

# United States Department of Agriculture Natural Resources Conservation Service

## Ecological Site Description

**Site Type:** Rangeland

**Site Name:** Shallow Loamy

**Site ID:** R102AY024SD

**Major Land Resource Area (MLRA):** 102A – Rolling Till Prairie



### Physiographic Features

This site occurs on moderately to steeply sloping uplands.

**Landform:** moraine, till plain

**Aspect:** N/A

	<u>Minimum</u>	<u>Maximum</u>
<b>Elevation (feet):</b>	1,000	2,000
<b>Slope (percent):</b>	15	30
<b>Water Table Depth (inches):</b>	80	80
<b>Flooding:</b>		
<b>Frequency:</b>	None	None
<b>Duration:</b>	None	None
<b>Ponding:</b>		
<b>Depth (inches):</b>	None	None
<b>Frequency:</b>	None	None
<b>Duration:</b>	None	None
<b>Runoff Class:</b>	High	High

### Climatic Features

MLRA 102A 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 21 to 27 inches per year. The average annual temperature is about 43°F. January is the coldest month with average temperatures ranging from about 5°F (Mahnomens 1 W, Minnesota (MN)), to about 14°F (Tracy, MN). July is the warmest month with temperatures averaging from about 69°F (Mahnomens 1 W, MN), to about 73°F (Tracy, MN). The range of normal average monthly temperatures between the coldest and warmest months is about 62°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>
<b>Frost-free period (days):</b>	121	152
<b>Freeze-free period (days):</b>	145	174
<b>Mean Annual Precipitation (inches):</b>	21	27

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.50	0.78	-5.9	23.1
February	0.50	0.76	1.1	27.8
March	0.86	1.46	15.0	39.4
April	2.00	2.52	30.5	56.5
May	2.93	3.14	42.5	70.0
June	3.67	4.14	52.0	79.4
July	3.17	3.66	56.3	84.7
August	2.64	3.60	54.2	82.3
September	1.98	2.83	44.6	73.6
October	1.52	2.14	34.1	60.8
November	0.74	1.23	18.4	41.9
December	0.45	0.76	2.8	27.9

Climate Stations		Period	
Station ID	Location or Name	From	To
SD0281	Arlington 1 W, SD	1928	2009
MN0667	Benson, MN	1952	2009
SD1739	Clark, SD	1893	2009
MN5012	Mahnomen 1 W, MN	1927	1998
MN8323	Tracy, MN	1912	2009
SD8980	Waubay National Wildlife Refuge, SD	1952	2009

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 features common to soils in this site are the silt loam or clay loam textured surface layers and slopes of 15 to 30 percent. The soils in this site are well-drained and formed in loamy till over shale. The surface layer is about six to seven inches thick. The texture of the subsurface layers ranges from loam to clay loam. The soils have a moderately slow infiltration rate. These soils are shallow to the parent material at a depth of about 15 to 18 inches. 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. The soil surface is stable and intact.

These soils are susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 20 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:** till, unspecified

**Parent Material Origin:**

**Surface Texture:** silt loam, clay loam

**Surface Texture Modifier:** none

**Subsurface Texture Group:** loamy

**Surface Fragments ≤3" (% Cover):** 4-6

**Surface Fragments >3" (%Cover):** 2-4

**Subsurface Fragments ≤3" (% Volume):** 6-9

**Subsurface Fragments >3" (% Volume):** 2-4

	<u>Minimum</u>	<u>Maximum</u>
<b>Drainage Class:</b>	well	well
<b>Permeability Class:</b>	moderately slow	moderate slow
<b>Depth (inches):</b>	10	20
<b>Electrical Conductivity (mmhos/cm)*:</b>	0	0
<b>Sodium Absorption Ratio*:</b>	0	0
<b>Soil Reaction (1:1 Water)*:</b>	6.1	8.4
<b>Soil Reaction (0.1M CaCl<sub>2</sub>)*:</b>	NA	NA
<b>Available Water Capacity (inches)*:</b>	2	2
<b>Calcium Carbonate Equivalent (percent)*:</b>	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 that may not be described within this document.

