

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

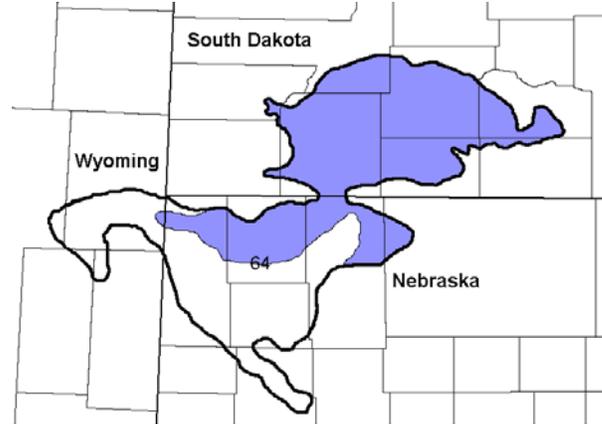
Site Name: Clayey 17-20" P.Z.

Site ID: R064XY035NE

Major Land Resource Area (MLRA): 64 – Mixed Sandy and Silty Tableland

Physiographic Features

This site occurs on nearly level to steeply sloping uplands.



Landform: alluvial fan, plain, stream terrace

Aspect: N/A

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	2,900	4,000
Slope (percent):	0	20
Water Table Depth (inches):	None	None
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):	None	None
Frequency:	None	None
Duration:	None	None
Runoff Class:	Low	Very high

Climatic Features

MLRA 64 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 ranges from 17 to 20 inches per year. The normal average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 21°F (Wood, South Dakota (SD)), to about 25°F (Hemingford, Nebraska (NE)). July is the warmest month with temperatures averaging from about 72°F (Hemingford, NE), to about 76°F (Wood, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 55°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

	<u>Minimum</u>	<u>Maximum</u>
Frost-free period (days):	138	143
Freeze-free period (days):	161	163
Mean Annual Precipitation (inches):	17	20

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.42	0.46	9.0	35.8
February	0.48	0.61	14.6	40.7
March	1.00	1.22	21.9	47.5
April	1.95	2.15	32.4	61.3
May	3.26	3.38	42.6	72.2
June	2.89	3.27	52.0	82.1
July	2.38	2.73	58.2	90.1
August	1.59	1.96	56.3	89.3
September	1.33	1.58	46.6	79.5
October	1.02	1.38	35.6	66.6
November	0.56	0.65	24.0	49.0
December	0.42	0.50	14.0	38.4

Climate Stations		Period	
Station ID	Location or Name	From	To
NE3755	Hemingford, NE	1964	1999
SD9442	Wood, SD	1948	1999

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

Riparian and Wetland Features

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

Representative Soil Features

The common features of soils in this site are the silty clay to clay textured subsoils and slopes of 0 to 20 percent. The soils in this site are well-drained and formed in alluvium, colluvium, and residuum derived primarily from shale. The silt loam to clay surface layer is three to seven inches thick. The soils have a moderately slow to slow infiltration rate. When dry these soils crack. Wet surface compaction can occur with heavy traffic. This site typically should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about five percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production.

More information can be found in the various soil survey reports. Contact the local United States Department of Agriculture (USDA) Service Center for soil survey reports that include more detail specific to your location.

Parent Material Kind: shale
Parent Material Origin: shale, clayey
Surface Texture: silt loam, silty clay loam, clay
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments ≤3" (% Cover): 0
Surface Fragments >3" (%Cover): 0
Subsurface Fragments ≤3" (% Volume): 0-13
Subsurface Fragments >3" (% Volume): 0-6

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	well	well
Permeability Class:	slow	moderately slow
Depth (inches):	20	80
Electrical Conductivity (mmhos/cm)*:	0	4
Sodium Absorption Ratio*:	0	10
Soil Reaction (1:1 Water)*:	6.1	9.0
Soil Reaction (0.1M CaCl ₂)*:	NA	NA
Available Water Capacity (inches)*:	4	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

