem, and prairie Junegrass. The significant forbs include dotted gayfeather, hairy goldaster, purple coneflower, and prairie clover. Significant shrubs are fringed sagewort, leadplant, rose, skunkbush sumac, and snowberry.

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. This plant community is stable and protected from excessive erosion.

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

Growth curve number: SD0212

Growth curve name: Till 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:

- 1.1a – Heavy continuous grazing (grazing the same area for extended portions of the growing season well above recommended stocking rates and without adequate recovery periods), especially when coupled with extended periods of below average precipitation will convert the plant community to the *1.2 Sedge/Grama/Needlegrass Plant Community Phase*.

1.2 Sedge/Grama/Needlegrass Plant Community Phase

This plant community can develop from the adverse effects of heavy, continuous grazing in conjunction with extended periods of below average precipitation. Short grass and grass-like species increase to dominate the site and annual production decreases.

Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives blue grama and sedges a competitive advantage over cool- and warm-season mid-grasses. Blue grama and threadleaf sedge are the dominant grass/grass-like species. Other grasses may include sideoats grama, needleandthread, prairie Junegrass, and threeawn. Significant forbs include green sagewort, cutleaf ironplant, scurfpeas, white prairie aster, and woolly Indianwheat. Common shrubs include fringed sagewort, cactus, and snowberry. Nonnative species such as Kentucky bluegrass, cheatgrass, and Japanese brome grass may begin to invade this phase.

This plant community is relatively stable. The competitive advantage of blue grama and threadleaf sedge prevents other species from establishing. This plant community is less productive than the 1.1 Needlegrass/Grama/Sedge Plant Community Phase. Runoff has increased and infiltration has decreased. Soil erosion does not increase substantially.

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

Growth curve number: SD0212

Growth curve name: Till 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

Transitional pathways leading to other plant communities are as follows:

- 1.2a – Grazing and fire returned to normal disturbance regime levels and frequencies or prescribed grazing (alternating season of use and providing adequate recovery periods) will convert this plant community to the *1.1 Needlegrass/Grama/Sedge Plant Community Phase*.
- T1 – Encroachment of non-native species and fluctuations in precipitation cycles (typically extended periods of below average precipitation) will cause a shift across a threshold from the *Reference State (State 1)* to the *Native/Invaded Grass State (State 2)*.

Native/Invaded 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 due to fire suppression. 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. Taller cool-season species can decline and a corresponding increase in short-statured grass will occur. Nonnative species such as cheatgrass or Japanese brome grass can become dominant at times and influence the biotic and hydrologic ecological processes of the State.

2.1 Needlegrass/Grama/Sedge Plant Community Phrase

This plant community is the result of encroachment of nonnative species, often as a result of fluctuations in precipitation cycles, typically extended periods of below average precipitation followed by a mild winter and/or a cool, wet spring. The potential vegetation is about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. Cool-season grass and grass-like species dominate this plant community, with warm-season grasses being subdominant. The major grass or grass-like species include needlegrasses (needleandthread, green needlegrass, and/or porcupine grass), blue and/or hairy grama, sideoats grama, threadleaf sedge, and needleleaf sedge.

Other grasses occurring on the site include threeawn, plains muhly, little bluestem, prairie Junegrass, and nonnative species such as Kentucky bluegrass, cheatgrass, and/or Japanese brome grass. The significant forbs include dotted gayfeather, purple coneflower, prairie clover, and hairy goldaster. Significant shrubs are fringed sagewort, leadplant, rose, and snowberry. This plant community is very similar to the 1.1 Needlegrass/Grama/Sedge Plant Community Phase (see plant composition tables for specific species composition). The main difference is that this plant community will have a minor amount on nonnative grasses, up to about 10 to 15 percent by weight.

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. This plant community is stable and protected from excessive erosion.

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

Growth curve number: SD0212

Growth curve name: Till 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 – Heavy continuous grazing (grazing the same area for extended portions of the growing season well above recommended stocking rates and without adequate recovery periods), especially when coupled with extended periods of below average precipitation will convert the plant community to the *2.2 Needlegrass/Annual Bromegrass/Sedge Plant Community Phase*.

