

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Claypan

Site ID: R053CY013SD

Major Land Resource Area (MLRA): 53C – Southern Dark Brown Glaciated Plains

Physiographic Features

This site occurs on nearly level to moderately sloping uplands.

Landform: plain, till plain, drainageway, terrace **Aspect:** N/A



	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	1,300	2,300
Slope (percent):	1	4
Water Table Depth (inches):	27	80
Flooding:		
Frequency:	None	Rare
Duration:	None	Very Brief
Ponding:		
Depth (inches):	None	None
Frequency:	None	None
Duration:	None	None
Runoff Class:	Medium	High

Climatic Features

MLRA 53C 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 18 to 22 inches per year. The average annual temperature is about 45°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, South Dakota (SD)), to about 16°F (Onida 4 NW, SD). July is the warmest month with temperatures averaging from about 72°F (Stephan, SD), to about 74°F (Onida 4 NW, 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):	125	141
Freeze-free period (days):	142	160
Mean Annual Precipitation (inches):	18	22

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.25	0.56	3.6	26.4
February	0.37	0.57	7.8	30.9
March	1.02	1.04	19.5	43.1
April	1.68	3.01	31.0	58.7
May	2.68	3.35	42.6	70.1
June	3.17	3.41	53.3	79.1
July	2.50	3.34	58.7	88.7
August	1.73	2.06	56.8	87.6
September	1.94	2.48	47.3	77.3
October	1.35	1.67	33.7	62.3
November	0.52	0.77	20.8	42.4
December	0.21	0.34	8.5	31.2

Climate Stations		Period	
Station ID	Location or Name	From	To
SD3608	Harrold 12 SSW	1963	2008
SD6292	Onida 4 NW	1913	2008
SD7992	Stephan	1903	2008
SD9077	Wessington Springs 7 SW	1948	1998

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 clay loam to clay textured subsoils and slopes of one to four percent. The soils in this site are moderately well to somewhat poorly drained and formed in till and alluvium. The loam to silty clay loam surface layer is 6 to 11 inches thick. The extremely hard clayey Btn horizon has round-topped or “bun shaped” columnar structure. These Btn horizons are high in sodium. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetation is diminished. Low available water capacity and very slow permeability strongly influences the soil-water-plant relationship.

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

Parent Material Kind: clayey till, silty drift over loamy till, clayey alluvium

Parent Material Origin:

Surface Texture: loam, silt loam, silty clay loam

Surface Texture Modifier: none

Subsurface Texture Group: clayey

Surface Fragments ≤3" (% Cover): 0-0

Surface Fragments >3" (%Cover): 0-0

Subsurface Fragments ≤3" (% Volume): 0-29

Subsurface Fragments >3" (% Volume): 0-2

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	somewhat poorly	moderately well
Permeability Class:	very slow	very slow
Depth (inches):	80	80
Electrical Conductivity (mmhos/cm)*:	0	8
Sodium Absorption Ratio*:	0	20
Soil Reaction (1:1 Water)*:	5.6	9
Soil Reaction (0.1M CaCl₂)*:	NA	NA
Available Water Capacity (inches)*:	5	7
Calcium Carbonate Equivalent (percent)*:	0	15