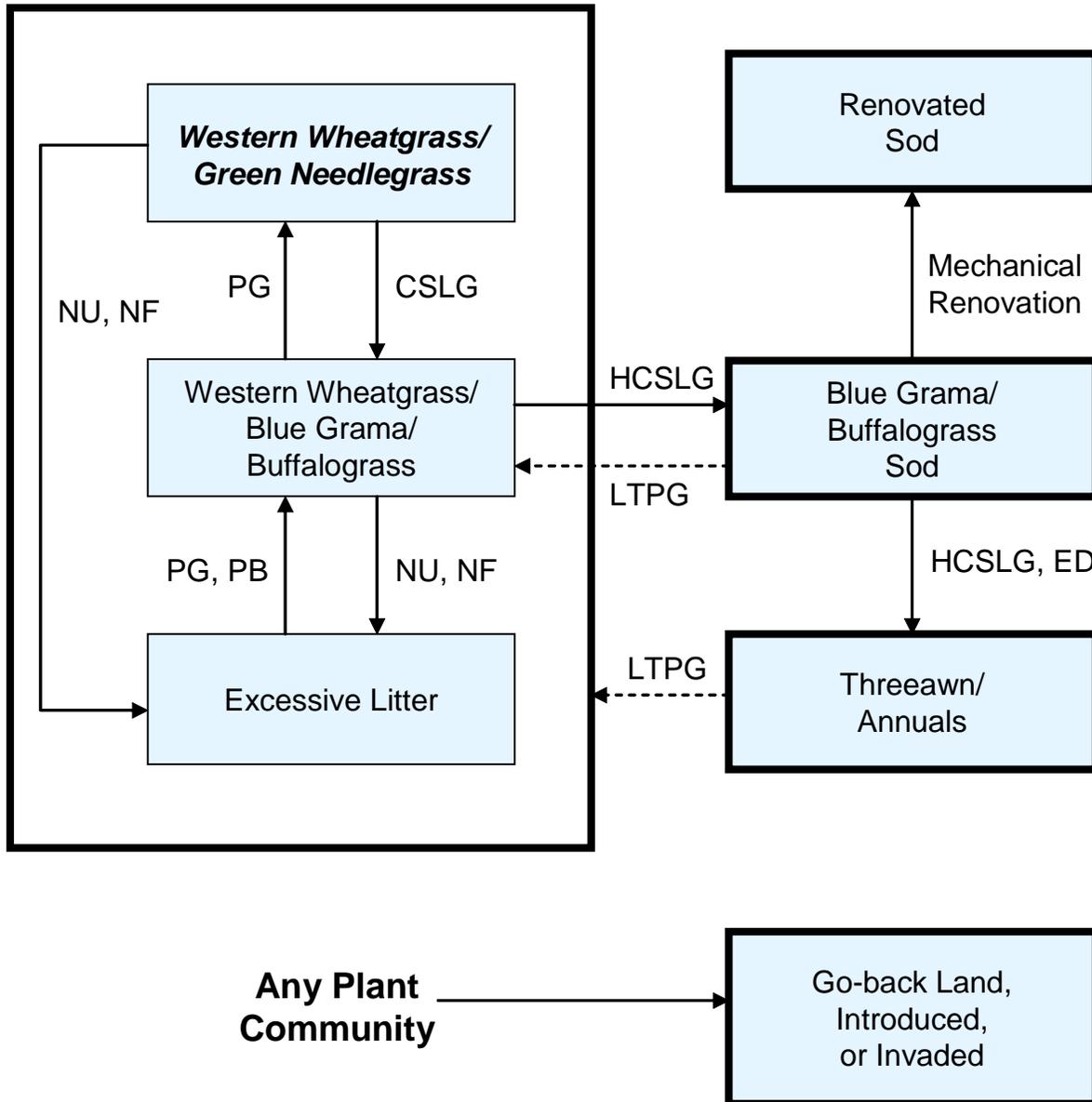
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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 between communities that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition. Encroachment may occur from associated sites. Ponderosa pine and Rocky Mountain juniper have the potential to shift site characteristics. These shifts can alter the site dynamics and potential. These species may occur in small amounts on several plant communities.

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

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

The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

Plant Communities and Transitional Pathways



CSLG - Continuous season-long grazing (grazing a unit for an entire growing season);
ED - Excessive defoliation; **HCSLG** - Heavy, continuous season-long grazing; **LTPG** -
 Long-term prescribed grazing; **NU, NF** - Non-use and no fire for extended periods of
 time; **PB** - Prescribed burning; **PG** - Prescribed grazing (planned, controlled harvest of
 vegetation with grazing or browsing animals – see FOTG, Section IV, 528).