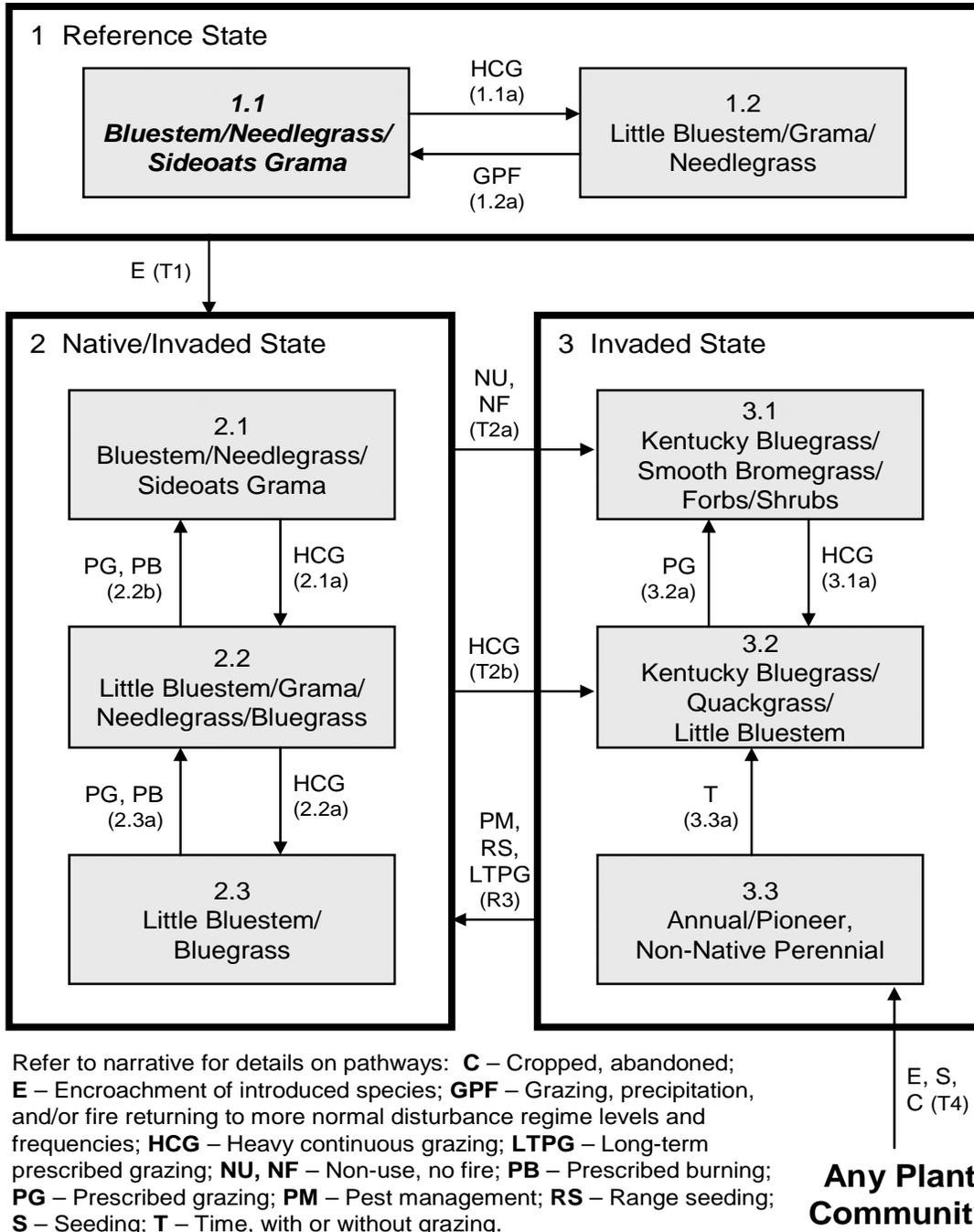
Continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following grazing events causes departure from the 2.1 Bluestem/Needlegrass/Sideoats Grama Plant Community Phase. Little bluestem, wheatgrass, sideoats grama, and blue grama will increase. Eventually, blue grama, quackgrass, and Kentucky bluegrass may develop into a sod. Indiangrass, big bluestem, porcupine grass, green needlegrass, 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 bromegrass, and green needlegrass.

Interpretations are primarily based on the 1.1 Bluestem/Needlegrass/Sideoats 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



**Plant Community Composition and Group Annual Production**

			1.1 Bluestem/Needlegrass/Sideoats Grama		
COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Group	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>				2160 - 2430	80 - 90
<b>MID WARM-SEASON GRASSES</b>			<b>1</b>	<b>540 - 945</b>	<b>20 - 35</b>
little bluestem	Schizachyrium scoparium	SCSC	1	270 - 675	10 - 25
sideoats grama	Bouteloua curtipendula	BOCU	1	135 - 405	5 - 15
plains muhly	Muhlenbergia cuspidata	MUCU3	1	54 - 270	2 - 10
prairie dropseed	Sporobolus heterolepis	SPHE	1	27 - 135	1 - 5
<b>COOL-SEASON BUNCHGRASSES</b>			<b>2</b>	<b>405 - 945</b>	<b>15 - 35</b>
porcupine grass	Hesperostipa spartea	HESP11	2	270 - 675	10 - 25
green needlegrass	Nassella viridula	NAVI4	2	54 - 270	2 - 10
needleandthread	Hesperostipa comata ssp. comata	HECOC8	2	27 - 135	1 - 5
Canada wildrye	Elymus canadensis	ELCA4	2	27 - 81	1 - 3
<b>TALL WARM-SEASON GRASSES</b>			<b>3</b>	<b>270 - 540</b>	<b>10 - 20</b>
big bluestem	Andropogon gerardii	ANGE	3	135 - 405	5 - 15
Indiangrass	Sorghastrum nutans	SONU2	3	54 - 270	2 - 10
prairie sandreed	Calamovilfa longifolia	CALO	3	27 - 135	1 - 5
<b>WHEATGRASS</b>			<b>4</b>	<b>54 - 135</b>	<b>2 - 5</b>
western wheatgrass	Pascopyrum smithii	PASM	4	27 - 135	1 - 5
slender wheatgrass	Elymus trachycaulus	ELTR7	4	27 - 135	1 - 5
<b>OTHER NATIVE GRASSES</b>			<b>5</b>	<b>54 - 135</b>	<b>2 - 5</b>
blue grama	Bouteloua gracilis	BOGR2	5	27 - 81	1 - 3
prairie junegrass	Koeleria macrantha	KOMA	5	27 - 81	1 - 3