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

Plant Communities

Ecological Dynamics of the Site

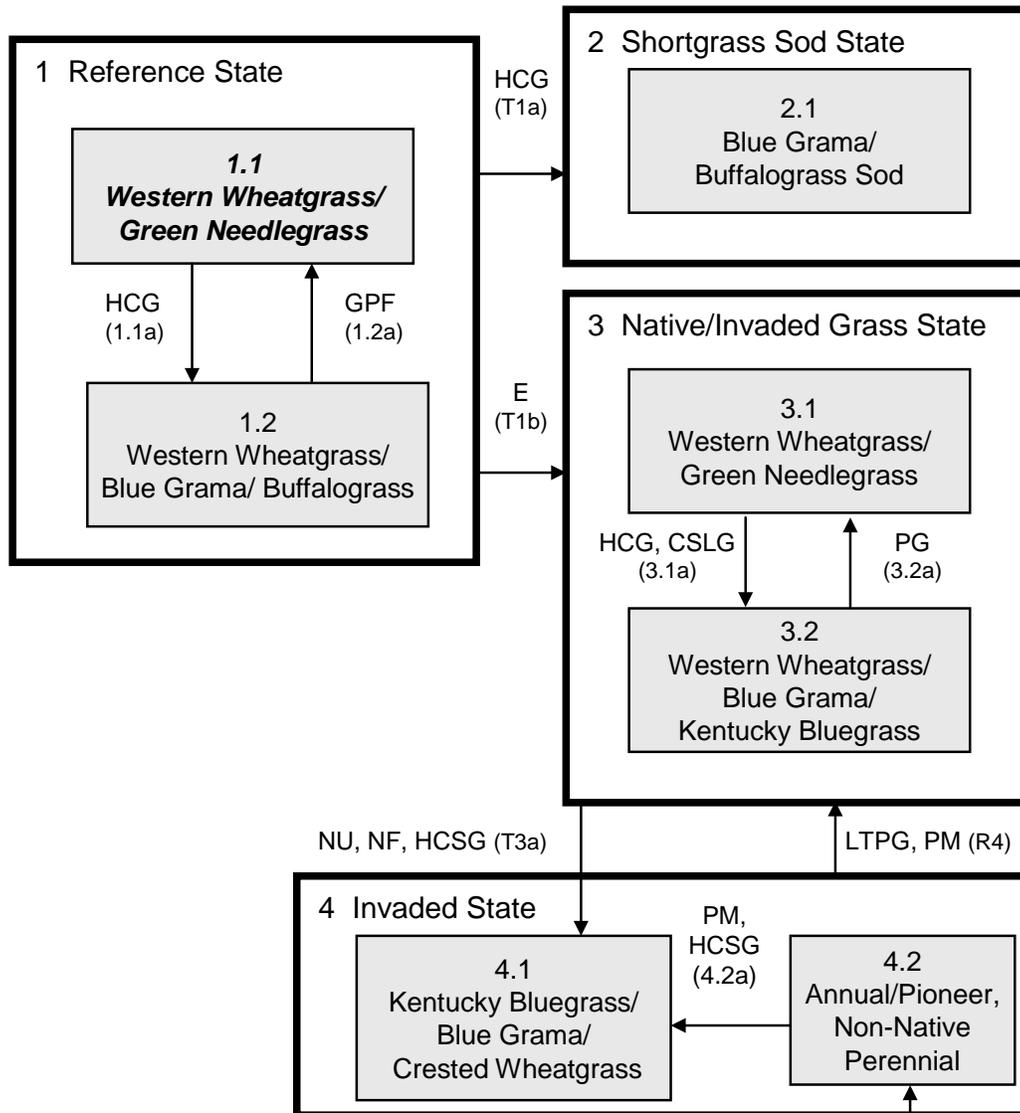
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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 grazing events causes departure from the 3.1 Western Wheatgrass/Green Needlegrass Plant Community Phase. This phase is the most typically occurring Plant Community Phase for this ecological site in MRLA 53C. Due to a general invasion of exotic species (such as Kentucky bluegrass and smooth brome) across the MLRA within this site, returning to the 1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase may not be possible. Blue grama will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass, needleandthread, sideoats grama, 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, green needlegrass, cheatgrass, and in some cases crested wheatgrass.

Interpretations are primarily based on the 1.1 Western Wheatgrass/Green Needlegrass 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: **C** – Cropped, abandoned; **CSLG** – Continuous season-long grazing; **E** – Encroachment of introduced species; **GPF** – Grazing, precipitation, and/or fire returning to more normal disturbance regime levels and frequencies; **HCG** – Heavy continuous grazing; **HCSG** – Heavy continuous seasonal grazing; **LTPG** – Long-term prescribed grazing; **NU, NF** – Non-use, no fire; **PG** – Prescribed grazing; **PM** – Pest management (herbicide); **S** – Seeding.