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	Western Wheatgrass/ Green Needlegrass			Western Wheatgrass/Blue Grass/Bufallograss			Blue Grama/ Bufallograss Sod			Excessive Litter		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES													
western wheatgrass	PASM	1	600 - 1000	30 - 50	1	240 - 560	15 - 35	1	55 - 165	5 - 15	1	140 - 700	10 - 50
big bluestem	ANGE	2	0 - 200	0 - 10	2	0 - 80	0 - 5	2	0 - 33	0 - 3	2	0 - 70	0 - 5
little bluestem	SCSC	3	0 - 200	0 - 10	3	0 - 80	0 - 5	3	0 - 55	0 - 5	3	0 - 70	0 - 5
NEEDLEGRASSES		4	300 - 700	15 - 35	4	160 - 320	10 - 20	4	0 - 110	0 - 10	4	70 - 280	5 - 20
green needlegrass	NAV14	4	200 - 500	10 - 25	4	80 - 160	5 - 10	4	0 - 55	0 - 5	4	14 - 140	1 - 10
needleandthread	HECOC8	4	100 - 300	5 - 15	4	80 - 160	5 - 10	4	0 - 88	0 - 8	4	14 - 140	1 - 10
porcupine grass	HESP11	4	100 - 300	5 - 15	4	0 - 128	0 - 8	4	0 - 22	0 - 2	4	14 - 140	1 - 10
SHORT GRASSES & GRASS-LIKES		5	100 - 300	5 - 15	5	240 - 400	15 - 25	5	220 - 550	20 - 50	5	70 - 210	5 - 15
blue grama	BOGR2	5	40 - 160	2 - 8	5	160 - 320	10 - 20	5	165 - 275	15 - 25	5	14 - 70	1 - 5
buffallograss	BUDA	5	40 - 160	2 - 8	5	160 - 320	10 - 20	5	220 - 330	20 - 30	5	14 - 70	1 - 5
sedge	CAREX	5	40 - 100	2 - 5	5	80 - 160	5 - 10	5	110 - 165	10 - 15	5	70 - 140	5 - 10
OTHER NATIVE GRASSES		6	100 - 300	5 - 15	6	32 - 160	2 - 10	6	55 - 165	5 - 15	6	42 - 140	3 - 10
prairie junegrass	KOMA	6	0 - 100	0 - 5	6	0 - 48	0 - 3	6	0 - 33	0 - 3	6	0 - 70	0 - 5
sideoats grama	BOCU	6	100 - 200	5 - 10	6	32 - 128	2 - 8	6	0 - 55	0 - 5	6	28 - 70	2 - 5
threawn	ARIST	6	0 - 60	0 - 3	6	16 - 80	1 - 5	6	55 - 110	5 - 10	6	14 - 70	1 - 5
Sandberg bluegrass	POSE	6	0 - 60	0 - 3	6	0 - 48	0 - 3	6	0 - 33	0 - 3	6	0 - 56	0 - 4
dropseed	SPORO				6	0 - 32	0 - 2	6	0 - 55	0 - 5	6	28 - 140	2 - 10
sixweeks fescue	VUOC				6	0 - 16	0 - 1	6	11 - 33	1 - 3	6	0 - 42	0 - 3
other perennial grasses	ZGP	6	0 - 100	0 - 5	6	0 - 48	0 - 3	6	0 - 33	0 - 3	6	0 - 42	0 - 3
NON-NATIVE GRASSES		7			7	0 - 80	0 - 5	7	33 - 110	3 - 10	7	70 - 560	5 - 40
bluegrass	POA				7	0 - 48	0 - 3	7	0 - 22	0 - 2	7	42 - 420	3 - 30
cheatgrass	BRTE				7	0 - 48	0 - 3	7	33 - 110	3 - 10	7	42 - 420	3 - 30
FORBS		8	100 - 200	5 - 10	8	32 - 160	2 - 10	8	55 - 165	5 - 15	8	14 - 140	1 - 10
biscuitroot	LOMAT	8	0 - 40	0 - 2	8	0 - 32	0 - 2	8	0 - 22	0 - 2	8	0 - 28	0 - 2
cudweed sagewort	ARLU	8	0 - 60	0 - 3	8	0 - 80	0 - 5	8	0 - 55	0 - 5	8	14 - 112	1 - 8
deathcamas	ZIGAD	8	0 - 20	0 - 1	8	0 - 32	0 - 2	8	0 - 33	0 - 3	8	0 - 28	0 - 2
dotted gayfeather	LIPU	8	0 - 40	0 - 2	8	0 - 48	0 - 3	8	0 - 33	0 - 3	8	0 - 42	0 - 3
false bonaset	BREU	8	0 - 100	0 - 5	8	0 - 80	0 - 5	8	0 - 55	0 - 5	8	0 - 70	0 - 5
fringed sagewort	ARFR4	8	20 - 100	1 - 5	8	32 - 128	2 - 8	8	33 - 110	3 - 10	8	0 - 70	0 - 5
green sagewort	ARDR4	8	0 - 40	0 - 2	8	0 - 80	0 - 5	8	0 - 55	0 - 5	8	0 - 70	0 - 5
heath aster	SYER	8	0 - 40	0 - 2	8	0 - 80	0 - 5	8	0 - 55	0 - 5	8	0 - 70	0 - 5
maretail	COCA5				8	0 - 80	0 - 5	8	0 - 55	0 - 5	8	14 - 112	1 - 8
penstemon	PENST	8	0 - 40	0 - 2	8	0 - 48	0 - 3	8	0 - 33	0 - 3	8	0 - 42	0 - 3
prairie coneflower	RACO3	8	0 - 100	0 - 5	8	0 - 80	0 - 5	8	0 - 55	0 - 5	8	0 - 70	0 - 5
purple coneflower	ECAN2	8	0 - 40	0 - 2	8	0 - 48	0 - 3	8	0 - 11	0 - 1	8	0 - 28	0 - 2
salsify	TRAGO				8	0 - 48	0 - 3	8	0 - 55	0 - 5	8	0 - 98	0 - 7
scarlet gaura	GACO5	8	0 - 60	0 - 3	8	0 - 48	0 - 3	8	0 - 33	0 - 3	8	0 - 42	0 - 3
scarlet globemallow	SPCO	8	20 - 100	1 - 5	8	16 - 80	1 - 5	8	11 - 55	1 - 5	8	0 - 70	0 - 5
scurfpea	PSORA2	8	0 - 40	0 - 2	8	0 - 80	0 - 5	8	0 - 77	0 - 7	8	0 - 70	0 - 5
spiderwort	TRADE	8	0 - 40	0 - 2	8	0 - 32	0 - 2	8	0 - 11	0 - 1	8	0 - 28	0 - 2
sweetclover	MELIL				8	0 - 160	0 - 10	8	0 - 110	0 - 10	8	0 - 140	0 - 10
vetch	VICIA	8	0 - 40	0 - 2	8	0 - 32	0 - 2	8	0 - 22	0 - 2	8	0 - 28	0 - 2
western yarrow	ACM12	8	20 - 60	1 - 3	8	16 - 80	1 - 5	8	11 - 33	1 - 3	8	0 - 70	0 - 5
wild onion	ALLIU	8	0 - 40	0 - 2	8	0 - 48	0 - 3	8	0 - 33	0 - 3	8	0 - 42	0 - 3
wild parsley	MUDI	8	20 - 40	1 - 2	8	16 - 32	1 - 2	8	11 - 44	1 - 4	8	0 - 42	0 - 3
other perennial forbs	ZFP	8	0 - 60	0 - 3	8	0 - 48	0 - 3	8	0 - 33	0 - 3	8	0 - 42	0 - 3
SHRUBS		9	0 - 100	0 - 5	9	0 - 160	0 - 10	9	11 - 110	1 - 10	9	0 - 140	0 - 10
broom snakeweed	GUSA2	9	0 - 40	0 - 2	9	0 - 80	0 - 5	9	11 - 55	1 - 5	9	0 - 42	0 - 3
cactus	OPUNT	9	0 - 40	0 - 2	9	0 - 48	0 - 3	9	0 - 55	0 - 5	9	0 - 42	0 - 3
leadplant	AMCA6	9	0 - 100	0 - 5	9	0 - 48	0 - 3	9	0 - 22	0 - 2	9	0 - 42	0 - 3
rose	ROSA5	9	0 - 60	0 - 3	9	0 - 48	0 - 3	9	0 - 22	0 - 2	9	0 - 42	0 - 3
snowberry	SYMPH	9	0 - 100	0 - 5	9	0 - 80	0 - 5	9	0 - 33	0 - 3	9	0 - 70	0 - 5
other shrubs	ZSHRUB	9	0 - 40	0 - 2	9	0 - 32	0 - 2	9	0 - 22	0 - 2	9	0 - 28	0 - 2
Annual Production lbs./acre													
GRASSES & GRASS-LIKES		LOW RV HIGH			LOW RV HIGH			LOW RV HIGH			LOW RV HIGH		
FORBS		1105 - 1800 - 2590			870 - 1424 - 2170			545 - 930 - 1215			790 - 1253 - 1510		
SHRUBS		95 - 150 - 205			30 - 96 - 165			50 - 110 - 170			10 - 77 - 145		
TOTAL		0 - 50 - 105			0 - 80 - 165			5 - 61 - 115			0 - 70 - 145		
		1200 - 2000 - 2900			900 - 1600 - 2500			600 - 1100 - 1500			800 - 1400 - 1800		