Scribner panicum	Dichantherium oligosanthes var. scribnerianum	DIOLS	5	0 - 54	0 - 2
other grasses		2GRAM	5	0 - 135	0 - 5
<b>GRASS-LIKES</b>			<b>6</b>	<b>54 - 135</b>	<b>2 - 5</b>
sun sedge	Carex inops ssp. heliophila	CAINH2	6	27 - 81	1 - 3
other grass-likes		2GL	6	27 - 81	1 - 3
<b>FORBS</b>			<b>8</b>	<b>135 - 270</b>	<b>5 - 10</b>
American pasqueflower	Pulsatilla patens ssp. multifida	PUPAM	8	27 - 54	1 - 2
American vetch	Vicia americana	VIAM	8	27 - 54	1 - 2
aromatic aster	Symphyotrichum oblongifolium	SYOB	8	0 - 27	0 - 1
catclaw sensitive briar	Mimosa nuttallii	MINU6	8	27 - 54	1 - 2
compassplant	Silphium laciniatum	SILA3	8	27 - 54	1 - 2
cudweed sagewort	Artemisia ludoviciana	ARLU	8	27 - 54	1 - 2
cutleaf ironplant	Machaeranthera pinnatifida	MAPI	8	0 - 27	0 - 1
gayfeather	Liatris spp.	LIATR	8	27 - 54	1 - 2
goldenrod	Solidago spp.	SOLID	8	27 - 54	1 - 2
green sagewort	Artemisia campestris	ARCA12	8	0 - 27	0 - 1
heath aster	Symphyotrichum ericoides	SYER	8	27 - 54	1 - 2
Indian breadroot	Pediomelum spp.	PEDIO2	8	0 - 54	0 - 2
Lambert crazyweed	Oxytropis lambertii	OXLA3	8	0 - 27	0 - 1
milkvetch	Astragalus spp.	ASTRA	8	0 - 27	0 - 1
prairie coneflower	Ratibida columnifera	RACO3	8	27 - 54	1 - 2
purple coneflower	Echinacea angustifolia	ECAN2	8	27 - 81	1 - 3
purple prairie clover	Dalea purpurea	DAPU5	8	27 - 54	1 - 2
pussytoes	Antennaria spp.	ANTEN	8	0 - 27	0 - 1
scurfpea	Psoraleum spp.	PSORA2	8	27 - 54	1 - 2
stiff sunflower	Helianthus pauciflorus	HEPA19	8	27 - 54	1 - 2
wavyleaf thistle	Cirsium undulatum	CIUN	8	0 - 27	0 - 1
western ragweed	Ambrosia psilostachya	AMPS	8	0 - 27	0 - 1
western yarrow	Achillea millefolium var. occidentalis	ACMIO	8	0 - 27	0 - 1
wild onion	Allium spp.	ALLIU	8	0 - 27	0 - 1
native forbs		2FN	8	27 - 81	1 - 3
<b>SHRUBS</b>			<b>9</b>	<b>135 - 270</b>	<b>5 - 10</b>
chokecherry	Prunus virginiana	PRVI	9	0 - 54	0 - 2
fringed sagewort	Artemisia frigida	ARFR4	9	27 - 54	1 - 2
leadplant	Amorpha canescens	AMCA6	9	27 - 108	1 - 4
rose	Rosa spp.	ROSA5	9	27 - 54	1 - 2
smooth sumac	Rhus glabra	RHGL	9	0 - 54	0 - 2
snowberry	Symphoricarpos spp.	SYMPH	9	27 - 54	1 - 2
wild plum	Prunus americana	PRAM	9	0 - 54	0 - 2
other shrubs		2SHRUB	9	0 - 108	0 - 4