Any Plant Community

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				1500 - 1800	75 - 90
WHEATGRASS			1	300 - 800	15 - 40
western wheatgrass	Pascopyrum smithii	PASM	1	300 - 800	15 - 40
slender wheatgrass	Elymus trachycaulus	ELTR7	1	0 - 100	0 - 5
COOL-SEASON BUNCHGRASSES			2	300 - 660	15 - 33
green needlegrass	Nassella viridula	NAV14	2	300 - 600	15 - 30
needleandthread	Hesperostipa comata ssp. comata	HECOC8	2	40 - 200	2 - 10
porcupine grass	Hesperostipa spartea	HESP11	2	0 - 100	0 - 5
SHORT WARM-SEASON GRASSES			3	100 - 300	5 - 15
blue grama	Bouteloua gracilis	BOGR2	3	100 - 300	5 - 15
buffalograss	Bouteloua dactyloides	BODA2	3	20 - 100	1 - 5
inland saltgrass	Distichlis spicata	DISP	3	20 - 60	1 - 3
threeawn	Aristida spp.	ARIST	3	20 - 40	1 - 2
TALL/MID WARM-SEASON GRASSES			4	40 - 180	2 - 9
prairie sandreed	Calamovilfa longifolia	CALO	4	0 - 180	0 - 9
sideoats grama	Bouteloua curtipendula	BOCU	4	20 - 180	1 - 9
OTHER NATIVE GRASSES			5	20 - 100	1 - 5
prairie junegrass	Koeleria macrantha	KOMA	5	20 - 60	1 - 3
Sandberg bluegrass	Poa secunda	POSE	5	0 - 40	0 - 2
Scribner panicum	Dichantherium oligosanthes var. scribnerian	DIOLS	5	0 - 40	0 - 2
other grasses		2GRAM	5	0 - 80	0 - 4
GRASS-LIKES			6	40 - 160	2 - 8
needleleaf sedge	Carex duriuscula	CADU6	6	20 - 160	1 - 8
threadleaf sedge	Carex filifolia	CAFI	6	20 - 100	1 - 5
other grass-like		2GL	6	0 - 60	0 - 3
FORBS			8	100 - 200	5 - 10
American vetch	Vicia americana	VIAM	8	20 - 40	1 - 2
cudweed sagewort	Artemisia ludoviciana	ARLU	8	20 - 60	1 - 3
curlycup gumweed	Grindelia squarrosa	GRSQ	8	0 - 20	0 - 1
deervetch	Lotus unifoliolatus var. unifoliolatus	LOUNU	8	20 - 40	1 - 2
goldenrod	Solidago spp.	SOLID	8	20 - 60	1 - 3
heath aster	Symphyotrichum ericoides	SYER	8	20 - 40	1 - 2
milkvetch	Astragalus spp.	ASTRA	8	0 - 20	0 - 1
prairie coneflower	Ratibida columnifera	RACO3	8	20 - 40	1 - 2
pussytoes	Antennaria spp.	ANTEN	8	0 - 20	0 - 1
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
scurfpea	Psoraleidium spp.	PSORA2	8	20 - 60	1 - 3
textile onion	Allium textile	ALTE	8	0 - 40	0 - 2
wavyleaf thistle	Cirsium undulatum	CIUN	8	0 - 40	0 - 2
western wallflower	Erysimum asperum	ERAS2	8	0 - 20	0 - 1
western yarrow	Achillea millefolium var. occidentalis	ACMIO	8	20 - 40	1 - 2
woolly Indianwheat	Plantago patagonica	PLPA2	8	20 - 40	1 - 2
native forbs		2FN	8	20 - 80	1 - 4
SHRUBS			9	100 - 200	5 - 10
brittle cactus	Opuntia fragilis	OPFR	9	20 - 80	1 - 4
fringed sagewort	Artemisia frigida	ARFR4	9	20 - 100	1 - 5
plains pricklypear	Opuntia polyacantha	OPPO	9	20 - 80	1 - 4
rose	Rosa spp.	ROSA5	9	20 - 40	1 - 2
other shrubs		2SHRUB	9	0 - 40	0 - 2