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

Following are the narratives for each of the described plant communities. These plant communities may not represent every possibility but they are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more data is collected, some of these plant communities may be revised or removed and new ones may be added. None of these plant communities should necessarily be thought of as "Desired Plant Communities" (DPCs). According to the USDA Natural Resources Conservation Service (NRCS) National Range and Pasture Handbook, DPCs will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

Western Wheatgrass/Green Needlegrass Plant Community

Interpretations are based primarily on the Western Wheatgrass/Green Needlegrass Plant Community (this is also considered to be climax). This plant community can be found on areas that are properly managed with grazing and/or prescribed burning and sometimes on areas receiving occasional short periods of rest. The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent woody plants. The community is dominated by cool-season grasses.

The major grasses include western wheatgrass, green needlegrass, needleandthread, and porcupine grass. Other grasses include sideoats grama, sedges, and buffalograss. This plant community is extremely 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: NE6401

Growth curve name: Pine Ridge/Badlands, cool-season dominant.

Growth curve description: Cool-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	5	15	28	30	10	2	5	5	0	0

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

- Nonuse and no fire will convert this plant community to the *Excessive Litter Plant Community*.
- Continuous season-long grazing will convert the plant community to the *Western Wheatgrass/Blue Grama/Buffalograss Plant Community*.