Annual Production lbs./acre	LOW	RV	HIGH
<b>GRASSES &amp; GRASS-LIKES</b>	1760	2295	2780
<b>FORBS</b>	120	203	310
<b>SHRUBS</b>	120	203	310
<b>TOTAL</b>	2000	2700	3400

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 Bluestem/Needlegrass/ Sideoats Grama			2.2 Little Bluestem/Grama/ Needlegrass/Bluegrass			2.3 Little Bluestem/Bluegrass		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>			2160 - 2430	80 - 90		1650 - 1870	75 - 85		1500 - 1700	75 - 85
<b>MID WARM-SEASON GRASSES</b>		1	540 - 945	20 - 35	1	550 - 990	25 - 45	1	500 - 1000	25 - 50
little bluestem	SCSC	1	270 - 675	10 - 25	1	440 - 880	20 - 40	1	500 - 1000	25 - 50
sideoats grama	BOCU	1	135 - 405	5 - 15	1	110 - 440	5 - 20	1	40 - 300	2 - 15
plains muhly	MUCU3	1	54 - 270	2 - 10	1	0 - 66	0 - 3			
prairie dropseed	SPHE	1	27 - 135	1 - 5	1	0 - 44	0 - 2			
<b>COOL-SEASON BUNCHGRASSES</b>		2	405 - 945	15 - 35	2	110 - 330	5 - 15	2	0 - 160	0 - 8
porcupine grass	HESP11	2	270 - 675	10 - 25	2	0 - 176	0 - 8	2	0 - 60	0 - 3
green needlegrass	NAVI4	2	54 - 270	2 - 10	2	44 - 220	2 - 10	2	0 - 120	0 - 6
needleandthread	HECOC8	2	27 - 135	1 - 5	2	0 - 88	0 - 4	2	0 - 40	0 - 2
Canada wildrye	ELCA4	2	27 - 81	1 - 3	2	0 - 44	0 - 2			
<b>TALL WARM-SEASON GRASSES</b>		3	270 - 540	10 - 20	3	22 - 220	1 - 10	3	0 - 100	0 - 5
big bluestem	ANGE	3	135 - 405	5 - 15	3	22 - 176	1 - 8	3	0 - 100	0 - 5
Indiangrass	SONU2	3	54 - 270	2 - 10	3	0 - 66	0 - 3			
prairie sandreed	CALO	3	27 - 135	1 - 5	3	0 - 44	0 - 2			
<b>WHEATGRASS</b>		4	54 - 135	2 - 5	4	0 - 132	0 - 6	4	0 - 140	0 - 7
western wheatgrass	PASM	4	27 - 135	1 - 5	4	0 - 132	0 - 6	4	0 - 140	0 - 7
slender wheatgrass	ELTR7	4	27 - 135	1 - 5	4	0 - 44	0 - 2			
<b>OTHER NATIVE GRASSES</b>		5	54 - 135	2 - 5	5	22 - 154	1 - 7	5	40 - 160	2 - 8
blue grama	BOGR2	5	27 - 81	1 - 3	5	22 - 132	1 - 6	5	40 - 160	2 - 8
prairie junegrass	KOMA	5	27 - 81	1 - 3	5	0 - 44	0 - 2	5	0 - 20	0 - 1
Scribner panicum	DIOLS	5	0 - 54	0 - 2	5	0 - 44	0 - 2	5	0 - 20	0 - 1
other grasses	2GRAM	5	0 - 135	0 - 5	5	0 - 110	0 - 5	5	0 - 100	0 - 5
<b>GRASS-LIKES</b>		6	54 - 135	2 - 5	6	22 - 110	1 - 5	6	20 - 140	1 - 7
sun sedge	CAINH2	6	27 - 81	1 - 3	6	22 - 110	1 - 5	6	20 - 140	1 - 7
other grass-likes	2GL	6	27 - 81	1 - 3	6	0 - 66	0 - 3	6	0 - 100	0 - 5
<b>NON-NATIVE GRASSES</b>		7			7	22 - 264	1 - 12	7	100 - 400	5 - 20
Kentucky bluegrass	POPR	7			7	22 - 220	1 - 10	7	40 - 400	2 - 20
quackgrass	ELRE4	7			7	0 - 66	0 - 3	7	0 - 100	0 - 5
smooth bromegrass	BRIN2	7			7	0 - 110	0 - 5	7	0 - 60	0 - 3
<b>FORBS</b>		8	135 - 270	5 - 10	8	110 - 330	5 - 15	8	100 - 300	5 - 15
American pasqueflower	PUPAM	8	27 - 54	1 - 2	8	0 - 22	0 - 1			
American vetch	VIAM	8	27 - 54	1 - 2	8	0 - 22	0 - 1			
aromatic aster	SYOB	8	0 - 27	0 - 1						
catclaw sensitive briar	MINU6	8	27 - 54	1 - 2	8	0 - 22	0 - 1			
compassplant	SILA3	8	27 - 54	1 - 2	8	0 - 22	0 - 1			
cutweed sagewort	ARLU	8	27 - 54	1 - 2	8	22 - 66	1 - 3	8	20 - 100	1 - 5
cutleaf ironplant	MAPI	8	0 - 27	0 - 1	8	0 - 22	0 - 1			
gayfeather	LIATR	8	27 - 54	1 - 2	8	22 - 44	1 - 2	8	0 - 20	0 - 1
goldenrod	SOLID	8	27 - 54	1 - 2	8	22 - 66	1 - 3	8	20 - 100	1 - 5
green sagewort	ARCA12	8	0 - 27	0 - 1	8	0 - 44	0 - 2	8	0 - 60	0 - 3
heath aster	SYER	8	27 - 54	1 - 2	8	22 - 66	1 - 3	8	20 - 80	1 - 4
Indian breadroot	PEDIO2	8	0 - 54	0 - 2	8	0 - 22	0 - 1			
Lambert crazyweed	OXLA3	8	0 - 27	0 - 1	8	0 - 22	0 - 1			
milkvetch	ASTRA	8	0 - 27	0 - 1	8	0 - 22	0 - 1	8	0 - 20	0 - 1
prairie coneflower	RACO3	8	27 - 54	1 - 2	8	0 - 22	0 - 1			
purple coneflower	ECAN2	8	27 - 81	1 - 3	8	0 - 44	0 - 2	8	0 - 20	0 - 1
purple prairie clover	DAPU5	8	27 - 54	1 - 2	8	0 - 22	0 - 1			
pussytoes	ANTEN	8	0 - 27	0 - 1	8	0 - 22	0 - 1	8	0 - 20	0 - 1
scurfpea	PSORA2	8	27 - 54	1 - 2	8	22 - 66	1 - 3	8	20 - 60	1 - 3
stiff sunflower	HEPA19	8	27 - 54	1 - 2	8	0 - 22	0 - 1			
wavyleaf thistle	CIUN	8	0 - 27	0 - 1	8	0 - 22	0 - 1	8	0 - 20	0 - 1
western ragweed	AMPS	8	0 - 27	0 - 1	8	22 - 44	1 - 2	8	20 - 80	1 - 4
western yarrow	ACMIO	8	0 - 27	0 - 1	8	22 - 44	1 - 2	8	20 - 80	1 - 4
wild onion	ALLIU	8	0 - 27	0 - 1	8	0 - 22	0 - 1	8	0 - 20	0 - 1
native forbs	2FN	8	27 - 81	1 - 3	8	0 - 66	0 - 3	8	0 - 60	0 - 3
introduced forbs	2FI				8	22 - 66	1 - 3	8	20 - 120	1 - 6
<b>SHRUBS</b>		9	135 - 270	5 - 10	9	110 - 220	5 - 10	9	100 - 200	5 - 10
chokecherry	PRVI	9	0 - 54	0 - 2	9	0 - 22	0 - 1			
fringed sagewort	ARFR4	9	27 - 54	1 - 2	9	0 - 44	0 - 2	9	0 - 60	0 - 3
leadplant	AMCA6	9	27 - 108	1 - 4	9	0 - 44	0 - 2			
rose	ROSA5	9	27 - 54	1 - 2	9	22 - 44	1 - 2	9	20 - 40	1 - 2
smooth sumac	RHGL	9	0 - 54	0 - 2	9	0 - 66	0 - 3	9	0 - 80	0 - 4
snowberry	SYMPH	9	27 - 54	1 - 2	9	22 - 110	1 - 5	9	20 - 140	1 - 7
wild plum	PRAM	9	0 - 54	0 - 2	9	0 - 44	0 - 2	9	0 - 60	0 - 3
other shrubs	2SHRUB	9	0 - 108	0 - 4	9	0 - 44	0 - 2	9	0 - 40	0 - 2
<b>Annual Production lbs./acre</b>			LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH	
<b>GRASSES &amp; GRASS-LIKES</b>			1760 - 2295 - 2780		1400 - 1815 - 2165		1210 - 1650 - 2030			
<b>FORBS</b>			120 - 203 - 310		100 - 220 - 385		95 - 200 - 345			
<b>SHRUBS</b>			120 - 203 - 310		100 - 165 - 250		95 - 150 - 225			
<b>TOTAL</b>			2000 - 2700 - 3400		1600 - 2200 - 2800		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. Refer to PLANTS database for scientific names and codes: <http://plants.usda.gov>