Annual Production lbs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	1010 -	1700	-2350
FORBS	95 -	150	-225
SHRUBS	95 -	150	-225
TOTAL	1200 -	2000	-2800

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 Western Wheatgrass/ Green Needlegrass			2.1 Blue Grama/ Buffalograss Sod			3.2 Western Wheatgrass/Blue Grama/Kentucky Bluegrass			4.1 Kentucky Bluegrass/Blue Grama/Crested Wheatgrass		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES			1500 - 1800	75 - 90		1050 - 1260	75 - 90		1190 - 1530	70 - 90		770 - 990	70 - 90
WHEATGRASS		1	300 - 800	15 - 40	1	14 - 56	1 - 4	1	170 - 340	10 - 20	1	0 - 44	0 - 4
western wheatgrass	PASM	1	300 - 900	15 - 45	1	14 - 56	1 - 4	1	170 - 340	10 - 20	1	0 - 44	0 - 4
slender wheatgrass	ELTR7	1	0 - 100	0 - 5				1	0 - 51	0 - 3			
COOL-SEASON BUNCHGRASSES		2	300 - 660	15 - 33	2	0 - 42	0 - 3	2	17 - 170	1 - 10	2	0 - 22	0 - 2
green needlegrass	NAV4	2	300 - 600	15 - 30	2	0 - 14	0 - 1	2	0 - 170	0 - 10	2	0 - 11	0 - 1
needleandthread	HECOC8	2	40 - 200	2 - 10	2	0 - 28	0 - 2	2	0 - 170	0 - 10	2	0 - 11	0 - 1
porcupine grass	HESP11	2	0 - 100	0 - 5									
SHORT WARM-SEASON GRASSES		3	100 - 300	5 - 15	3	350 - 770	25 - 55	3	340 - 595	20 - 35	3	330 - 550	30 - 50
blue grama	BOGR2	3	100 - 300	5 - 15	3	280 - 560	20 - 40	3	170 - 425	10 - 25	3	275 - 495	25 - 45
buffalograss	BODA2	3	20 - 100	1 - 5	3	28 - 280	2 - 20	3	34 - 170	2 - 10	3	22 - 55	2 - 5
inland saltgrass	DISP	3	20 - 60	1 - 3	3	14 - 70	1 - 5	3	0 - 51	0 - 3	3	11 - 55	1 - 5
threeawn	ARIST	3	20 - 40	1 - 2	3	28 - 140	2 - 10	3	17 - 85	1 - 5	3	22 - 55	2 - 5
TALL/MID WARM-SEASON		4	40 - 180	2 - 9	4	0 - 14	0 - 1	4	17 - 85	1 - 5	4	0 - 33	0 - 3
prairie sandreed	CALO	4	0 - 180	0 - 9	4	0 - 14	0 - 1	4	0 - 34	0 - 2	4	0 - 11	0 - 1
sideoats grama	BOCU	4	20 - 180	1 - 9	4	0 - 14	0 - 1	4	17 - 85	1 - 5	4	0 - 33	0 - 3
OTHER NATIVE GRASSES		5	20 - 100	1 - 5	5	14 - 70	1 - 5	5	17 - 85	1 - 5	5	0 - 55	0 - 5
prairie junegrass	KOMA	5	20 - 60	1 - 3	5	14 - 28	1 - 2	5	17 - 51	1 - 3	5	0 - 11	0 - 1
Sandberg bluegrass	POSE	5	0 - 40	0 - 2	5	0 - 42	0 - 3	5	0 - 51	0 - 3	5	0 - 22	0 - 2
Scribner panicum	DIOLS	5	0 - 40	0 - 2	5	0 - 28	0 - 2	5	0 - 34	0 - 2	5	0 - 11	0 - 1
other grasses	2GRAM	5	0 - 80	0 - 4	5	0 - 70	0 - 5	5	0 - 85	0 - 5	5	0 - 55	0 - 5
GRASS-LIKES		6	40 - 160	2 - 8	6	140 - 280	10 - 20	6	34 - 170	2 - 10	6	22 - 110	2 - 10
needleleaf sedge	CADU6	6	20 - 160	1 - 8	6	70 - 210	5 - 15	6	17 - 170	1 - 10	6	11 - 88	1 - 8
threadleaf sedge	CAFI	6	20 - 100	1 - 5	6	28 - 140	2 - 10	6	17 - 119	1 - 7	6	11 - 55	1 - 5
other grass-likes	2GL	6	0 - 60	0 - 3	6	0 - 70	0 - 5	6	0 - 51	0 - 3	6	0 - 22	0 - 2
NON-NATIVE GRASSES		7			7	0 - 140	0 - 10	7	170 - 340	10 - 20	7	220 - 385	20 - 35
annual bromegrass	BROMU	7			7	0 - 70	0 - 5	7	0 - 85	0 - 5	7	22 - 165	2 - 15
bluegrass	POA	7			7	0 - 140	0 - 10	7	85 - 255	5 - 15	7	110 - 330	10 - 30