2.2 Needlegrass/Annual Bromegrass/Sedge Plant Community Phase

This plant community can develop from the adverse effects of heavy, continuous grazing in conjunction with extended periods of below average precipitation. This plant community phase is further impacted by the invasion of nonnative species such as cheatgrass, Japanese brome grass, and/or Kentucky bluegrass. Needlegrasses will be evident on the aspect of this phase but will be reduced in vigor and production. Annual bromegrass and sedge will make up a bulk of the composition on this plant community phase. The dominant grass and grass-like species will include threadleaf sedge and/or needleleaf sedge, needlegrass (needleandthread, green needlegrass, and/or porcupine grass), and cheatgrass and/or Japanese brome grass. Other grasses present include blue grama, threeawn, Kentucky bluegrass, hairy grama, and prairie Junegrass. Significant forbs include green sagewort, cutleaf ironplant, scurfpeas, white prairie aster, and woolly Indianwheat. Common shrubs include cactus, snowberry, and fringed sagewort.

Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives sedges and annual bromegrass a competitive advantage over cool- and warm-season mid-grasses. This plant community is relatively stable. The competitive advantage of blue grama and threadleaf sedge prevents other species from establishing. This plant community is less productive than the 1.1 Needlegrass/Grama/Sedge Plant Community Phase. Runoff has increased and infiltration has decreased. Soil erosion does not increase substantially.

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

Growth curve number: SD0211
Growth curve name: Till 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 recovery pathways leading to other plant communities are as follows:

- 2.2a – Prescribed grazing (alternating season of use and providing adequate recovery periods) especially when coupled with a return to more normal precipitation cycles will convert this plant community to the *2.1 Needlegrass/Grama/Sedge Plant Community Phase*.
- R2 – 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) coupled with a return to more normal precipitation cycles may lead this plant community phase over a threshold to the *Reference State (State 1)*. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

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

Sedge/Grama/Needlegrass Plant Community Phase (1.2):

Needlegrass/Annual Bromegrass/Sedge Plant Community Phase (2.2):

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses and Grass-like							
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
needleleaf sedge	U D U D	U P N D	U D U D	U D U D	U D U D	U D U D	U D U D
plains 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 junegrass	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
Scribner panicum	U U D U	N U N N	U U D U	N U N N	N U N N	U U D U	U U D U
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
sun 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
threadleaf sedge	U D U D	U P N D	U D U D	U D U D	U D U D	U D U D	U D U D
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
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
cutweed 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
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
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 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
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
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
silverleaf 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
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
white 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
woolly Indianwheat	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
Shrubs							
cactus	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
fringed sagewort	U U U U	U U U U	U U U U	U D D U	U P P D	U U U U	U U U D
leadplant	U P D U	U P D U	U P D U	U P D U	U P D U	U P D U	U P D U
rose	U D D U	U D D U	U D D U	U D D U	U D D U	U D D U	U D D U
skunkbush sumac	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 U D
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)
Needlegrass/Grama/Sedge (1.1 & 2.1)	2,100	0.58
Sedge/Grama/Needlegrass (1.2)	1,400	0.38
Needlegrass/Annual Bromegrass/Sedge (2.2)	900	0.25

*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 A. 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, 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 (R102BY010SD), Shallow to Gravel (R102BY014SD)

Similar Sites

(R102BY014SD) – Shallow to Gravel [more bluestem; higher production]

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.

State Correlation

This site occurs entirely within South Dakota.

Field Offices/Counties

Brookings, SD	Brookings	Howard, SD	Miner	Salem, SD	McCook
Canton, SD	Lincoln	Madison, SD	Lake	Sioux Falls, SD	Minnehaha
Elk Point, SD	Union	Parker, SD	Turner	Vermillion, SD	Clay
Flandreau, SD	Moody	Parkston, SD	Hutchinson	Yankton, SD	Yankton

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 46k – Prairie Coteau; 46n – James River Lowland.

Other References

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

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

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

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

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

Site Description Approval

SD, State Range Management Specialist

Date