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	1.1 Bluestem/Needlegrass/ Sideoats Grama			3.1 Kentucky Bluegrass/Smooth Bromegrass/Forbs/Shrubs			3.2 Kentucky Bluegrass/ Quackgrass/Little Bluestem		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
<b>GRASSES &amp; GRASS-LIKES</b>			2160 - 2430	80 - 90		1750 - 2125	70 - 85		1200 - 1440	75 - 90
<b>MID WARM-SEASON GRASSES</b>		1	540 - 945	20 - 35	1	0 - 250	0 - 10	1	16 - 192	1 - 12
little bluestem	SCSC	1	270 - 675	10 - 25	1	0 - 200	0 - 8	1	16 - 192	1 - 12
sideoats grama	BOCU	1	135 - 405	5 - 15	1	0 - 125	0 - 5	1	0 - 48	0 - 3
plains muhly	MUCU3	1	54 - 270	2 - 10						
prairie dropseed	SPHE	1	27 - 135	1 - 5						
<b>COOL-SEASON BUNCHGRASSES</b>		2	405 - 945	15 - 35	2	0 - 200	0 - 8	2	0 - 48	0 - 3
porcupine grass	HESP11	2	270 - 675	10 - 25	2	0 - 125	0 - 5			
green needlegrass	NAVI4	2	54 - 270	2 - 10	2	0 - 200	0 - 8	2	0 - 48	0 - 3
needleandthread	HECOC8	2	27 - 135	1 - 5	2	0 - 75	0 - 3	2	0 - 32	0 - 2
Canada wildrye	ELCA4	2	27 - 81	1 - 3	2	0 - 50	0 - 2			
<b>TALL WARM-SEASON GRASSES</b>		3	270 - 540	10 - 20	3	0 - 125	0 - 5	3	0 - 48	0 - 3
big bluestem	ANGE	3	135 - 405	5 - 15	3	0 - 125	0 - 5	3	0 - 48	0 - 3
Indiangrass	SONU2	3	54 - 270	2 - 10						
prairie sandreed	CALO	3	27 - 135	1 - 5						
<b>WHEATGRASS</b>		4	54 - 135	2 - 5	4	0 - 175	0 - 7	4	0 - 32	0 - 2
western wheatgrass	PASM	4	27 - 135	1 - 5	4	0 - 175	0 - 7	4	0 - 32	0 - 2
slender wheatgrass	ELTR7	4	27 - 135	1 - 5	4	0 - 75	0 - 3			
<b>OTHER NATIVE GRASSES</b>		5	54 - 135	2 - 5	5	0 - 125	0 - 5	5	0 - 80	0 - 5
blue grama	BOGR2	5	27 - 81	1 - 3	5	0 - 100	0 - 4	5	0 - 80	0 - 5
prairie junegrass	KOMA	5	27 - 81	1 - 3	5	0 - 25	0 - 1	5	0 - 16	0 - 1
Scribner panicum	DIOLS	5	0 - 54	0 - 2	5	0 - 25	0 - 1	5	0 - 16	0 - 1
other grasses	2GRAM	5	0 - 135	0 - 5	5	0 - 125	0 - 5	5	0 - 48	0 - 3
<b>GRASS-LIKES</b>		6	54 - 135	2 - 5	6	25 - 125	1 - 5	6	32 - 160	2 - 10
sun sedge	CAINH2	6	27 - 81	1 - 3	6	25 - 125	1 - 5	6	16 - 112	1 - 7
other grass-likes	2GL	6	27 - 81	1 - 3	6	0 - 75	0 - 3	6	16 - 96	1 - 6
<b>NON-NATIVE GRASSES</b>		7			7	750 - 1500	30 - 60	7	560 - 1120	35 - 70
Kentucky bluegrass	POPR	7			7	375 - 1375	15 - 55	7	320 - 960	20 - 60
quackgrass	ELRE4	7			7	0 - 150	0 - 6	7	80 - 480	5 - 30
smooth bromegrass	BRIN2	7			7	125 - 875	5 - 35	7	0 - 80	0 - 5
<b>FORBS</b>		8	135 - 270	5 - 10	8	125 - 375	5 - 15	8	80 - 240	5 - 15
American pasqueflower	PUPAM	8	27 - 54	1 - 2						
American vetch	VIAM	8	27 - 54	1 - 2	8	0 - 25	0 - 1			
aromatic aster	SYOB	8	0 - 27	0 - 1						
catclaw sensitive briar	MINU6	8	27 - 54	1 - 2						
compassplant	SILA3	8	27 - 54	1 - 2						
cutweed sagewort	ARLU	8	27 - 54	1 - 2	8	25 - 150	1 - 6	8	16 - 96	1 - 6
cutleaf ironplant	MAPI	8	0 - 27	0 - 1						
gayfeather	LIATR	8	27 - 54	1 - 2	8	0 - 25	0 - 1			
goldenrod	SOLID	8	27 - 54	1 - 2	8	25 - 150	1 - 6	8	16 - 96	1 - 6
green sagewort	ARCA12	8	0 - 27	0 - 1	8	0 - 25	0 - 1	8	0 - 32	0 - 2
heath aster	SYER	8	27 - 54	1 - 2	8	25 - 100	1 - 4	8	16 - 64	1 - 4
Indian breadroot	PEDIO2	8	0 - 54	0 - 2						
Lambert crazyweed	OXLA3	8	0 - 27	0 - 1						
milkvetch	ASTRA	8	0 - 27	0 - 1						
prairie coneflower	RACO3	8	27 - 54	1 - 2						
purple coneflower	ECAN2	8	27 - 81	1 - 3						
purple prairie clover	DAPU5	8	27 - 54	1 - 2						
pussytoes	ANTEN	8	0 - 27	0 - 1	8	0 - 25	0 - 1	8	0 - 32	0 - 2
scurfpea	PSORA2	8	27 - 54	1 - 2	8	25 - 100	1 - 4	8	16 - 48	1 - 3
stiff sunflower	HEPA19	8	27 - 54	1 - 2						
wavyleaf thistle	CIUN	8	0 - 27	0 - 1						
western ragweed	AMPS	8	0 - 27	0 - 1	8	25 - 100	1 - 4	8	16 - 64	1 - 4
western yarrow	ACMIO	8	0 - 27	0 - 1	8	0 - 50	0 - 2	8	16 - 64	1 - 4
wild onion	ALLIU	8	0 - 27	0 - 1						
native forbs	2FN	8	27 - 81	1 - 3	8	0 - 75	0 - 3	8	0 - 32	0 - 2
introduced forbs	2FI				8	25 - 250	1 - 10	8	16 - 96	1 - 6
<b>SHRUBS</b>		9	135 - 270	5 - 10	9	125 - 375	5 - 15	9	32 - 160	2 - 10
chokecherry	PRVI	9	0 - 54	0 - 2	9	0 - 50	0 - 2			
fringed sagewort	ARFR4	9	27 - 54	1 - 2	9	0 - 25	0 - 1	9	16 - 64	1 - 4
leadplant	AMCA6	9	27 - 108	1 - 4						
rose	ROSA5	9	27 - 54	1 - 2	9	0 - 50	0 - 2	9	0 - 16	0 - 1
smooth sumac	RHGL	9	0 - 54	0 - 2	9	0 - 250	0 - 10	9	0 - 64	0 - 4
snowberry	SYMPH	9	27 - 54	1 - 2	9	125 - 375	5 - 15	9	16 - 96	1 - 6
wild plum	PRAM	9	0 - 54	0 - 2	9	0 - 125	0 - 5	9	0 - 16	0 - 1
other shrubs	2SHRUB	9	0 - 108	0 - 4	9	0 - 50	0 - 2	9	0 - 32	0 - 2
<b>Annual Production lbs./acre</b>			LOW RV HIGH		LOW RV HIGH		LOW RV HIGH		LOW RV HIGH	
<b>GRASSES &amp; GRASS-LIKES</b>			1760 - 2295 - 2780		1580 - 2000 - 2310		995 - 1344 - 1745			
<b>FORBS</b>			120 - 203 - 310		110 - 250 - 445		75 - 160 - 275			
<b>SHRUBS</b>			120 - 203 - 310		110 - 250 - 445		30 - 96 - 180			
<b>TOTAL</b>			2000 - 2700 - 3400		1800 - 2500 - 3200		1100 - 1600 - 2200			