crested wheatgrass	AGCR	7						7	0 - 170	0 - 10	7	0 - 165	0 - 15
smooth bromegrass	BRIN2	7						7	0 - 136	0 - 8	7	0 - 88	0 - 8
FORBS		8	100 - 200	5 - 10	8	70 - 140	5 - 10	8	85 - 170	5 - 10	8	55 - 110	5 - 10
American vetch	VIAM	8	20 - 40	1 - 2				8	0 - 17	0 - 1			
common dandelion	TAOF				8	0 - 28	0 - 2	8	0 - 34	0 - 2	8	0 - 55	0 - 5
cudweed sagewort	ARLU	8	20 - 60	1 - 3	8	14 - 42	1 - 3	8	17 - 51	1 - 3	8	0 - 33	0 - 3
curlycup gumweed	GRSQ	8	0 - 20	0 - 1	8	14 - 56	1 - 4	8	17 - 68	1 - 4	8	11 - 33	1 - 3
deervetch	LOUNU	8	20 - 40	1 - 2				8	0 - 17	0 - 1	8	0 - 11	0 - 1
goldenrod	SOLID	8	20 - 60	1 - 3	8	14 - 42	1 - 3	8	17 - 51	1 - 3	8	0 - 22	0 - 2
heath aster	SYER	8	20 - 40	1 - 2	8	14 - 28	1 - 2	8	17 - 34	1 - 2	8	0 - 22	0 - 2
milkvetch	ASTRA	8	0 - 20	0 - 1									
prairie coneflower	RACO3	8	20 - 40	1 - 2				8	0 - 34	0 - 2			
pussytoes	ANTEN	8	0 - 20	0 - 1	8	0 - 14	0 - 1	8	0 - 17	0 - 1	8	0 - 11	0 - 1
rush skeletonweed	LYJU	8	0 - 20	0 - 1				8	0 - 17	0 - 1	8	0 - 11	0 - 1
scarlet gaura	GACO5	8	20 - 40	1 - 2									
scarlet globemallow	SPOC	8	20 - 40	1 - 2	8	14 - 28	1 - 2	8	17 - 34	1 - 2	8	0 - 11	0 - 1
scurfpea	PSORA2	8	20 - 60	1 - 3	8	14 - 28	1 - 2	8	17 - 51	1 - 3	8	0 - 22	0 - 2
sweetclover	MELIL				8	0 - 84	0 - 6	8	0 - 102	0 - 6	8	0 - 99	0 - 9
textile onion	ALTE	8	0 - 40	0 - 2									
wayleaf thistle	CIUN	8	0 - 40	0 - 2	8	0 - 14	0 - 1	8	0 - 17	0 - 1			
western salsify	TRDU				8	0 - 42	0 - 3	8	0 - 51	0 - 3	8	0 - 22	0 - 2
western wallflower	ERAS2	8	0 - 20	0 - 1				8	0 - 34	0 - 2			
western yarrow	ACMIO	8	20 - 40	1 - 2	8	14 - 42	1 - 3	8	17 - 51	1 - 3	8	11 - 33	1 - 3
woolly Indianwheat	PLPA2	8	20 - 40	1 - 2	8	0 - 28	0 - 2	8	0 - 34	0 - 2	8	0 - 11	0 - 1
native forbs	2FN	8	20 - 80	1 - 4	8	0 - 28	0 - 2	8	0 - 51	0 - 3	8	0 - 22	0 - 2
introduced forbs	2FI				8	0 - 70	0 - 5	8	0 - 85	0 - 5	8	11 - 99	1 - 9
SHRUBS		9	100 - 200	5 - 10	9	70 - 210	5 - 15	9	85 - 255	5 - 15	9	55 - 110	5 - 10
brittle cactus	OPFR	9	20 - 80	1 - 4	9	14 - 112	1 - 8	9	17 - 136	1 - 8	9	11 - 88	1 - 8
fringed sagewort	ARFR4	9	20 - 100	1 - 5	9	14 - 126	1 - 9	9	17 - 153	1 - 9	9	11 - 55	1 - 5
plains pricklypear	OPPO	9	20 - 80	1 - 4	9	14 - 98	1 - 7	9	17 - 119	1 - 7	9	11 - 88	1 - 8
rose	ROSA5	9	20 - 40	1 - 2	9	0 - 28	0 - 2	9	0 - 34	0 - 2	9	0 - 11	0 - 1
other shrubs	2SHRUB	9	0 - 40	0 - 2	9	0 - 42	0 - 3	9	0 - 51	0 - 3	9	0 - 22	0 - 2
Annual Production lbs./acre			LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH
GRASSES & GRASS-LIKES			1010 - 1700 - 2350		870 - 1155 - 1405		1040 - 1403 - 1720		600 - 935 - 1260				
FORBS			95 - 150 - 225		65 - 105 - 155		80 - 128 - 190		50 - 83 - 120				
SHRUBS			95 - 150 - 225		65 - 140 - 240		80 - 170 - 290		50 - 83 - 120				
TOTAL			1200 - 2000 - 2800		1000 - 1400 - 1800		1200 - 1700 - 2200		700 - 1100 - 1500				