Western Wheatgrass/Blue Grama/Buffalograss Plant Community

This plant community evolved under continuous season-long grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs.

Dominant grasses include western wheatgrass, blue grama, and buffalograss. Grasses of secondary importance include sedge, sideoats grama, green needlegrass, and needleandthread. Forbs commonly found in this plant community include fringed sagewort, cudweed sagewort, prairie coneflower, and western yarrow. Shrub canopy ranges from 0 percent to 10 percent.

When compared to the Western Wheatgrass/Green Needlegrass Plant Community, blue grama and buffalograss have increased. Green needlegrass and sideoats grama have decreased and production of mid- and tall warm-season grasses has also been reduced.

This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

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

Growth curve number: NE6403

Growth curve name: Pine Ridge/Badlands, 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	5	10	20	25	20	10	5	5	0	0

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

- Nonuse and no fire will convert the plant community to the *Excessive Litter Plant Community*.
- Heavy continuous season-long grazing will convert this plant community to the *Blue Grama/Buffalograss Sod Plant Community*.
- Prescribed grazing will convert this plant community to the *Western Wheatgrass/Green Needlegrass Plant Community*.

Excessive Litter Plant Community

This plant community developed under the absence of grazing and fire. At first, excessive litter builds up shading out some plants. Other plants become decadent with low vigor. Bunch grasses often develop dead centers and rhizomatous grasses form small colonies due to the lack of tiller stimulation. Eventually, the interspaces between plants increase in size leaving more soil surface exposed. Dominant grasses include bluegrass and western wheatgrass. Other species include dropseed and threadleaf sedge. Dominant forbs include sweet clover, cudweed sagewort, and maretail. The dominant shrub is snowberry.

Compared to the Western Wheatgrass/Green Needlegrass Plant Community, nonnative species, cool-season grasses and sedges have increased. Rodent disturbance (from mice and gophers) results in an increase of soil disturbance. Noxious weeds such as Canada thistle or leafy spurge may invade the site if a seed source is present. Plant diversity is moderate to high.

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: NE6401

Growth curve name: Pine Ridge/Badlands, cool-season dominant.

Growth curve description: Cool-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	5	15	28	30	10	2	5	5	0	0

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

- Prescribed grazing, or prescribed burning followed by prescribed grazing will eventually lead this plant community to the *Western Wheatgrass/Green Needlegrass Plant Community*. How long it will take depends on the composition and vigor of the species.

Blue Grama/Buffalograss Sod

This plant community evolved under heavy continuous season long grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs.

Dominant grasses include blue grama and buffalograss. Grasses of secondary importance include sedge and western wheatgrass. Forbs commonly found in this plant community include fringed sagewort, wild parsley, and scarlet globemallow. Shrub canopy ranges from 0 percent to 10 percent. When compared to the Western Wheatgrass/Green Needlegrass Plant Community, blue grama and buffalograss are dominant on this plant community. Cool-season grasses have decreased significantly. This vegetation state is very resistant to change. The herbaceous species present are well adapted to grazing; however, composition can be altered through long-term prescribed grazing.

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: NE6405

Growth curve name: Pine Ridge/Badlands, warm-season dominant.

Growth curve description: Warm-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	7	15	20	30	15	5	5	0	0

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

- Long-term prescribed grazing may potentially convert the plant community to the *Western Wheatgrass/Blue Grama/Buffalograss Plant Community*, assuming an adequate seed/vegetative source is present. This could require significant time and input to achieve.
- Heavy continuous season-long grazing and/or excessive defoliation will likely move this plant community to the *Threeawn/Annuals Plant Community*.

Threeawn/Annuals Plant Community

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 80 percent grasses and grass-like species and 15-20 percent forbs. The dominant grasses include threeawn and annual brome grasses. Other grasses may include little bluestem, blue grama, buffalograss, sedges, western wheatgrass, and sixweeks fescue. The dominant forbs include fringed sagewort, fetid marigold, western ragweed, pussytoes, prostrate verbena, and other annual invader-like species. Other plant species, from adjacent ecological sites (ES), can become minor components of this plant community. This plant community is susceptible to invasion of Canada thistle and other nonnative species because of the relatively high percent of bare ground. Compared to the Western Wheatgrass/Needleandthread Plant Community, red threeawn, annual brome grasses, and percent of bare ground has increased. Western wheatgrass, needlegrasses, and other cool-season grasses and grass-like species have decreased as have the warm-season species including big bluestem, sideoats grama, blue grama, and buffalograss. Plant diversity is low (plant richness may be high but areas are often dominated by a few species and evenness is lacking).

This plant community is difficult to return to the Western Wheatgrass/Green Needlegrass Plant Community 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. This community produces from 400 to 1,000 lbs./ac. (air-dry weight) annually depending on the growing conditions.