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 warm-season grasses with cool-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. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined and cool-season bunchgrasses and short to mid-statured warm-season grasses would have increased. Today, a similar state (State 2) 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.

### 1.1 Bluestem/Needlegrass/Sideoats Grama Plant Community Phase

Interpretations are based primarily on the Bluestem/Needlegrass/Prairie Dropseed Plant Community Phase (this is also considered to be climax). The potential vegetation was about 80 percent grasses or grass-like plants, 10 percent forbs, and 8 percent shrubs. The community was dominated by warm-season grasses with cool-season grasses being subdominant. The major grasses included little bluestem, big bluestem, Indiangrass, sideoats grama, porcupine grass, and green needlegrass. Other grass or grass-like species included plains muhly, prairie sandreed, Canada wildrye, slender wheatgrass, needleandthread, western wheatgrass, blue grama, and threadleaf sedge. 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: SD0204

Growth curve name: Rolling Till Prairie, warm-season dominant, cool-season subdominant.

Growth curve description: Warm-season dominant, cool-season subdominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	7	17	25	25	15	7	1	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 Little Bluestem/Grama/Needlegrass Plant Community Phase*.

### 1.2 Little Bluestem/Grama/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 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses included little bluestem, sideoats grama, and green needlegrass. Grasses of secondary importance included big bluestem, porcupine grass, blue grama, western wheatgrass, prairie dropseed, and threadleaf sedge. Forbs commonly found in this plant community included goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow.

This plant community had similar plant composition to the 2.2 Little Bluestem/Grama/Needlegrass/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 Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (1.1), little bluestem and sideoats grama increased. Production of tall warm-season grasses was 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. Most of the components of the ecological processes would have been functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses would have been reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allowed for an increase in shorter-statured (and shallower rooted) species.

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: SD0204

Growth curve name: Rolling Till Prairie, warm-season dominant, cool-season subdominant.

Growth curve description: Warm-season dominant, cool-season subdominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	7	17	25	25	15	7	1	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 would have converted this plant community to the *1.1 Bluestem/Needlegrass/Sideoats Grama Plant Community Phase*.

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

- T1b – 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 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- and warm-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 warm-season species can decline and a corresponding increase in short-statured grass will occur.