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 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 periods of below and/or above average precipitation, periodic fire, and herbivory by insects and large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. Cool-season and taller warm-season grasses would have declined and a corresponding increase in short, warm-season grasses would have occurred. Today, a similar state (State 3) 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. These sites are differentiated by the presence of exotic species such as Kentucky bluegrass and smooth brome. On most Clayey Loamy Overflow ESs within the MLRA, these species have invaded and are now present. It is likely that attaining the reference state as described here (without the presence of exotic herbaceous species) is not possible.

1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase

Interpretations are based primarily on the 1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation was about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community was dominated by cool-season grasses. The major grasses included western wheatgrass, green needlegrass, and blue grama. Other grass or grass-like species included needleandthread, sideoats grama, slender wheatgrass, and porcupine grass. 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: SD5301

Growth curve name: Southern Dark Brown 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 were as follows:

- 1.1a – Heavy Continuous Grazing at the same time of year, each year, without adequate recovery periods or chronic 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 heavy continuous grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grasses included western wheatgrass, blue grama, buffalograss, green needlegrass, sideoats grama, and needleandthread. Grasses of secondary importance included porcupine grass and sedge. Forbs commonly found in this plant community included cudweed sagewort, prairie coneflower, and western yarrow. This plant community had similar plant composition to the 3.2 Western Wheatgrass/Blue Grama/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.