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: NE6403

Growth curve name: Pine Ridge/Badlands, 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	5	10	20	25	20	10	5	5	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Under long-term prescribed grazing, including adequate rest periods, this plant community will move through the successional stages leading to the *Western Wheatgrass/Needleandthread Plant Community*. Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly.

Renovated Sod Vegetation State

An altered vegetation community can be achieved through mechanical renovation. Renovation creates microrelief that alters the water cycle by increasing infiltration and decreasing runoff. The renovation reduces the sod-bound conditions, increasing the production potential. These factors favor cool-season species such as western wheatgrass, green needlegrass, and a variety of forbs.

With proper management after renovation, this plant community will have similar plant composition and growth curve characteristics as the Western Wheatgrass/Blue Grama/Buffalograss Plant Community. However, the production could be higher, depending on the degree of alteration. Proper grazing management must be implemented to maintain this plant community.

If this plant community is subjected to excessive disturbance after renovation (i.e., heavy continuous seasonal or season-long grazing, excessive defoliation, etc.) the plant community will be similar to the Blue Grama/Buffalograss Sod Plant Community in most respects. The main difference is the microrelief created by the renovation.

Go-back Land, Introduced, or Invaded

This group includes three separate vegetation states that are highly variable in nature. They are derived through three distinct management scenarios and are not related successional. Infiltration, runoff, and soil erosion varies depending on the vegetation present on the site.

The **Go-back Land** state can be reached whenever severe mechanical disturbance occurs (e.g., tilled and abandoned land, either past or present). During the early successional stages, the species that mainly dominate are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes being dominated by threeawn,

Kentucky or Canada bluegrass, smooth brome, annual brome, crested wheatgrass, buffalograss, broom snakeweed, sweet clover, and nonnative thistles. Other plants that commonly occur on the site include western wheatgrass, deathcamas, prickly lettuce, maretail, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health.

The **Introduced** state is normally those areas seeded to crested wheatgrass, pubescent, intermediate wheatgrass, and alfalfa or other introduced species. It may require considerable investment. Refer to the associated Forage Suitability Group (FSG) description for adapted species.

The **Invaded** state includes areas that have been invaded by species such as smooth brome, Kentucky bluegrass, nonnative thistles, field bindweed, knapweeds, leafy spurge, hoary cress, and other introduced species.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

MLRA 64 lies within the drier portion of northern mixed-grass prairie ecosystem where sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this area consisted of diverse grass/shrub land habitats interspersed with varying densities of depressional, instream wetlands, and woody riparian corridors. These habitats provided critical life cycle components for many of its users. Many species of grassland birds, small mammals, reptiles, amphibians, and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as, several small mammal and insect species, were the primary consumers linking the grassland resources to predators such as the wolf, mountain lion, and grizzly bear, as well as, smaller carnivores such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant; however, the species remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox were associated with prairie dog complexes.

Historically, the northern mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbance factors either singly or in combination. Following European settlement, livestock grazing, cropland conversion, elimination of fire, energy development, and other anthropogenic factors influenced species composition and abundance. Introduced and invasive species further impacted plant and animal communities. The bison was a historical keystone species but have been extirpated as a free-ranging herbivore. The loss of the bison and reduction of prairie dog populations and fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development has reduced habitat quality for area-sensitive species.

Within MLRA 64, the Clayey 17-20" P.Z. ES provides upland grassland cover with an associated forb, shrub, and tree component. It was typically part of a an expansive grassland landscape that included combinations of Badlands, Thin Breaks, Clayey, Claypan, Dense Clay, Loamy, Saline, Sandy, Shallow, Overflow, Subirrigated, and Terrace ESs. This site provided habitat for species requiring unfragmented grassland. Important habitat features and components found commonly or exclusively on this site may include sharp-tailed grouse leks; upland nesting habitat for grassland birds, forbs, and insects for brood habitat; and a forage source for small and large herbivores. Many grassland and shrub steppe nesting bird populations are declining. Extirpated species include free-ranging American bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

The majority of the Clayey ES remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, coyote, and a variety of reptiles, amphibians, and

insects. Invasive species such as annual bromegrasses and cheatgrass have impacted the biological integrity of the site for some grassland birds. Changes in historic fire regime and domestic grazing have impacted the forb/shrub/grass percentages.

Western Wheatgrass/Green Needlegrass (HCPC) and Excessive Litter: The predominance of grasses plus high diversity of forbs and shrubs in this community favors grazers and mixed-feeders such as deer and pronghorn. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. The complex plant structural diversity provides habitat for a wide array of migratory and resident birds. Grasshopper sparrow, savannah sparrow, lark bunting, western meadowlark, and sharp-tailed grouse are common and benefit from the structure and composition this plant community provides. This site provides important breeding habitat for the loggerhead shrike. This site provides excellent nesting and brood rearing habitat for sharp-tailed grouse. Diverse prey populations are available for grassland raptors such as ferruginous hawk, Swainson's hawk, golden eagle, and prairie falcon.