### 2.1 Bluestem/Needlegrass/Sideoats Grama Plant Community Phase

This plant community phase is similar to the 1.1 Bluestem/Needlegrass/Sideoats Grama Plant Community Phase but it also contains minor amounts of nonnative invasive grass species such as Kentucky bluegrass and smooth brome grass (up to about 10 percent by air-dry weight). The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 8 percent shrubs. This community is dominated by warm-season grasses, with cool-season grasses being subdominant.

The major grasses include little bluestem, big bluestem, Indiangrass, sideoats grama, plains muhly, porcupine grass, and green needlegrass. Other grass or grass-like species include prairie dropseed, prairie sandreed, Canada wildrye, needleandthread, slender wheatgrass, western wheatgrass, blue grama, Kentucky bluegrass, and threadleaf sedge. 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: SD0204

Growth curve name: Rolling Till Prairie, warm-season dominant, cool-season subdominant.

Growth curve description: Warm-season dominant, cool-season subdominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	7	17	25	25	15	7	1	0	0

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

- 2.1a – Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year), or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the 2.2 Little Bluestem/Grama/Needlegrass/Bluegrass Plant Community Phase.

## 2.2 Little Bluestem/Grama/Needlegrass/Bluegrass Plant Community Phase

This plant community is a result of heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses include little bluestem, sideoats grama, and green needlegrass. Grasses of secondary importance include big bluestem, porcupine grass, blue grama, western wheatgrass, prairie dropseed, and threadleaf sedge. Forbs commonly found in this plant community include goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow.

When compared to the Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (1.1), little bluestem, sideoats grama, and Kentucky bluegrass have increased. Production of tall warm-season grasses is reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. Most of the components of the ecological processes are functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses are reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allows for an increase in shorter-statured (and shallower rooted) species. The introduction of nonnative invasive species such as Kentucky bluegrass and smooth brome grass results in alterations to the soil profile. Organic matter levels tend to decrease and begin to be concentrated more in the surface layers and the structure will begin to be modified. These changes favor the shallow-rooted species and hasten their eventual dominance if steps are not taken to reduce these species.

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: SD0203

Growth curve name: Rolling Till Prairie, 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 – Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year) or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the *2.3 Little Bluestem/Bluegrass Plant Community Phase*.
- 2.2b – 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 Bluestem/Needlegrass/Sideoats Grama Plant Community Phase*. This pathway would be expedited by including prescribed burning along with prescribed grazing.

### 2.3 Little Bluestem/Bluegrass Plant Community Phase

This plant community is a result of heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses include little bluestem and Kentucky bluegrass. Grass and grass-like species of secondary importance include sideoats grama, blue grama, western wheatgrass, threadleaf sedge, green needlegrass, big bluestem, and quackgrass. Forbs commonly found in this plant community include goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow.

When compared to the Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (1.1), little bluestem and Kentucky bluegrass have increased. Production of mid and tall warm- and cool-season grasses is reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. A reduction of the dominant functional groups as found in the interpretive plant community phase allows for an increase in shorter-statured (and shallower rooted) species. The introduction of nonnative invasive species such as Kentucky bluegrass and smooth brome grass results in alterations to the soil profile. Organic matter levels tend to decrease and begin to be concentrated more in the surface layers and the structure will begin to be modified. These changes favor the shallow-rooted species and hasten their eventual dominance if steps are not taken to reduce these species.

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: SD0203

Growth curve name: Rolling Till Prairie, 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:

- T2b – Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year) or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will likely shift this community across a threshold leading to the *3.2 Kentucky Bluegrass/Quackgrass/Little Bluestem Plant Community Phase* within the *Invaded State (State 3)*.
- 2.3a – 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 *2.2 Little Bluestem/Grama/Needlegrass/Bluegrass Plant Community Phase*. This pathway would be expedited by including prescribed burning along with prescribed grazing.

### **Transition 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/Forbs/Shrubs Plant Community Phase* within the *Invaded State (State 3)*.

### **Invaded State (State 3)**

This state is a result of encroachment mainly by invasive introduced cool-season grasses. The ecological processes are not functioning, especially the biotic processes and the hydrologic functions. The introduced cool-season grasses cause reduced infiltration and increased runoff. 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. The opportunity for high intensity spring burns is severely reduced by early greenup and increased moisture and humidity at the soil surface and grazing pressure cannot cause a reduction in sodgrass dominance. Production is limited to the sod forming species. Infiltration continues to decrease and runoff increases and energy capture into the system is restricted to early season low producing species. Nutrient cycling is limited by root depth of the dominant species.

### **3.1 Kentucky Bluegrass/Smooth Bromegrass/Forbs/Shrubs Plant Community Phase**

This plant community phase is a result of extended periods of nonuse and no fire or occasionally light levels of grazing over several years. It is characterized by 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 dominance of these introduced species has been shown to alter the biotic component of the soil, as well as organic matter levels and eventually the soil structure. These alterations perpetuate the dominance of Kentucky bluegrass and smooth bromegrass and tend to make establishment of native species extremely difficult.

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: SD0201

Growth curve name: Rolling Till Prairie, 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/Quackgrass Plant Community Phase*.

#### 4.2 Kentucky Bluegrass/Quackgrass/Little Bluestem Plant Community Phase

This plant community phase is a result of heavy continuous grazing or a combination of disturbances such as extended periods of below-average precipitation combined with heavy continuous grazing. It is characterized by a dominance of Kentucky bluegrass and quackgrass and occasionally with significant levels of little bluestem. 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: SD0201

Growth curve name: Rolling Till Prairie, 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, Non-Native Perennial Plant Community Phase within the Invaded State (State 3)

- T4 – Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the *Invaded State (State 3)* and more specifically to the *3.3 Annual/Pioneer, Non-native Perennial Plant Community Phase*. In the case of a seeding, refer to the corresponding Forage Suitability Group (FSG) description for adapted species and expected production (production estimates in the FSG description may be unrealistically high due to the degraded condition of the site at this phase).