When compared to the 1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase, blue grama and buffalograss increased. Green needlegrass and porcupine grass decreased, and production of mid- and tall- warm-season grasses was 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: SD5303

Growth curve name: Southern Dark Brown 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, along with precipitation and periodic light to moderate grazing with possible periodic rest will shift this community to the 1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase.

Transitions from Reference State (State 1) to Shortgrass Sod State (State 2)

- T1a – Heavy Continuous Grazing at the same time of year, each year, without adequate recovery periods or chronic heavy grazing will shift this community to the 2.0 Shortgrass Sod State.

Transitions from Reference State (State 1) to Native/Invaded Grass State (State 3)

- T1b – Encroachment of nonnative species such as Kentucky bluegrass and smooth brome, in combination of disruption of natural regimes (typically fire suppression following settlement) will shift this plant community to the 3.0 Native/Invaded Grass State.

2.1 Blue Grama/Buffalograss Sod 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 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grasses typically included blue grama and buffalograss. Grasses of secondary importance included sedge and western wheatgrass. Forbs commonly found in this plant community included cudweed sagewort, scurfpea, and western yarrow. When compared to the 1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase, blue grama and buffalograss were dominant on this plant community. Cool-season grasses decreased significantly. This vegetation state was very resistant to change. The herbaceous species present were well adapted to grazing. This plant community was less productive than other phases and the thick sod prevented other species from getting established.

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: SD5305

Growth curve name: Southern Dark Brown Glaciated 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

3.1 Western Wheatgrass/Green Needlegrass Plant Community Phase

This plant community phase is similar to the 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 brome (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, with warm-season grasses being subdominant. The major grasses include western wheatgrass, green needlegrass, and blue grama. Other grass or grass-like species include needleandthread and sideoats grama. 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: SD5301

Growth curve name: Southern Dark Brown 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 were as follows:

- 3.1a – Heavy Continuous Grazing at the same time of year, each year, without adequate recovery periods or chronic heavy grazing or Continuous Season Long Grazing utilizing available forages through the majority of the growing season in the absence of adequate rest periods, and livestock grazing returning year after year will shift this plant community to the 3.2 Western Wheatgrass/Blue Grama/Kentucky Bluegrass Plant Community Phase.

3.2 Western Wheatgrass/Blue Grama/Kentucky Bluegrass Plant Community Phase

This plant community is a result of heavy continuous grazing, 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, 15 percent forbs, and 5 percent shrubs. Dominant grasses include western wheatgrass, blue grama, and Kentucky bluegrass. Grasses of secondary importance include sideoats grama, little bluestem, green needlegrass, needleandthread, porcupine grass, buffalograss, and sedge. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, and western yarrow.

When compared to the 3.1 Western Wheatgrass/Green Needlegrass Plant Community Phase, blue grama has increased and green needlegrass and sideoats grama have decreased. 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: SD5302

Growth curve name: Southern Dark Brown Glaciated 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 were as follows:

- 3.2a – Prescribed Grazing that includes alternating season of utilization while providing adequate rest recovery periods of periodic light to moderate grazing will shift this plant community to the 3.1 Western Wheatgrass/Green Needlegrass Plant Community Phase.

Transitions Native/Invaded Grass State (State 3) to Invaded State (State 4)

- T3a – Non-Use and No Fire for extended periods of time (typically for 10 or more years) or Heavy Continuous Seasonal Grazing with stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year, each year, will shift this plant community to the 4.1 Kentucky Bluegrass/Blue Grama/Crested Wheatgrass Plant Community Phase within the 4.0 Invaded State.

Invaded State (State 4)

This plant community phase is a result of extended periods of nonuse and no fire. It is characterized by a dominance of invasive cool-season grasses. 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.