The diversity of grasses, forbs, and shrubs provide high nutrition levels for small and large herbivores including voles, mice, least chipmunk, spotted ground squirrel, desert cottontail rabbit, white-tailed and black-tailed jackrabbit, and deer. This ES provides excellent wintering habitat for pronghorn. The moderate stature of this plant community provides suitable thermal, protective, and escape cover for small herbivores and grassland birds. Predators utilizing this plant community include coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for spade foot toad and Great Plains toads. Prey abundance and shade opportunities may attract multiple reptile species such as gopher snake, milk snake, prairie rattlesnake, and western ornate box turtle to this site along with lesser numbers of various lizard species.

Resulting from extended periods of nonuse or no fire, the plant community will become decadent and buildup litter. As plant litter accumulates, the grassland nesting bird composition may shift to favor those species that prefer dense litter otherwise the wildlife community will remain largely unchanged. Sharp-tailed grouse lek sites may decline.

Western Wheatgrass/Blue Grama/Buffalograss: Resulting from continuous season-long grazing or from overutilization during extended drought periods, blue grama and buffalograss will become dominate. The forb and shrub diversity and abundance increase. Density of species such as sharp-tail grouse and desert cottontail should remain unchanged. However, the shift to shorter plant structure will favor prairie dog expansion and associate species such as ferruginous hawk, burrowing owl, tiger salamander, and swift fox. Species such as the horned lark, long-billed curlew, upland sandpiper, and white-tailed and black-tailed jackrabbit will increase. This plant community may provide areas suitable for sharp-tailed grouse lek site development. The short stature of this plant community limits thermal, protective, and escape cover. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel.

Blue Grama/Buffalograss Sod: This plant community develops under heavy continuous season-long grazing and with continuous seasonal grazing with concentrated use in the spring. Forb diversity and abundance, and shrub abundance increases while shrub diversity declines. A shift to short plant structure will favor prairie dog expansion with prairie dog town sites and associate species such as ferruginous hawk, burrowing owl, tiger salamander, and swift fox. Species such as the horned lark, long-billed curlew, upland sandpiper, and white-tailed and black-tailed jackrabbit will increase. This plant community may provide areas suitable for sharp-tailed grouse lek site development. The short stature of this plant community limits thermal, protective, and escape cover. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel. Species such as the desert cottontail will rarely use this site.

Extreme impairment of the ecological processes impacts offsite aquatic habitats through excessive runoff and nutrient loads. Elevated surface temperatures resulting from reduced cover and litter will greatly reduce habitat for most amphibian species, grassland birds, and mammals.

Blue Grama/Buffalograss Sod (Renovated): See the description under the Blue Grama/Buffalograss Sod Plant Community.

Threeawn/Annuals: Resulting from heavy continuous season-long grazing over many years or frequent and severe defoliation, threeawn and annuals will dominate. The forb abundance has increased; however, forb diversity has substantially decreased and shrub abundance has increased. A shift to short plant structure and relatively high percent of bare ground will favor prairie dog expansion with prairie dog town sites and associate species such as swift fox, ferruginous hawk, and burrowing owl. Species such as horned lark, long-billed curlew, upland sandpiper, and white-tailed jackrabbit will increase. Species such as desert cottontail and grassland nesting birds requiring moderate cover height will rarely use this site.

The short stature of this plant community limits suitable thermal, protective, and escape cover. Prey populations are reduced and are more vulnerable to raptor and mammalian predation. Predators utilizing this plant community include the coyote, American badger, red fox, and long-tailed weasel.

Extreme impairment of the ecological processes impacts offsite aquatic habitats through excessive runoff, nutrient, and sediment loads. Elevated surface temperatures resulting from reduced cover and litter will greatly reduce habitat for most amphibian species, grassland birds, and mammals.

Go-back, Introduced, and/or Invaded States

This group includes separate vegetation states that are highly variable in nature. They are derived through distinct management scenarios. These plant communities have been or are highly susceptible to invasion of annual bromegrasses, bluegrasses, crested wheatgrass, and other nonnative species.

Since secondary succession is highly variable, plant and wildlife species will vary. This plant community provides habitat for generalist or early successional species. In addition, these communities may contain prairie dog towns.

The **Go-back** state can be reached whenever severe mechanical disturbance (i.e., abandoned farmland) is eliminated. Early successional plant communities include annual and perennial weedy type species first to occupy the site. These sites provide diverse foraging, reproductive, and escape cover favoring multiple edge species. This pioneer plant community provides abundant opportunity for insect, bird, and small mammal foraging due to abundant flowers and seed sources.

The **Introduced** state provides increased forage and, therefore; a potential for increased herbivore populations such as deer, pronghorn, and various small mammals. These sites provide diverse foraging, reproductive, and escape cover favoring multiple edge species.