#### 3.3 Annual/Pioneer, Non-Native Perennial Plant Community Phase

This plant community developed under continuous heavy grazing or other excessive disturbances such as abandonment after cropping, seeding of introduced species, or invasion and dominance of

noxious weed species. 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 early seral species.

Transitions or pathways leading to other states are as follows:

- 3.3a – With the passage of time, probably regardless of the type of management, this plant community will gradually convert to dominance by Kentucky bluegrass which will lead to the 3.2 *Kentucky Bluegrass/Quackgrass/Little Bluestem Plant Community Phase*.

### **Restoration Pathway from Invaded State (State 3) to the Native/Invaded State (State 2)**

- R3 - Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the *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. A seeding of native species may be the only avenue to restore this plant community to one resembling a community within the *Native/Invaded State (State 2)*.

## **Ecological Site Interpretations**

### **Animal Community – Wildlife Interpretations**

-- Under Development --

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

**Little Bluestem/Grama/Needlegrass/Bluegrass Plant Community Phase (2.2):**

**Little Bluestem/Bluegrass Plant Community Phase (2.3):**

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

**Kentucky Bluegrass/Quackgrass/Little Bluestem Plant Community Phase (3.2):**

**Annual/Pioneer, Non-native Perennial Plant Community Phase (3.3):**

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
<b>Grasses and Grass-likes</b>							
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
Canada wildrye	U D U U	N U N N	U D U U	N U N N	N U N N	U D U U	U D U 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
Indiangrass	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
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
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
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
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
<b>Forbs</b>							
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
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
aromatic aster	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
catclaw sensitive briar	U D P U	U P P U	U D P U	U P P U	U P P U	U D P U	U P P U
compassplant	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
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
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
goldenrod	U U D U	N U U N	U U D U	N U U N	N U U N	U U D U	N U U N
green sagewort	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
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
Indian breadroot	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
Lambert crazyweed	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T
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
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
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
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
wavyleaf thistle	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
western ragweed	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
western 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
wild 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
<b>Shrubs</b>							
chokecherry	D T T D	D T T D	D T T D	P U D P	D U U D	D T T D	P U U P
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
smooth sumac	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
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
wild plum	D U U D	D U U D	D U U D	P U D D	D U U D	D U U D	D U U D

**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)
Bluestem/Needlegrass/Sideoats Grama (1.1 & 2.1)	2,700	0.74
Little Bluestem/Grama/Needlegrass/Bluegrass (2.2)	2,200	0.60
Little Bluestem/Bluegrass (2.3)	2,000	0.55
Kentucky Bluegrass/Smooth Bromegrass/Forbs/Shrubs (3.1)	2,500	0.69
Kentucky Bluegrass/Quackgrass/Little Bluestem (3.2)	1,600	0.44
Annual/Pioneer, Non-Native Perennial (3.3)	1,000	0.27

\*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 is typically moderate to moderately slow and runoff potential for this site varies from medium 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 (R102AY010SD), Loamy Overflow (R102AY020SD), Thin Loamy (R102AY012SD)

### Similar Sites

(R102AY012SD) – Thin Loamy [more big bluestem, less needlegrasses; 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 has been correlated in MN, North Dakota (ND), and South Dakota (SD) in MLRA 102A.

## Field Offices/Counties

Ada, MN/Norman	Forman, ND/Sargent	Olivia, MN/Renville
Alexandria, MN/Douglas	Glenwood, MN/Pope	Ortonville, MN/Big Stone
Benson, MN/Swift	Hayti, SD/Hamlin	Pipestone, MN/Pipestone
Breckenridge, MN/Wilkin	Ivanhoe, MN/Lincoln	Redwood Falls, MN/Redwood
Britton, SD/Marshall	Long Prairie, MN/Todd	Sisseton, SD/Roberts
Brookings, SD/Brookings	Madison, MN/Lac Qui Parle	Slayton, MN/Murray
Clark, SD/Clark	Madison, SD/Lake	Wahpeton, ND/Richland
Clarkfield, MN/Yellow Medicine	Mahnomen, MN/Mahnomen	Waite Park, MN/Stearns
Clear Lake, SD/Deuel	Marshall, MN/Lyon	Watertown, SD/Codington
De Smet, SD/Kingsbury	McIntosh, MN/Polk	Webster, SD/Day
Detroit Lakes, MN/Becker	Milbank, SD/Grant	Wheaton, MN/Traverse
Elbow Lake, MN/Grant	Montevideo, MN/Chippewa	Willmar, MN/Kandiyohi
Fergus Falls, MN/Otter Tail	Moorhead, MN/Clay	Windom, MN/Cottonwood
Flandreau, SD/Moody	Morris, MN/Stevens	

## Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 46e – Tewaukon Dead Ice Moraine, 46k – Prairie Coteau, 46l – Prairie Coteau Escarpment, 46m – Big Sioux Basin, 46o – Minnesota River Prairie, 47b – Des Moines Lobe, 48d – Lake Agassiz Plain, 51j – Alexandria Moraines and Detroit Lakes Outwash Plain.

## Other References

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

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

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

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

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

## Site Description Approval

\_\_\_\_\_  
MN, State Grazing Lands Specialist

\_\_\_\_\_  
Date

\_\_\_\_\_  
ND, State Range Management Specialist

\_\_\_\_\_  
Date

\_\_\_\_\_  
SD, State Range Management Specialist

\_\_\_\_\_  
Date