4.1 Kentucky Bluegrass/Blue Grama/Crested Wheatgrass 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 brome 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. Crested wheatgrass is sometimes present as well, but usually comprises less than 20 percent of the plant community. Blue grama is present and may comprise nearly half of the plant community. Production can be equal to or higher than the interpretive plant community. 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: SD5302

Growth curve name: Southern Dark Brown Glaciated 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

4.2 Annual/Pioneer/Non-Native 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. 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.

No growth curve has been assigned to this plant community phase.

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

- 4.2a – Pest Management using chemical or mechanical treatment to control target species and/or Heavy Continuous Seasonal Grazing with stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year, each year, will shift this plant community to the 4.1 Kentucky Bluegrass/Blue Grama/Crested Wheatgrass Plant Community Phase.

Restoration Pathway from Invaded State (State 4) to Native/Invaded Grass State (State 3)

- R4 – Long-Term Prescribed Grazing with moderate stocking levels coupled with adequate recovery periods, or grazing systems such as high-density, low-frequency, etc., intended to treat specific species or periodic light to moderate stocking levels including possible rest periods will shift this community to the 3.0 Native/Invaded Grass State. Pest management may also be needed to suppress invasive grasses. Success depends on whether native reproductive propagates remain intact onsite and may take a long period of time (10 years or more). Recovery may not be attainable.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1):

Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phase (1.2):

Blue Grama/Buffalograss Sod Plant Community Phase (2.1):

Western Wheatgrass/Green Needlegrass Plant Community Phase (3.1):

Western Wheatgrass/Blue Grama/Kentucky Bluegrass Plant Community Phase (3.2):

Kentucky Bluegrass/Blue Grama/Crested Wheatgrass Plant Community Phase (4.1):

Annual/Pioneer, Non-native Perennial Plant Community Phase (4.2):

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses and Grasslikes							
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
inland saltgrass	N U U N	N N N N	N U U N	N N N N	N N N N	N U U N	N U U N
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
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
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
Sandberg bluegrass	N U N N	N D N N	N U N N	N D N N	N D N N	N U N N	N U N N
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
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
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
western wheatgrass	U P D U	N D N N	U P D U	N D N N	N D N N	U P D U	U P D U
Forbs							
American vetch	U D P U	U P P U	U D P U	U P P U	U P P U	U D P U	U P P U
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
curlycup gumweed	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
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
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
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
pussytoes	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
rush skeletonweed	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
scarlet gaura	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
scarlet globemallow	U U D U	U D D U	U U D U	U D D U	U D D U	U U D U	U D D U
scurfpea	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
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 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
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							
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
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

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):	2,000	0.55
Blue Grama/ Buffalograss Sod (2.1):	1,400	0.38
Western Wheatgrass/Blue Grama/Kentucky (3.2):	1,700	0.46
Kentucky Bluegrass/Blue Grama/Crested Wheatgrass (4.1):	1,100	0.30
Annual/Pioneer, Non-native Perennial (4.2):	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. Infiltration varies from very slow to slow, and runoff potential for this site varies from high to very 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 brome grass 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 (R053CY010SD), Clayey (R053CY011SD), Clayey Overflow (R053CY021SD)

Similar Sites

(R053CY021SD) – Clayey Overflow [more big bluestem; higher production]

(R053CY011SD) – Clayey [more green needlegrass; less blue grama; 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 (RMS), NRCS; Shane Deranleau, RMS, NRCS; and Mitch Faulkner, RMS, NRCS.

State Correlation

This site has been correlated in SD in MLRA 53C.

Field Offices/Counties

Chamberlain	Brule/Bufalo	Huron	Beadle	Plankinton	Aurora
Faulkton	Faulk	Miller	Hand	Selby	Walworth
Gettysburg	Potter	Onida	Sully	Wessington Springs	Jerauld
Highmore	Hyde	Pierre	Hughes		

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 42a – Missouri Coteau, 42e – Southern Missouri Coteau, 42f – Southern Missouri Coteau Slope.

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.

USDA, NRCS, Various Published Soil Surveys.

Site Description Approval

SD, State Range Management Specialist

Date