The **Invaded** state includes areas that have been invaded and are dominated by species such as smooth brome, Kentucky bluegrass, crested wheatgrass, nonnative thistles, field bindweed, knapweeds, leafy spurge, hoary cress, and other introduced species. These sites greatly reduce foraging, reproductive, and escape cover for grassland nesting bird species.

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses & Grass-likes							
big bluestem	U D P D	U D U U	U D P D	U D U U	U D U U	U D P D	U D P D
blue grama	U D P U	D P P D	U D P U	D P P D	D P P D	U D P U	U D P U
buffalograss	U U D U	N U D U	U U D U	N U D U	N U D U	U U D U	U U D U
green needlegrass	U P U D	N P N P	U P U D	N P N P	N P N P	U P U D	U P U D
little bluestem	U D D U	N D N N	U D D U	N D N N	N D N N	U D D U	U D D U
needleandthread	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
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
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
sedge	U D U D	U P N D	U D U D	U D U D	U D U D	U D U D	U D U D
sideoats grama	U D P U	U P D U	U D P U	U P D U	U P D U	U D P U	U D P U
threeawn	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
western wheatgrass	U P D U	N D N N	U P D U	N D N N	N D N N	U P D U	U P D U
Forbs							
biscuitroot	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
cudweed sagewort	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U D U
deathcamas	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T
dotted gayfeather	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
false boneset	U U D U	N D U N	U U D U	N D U N	N D U N	U U D U	N D U N
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
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
penstemon	U U U U	U P P U	U U U U	U P P U	U P P U	U U U U	U P P U
prairie coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
purple coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
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
spiderwort	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
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
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
wild parsley	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
Shrubs							
broom snakeweed	N N N N	U U U U	N N N N	U U U U	U U U U	N N N N	U U U U
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
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
snowberry	U U U U	U U U U	U U U U	D U D D	U U U U	U U U U	D U U U

N = not used; U = undesirable; D = desirable; P = preferred; T = toxic

† Quarters: 1 – Jan., Feb., Mar.; 2 – Apr., May, Jun.; 3 – Jul., Aug., Sep.; 4 – Oct., Nov., Dec.

Animal Community – Grazing Interpretations

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ES description). Because of this, a resource inventory is necessary to document plant composition and production.

More accurate carrying capacity estimates should eventually be calculated using the following

stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community	Average Annual Production (lbs./acre, air-dry)	Stocking Rate* (AUM/acre)
Western Wheatgrass/Green Needlegrass	2,000	0.63
Western Wheatgrass/Blue Grama/Buffalograss	1,600	0.51
Excessive Litter	1,400	0.44
Blue Grama/Buffalograss Sod	1,100	0.35
Threeawn/Annuals	700	0.22

*Based on 790 lbs./acre (air-dry weight) per Animal Unit Month (AUM) and on 25 percent harvest efficiency (refer to USDA 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 groups C and D. Infiltration varies from very low to moderate, and runoff potential varies from moderate 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 high runoff when short grasses form a strong sod and dominate the site. 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 present on the site.

Other Products

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

Supporting Information

Associated Sites

(064XY036NE) – Loamy 17-20" P.Z.
(064XY039NE) – Shallow Clay

(064XY037NE) – Thin Upland
(064XY027NE) – Clayey Overflow

Similar Sites

(064XY027NE) – Clayey Overflow [more big bluestem; higher production]
(064XY036NE) – Loamy 17-20" P.Z. [less green needlegrass; more needleandthread]

Inventory Data References

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, Range Management Specialist (RMS), NRCS; Jill Epley, RMS, NRCS; Rick Peterson, RMS, NRCS; David Steffen, RMS, NRCS; Jeff Vander Wilt; RMS, NRCS; and Phil Young, Soil Scientist, NRCS.

<u>Data Source</u>	<u>Number of Records</u>	<u>Sample Period</u>	<u>State</u>	<u>County</u>
SCS-RANGE-417	1	1970	NE	Dawes

State Correlation

This site has been correlated with NE, SD, and WY in MLRA 64.

Field Offices

Chadron, NE	Dawes/Sioux	Lusk, WY	Niobrara	Rushville, NE	Sheridan
Custer, SD	Custer	Martin, SD	Bennett/Shannon	Valentine, NE	Cherry
Hot Springs, SD	Fall River	Pine Ridge, SD	Pine Ridge IR	Wall, SD	East Pennington
Kadoka, SD	Jackson	Rosebud, SD	Rosebud IR	White River, SD	Mellette/Todd

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 25a – Pine Ridge Escarpment, 43h – White River Badlands, and 43i – Keya Paha Tablelands.

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.
USDA, NRCS, Various Published Soil Surveys.

Site Description Approval

NE, State Range Management Specialist

Date

SD, State Range Management Specialist

Date

WY, State Range Management Specialist

Date