

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Dense Clay

Site ID: R064XY045NE

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



Physiographic Features

This site occurs on nearly level to sloping upland valleys, fans and stream terraces.

Landform: stream terrace, alluvial fan, plain

Aspect: N/A

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	2900	4000
Slope (percent):	0	15
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:	Negligible	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 14 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, SD) to about 25° F (Hemingford, NE). July is the warmest month with temperatures averaging from about 70° F (Keeline 3 W, WY) 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 average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour 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 miles per hour.

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. Green up 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):	14	20

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.42	0.52	9.0	35.8
February	0.48	0.61	14.6	40.7
March	0.90	1.22	21.0	47.5
April	1.83	2.15	28.9	61.3
May	2.22	3.38	38.3	72.2
June	2.05	3.27	47.3	82.1
July	1.63	2.73	53.9	90.1
August	1.09	1.96	52.3	89.3
September	1.09	1.58	42.4	79.5
October	0.80	1.38	32.6	66.6
November	0.56	0.65	20.4	49.0
December	0.42	0.50	13.4	38.4

Climate Stations		Period	
Station ID	Location or Name	From	To
NE3755	Hemingford, NE	1964	1999
WY5085	Keeline 3 W, WY	1953	1986
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 clay textured soils and slopes of 0 to 15 percent. The soils in this site are moderately well to well drained and formed in clayey alluvium or residuum from soft shale. The clay surface layer is 1 to 5 inches thick. The soils have a slow to very slow infiltration rate except after dry periods when initial uptake may be rapid due to cracking of the surface. Gilgai microrelief occurs in most areas. 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. Sub-surface soil layers are moderately restrictive to water movement and root penetration.

These soils are susceptible to wind and water erosion. The hazard of water erosion increases on slopes greater than about 6 percent.

More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Parent Material Kind: alluvium, residuum, shale

Parent Material Origin: shale, unspecified
Surface Texture: clay
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments \leq 3" (% Cover): 0
Surface Fragments $>$ 3" (%Cover): 0
Subsurface Fragments \leq 3" (% Volume): 0
Subsurface Fragments $>$ 3" (% Volume): 0

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	moderately well	well
Permeability Class:	very slow	very slow
Depth (inches):	20	80
Electrical Conductivity (mmhos/cm)*:	0	16
Sodium Absorption Ratio*:	0	25
Soil Reaction (1:1 Water)*:	5.6	9.0
Soil Reaction (0.1M CaCl₂)*:	NA	NA
Available Water Capacity (inches)*:	2	4
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:

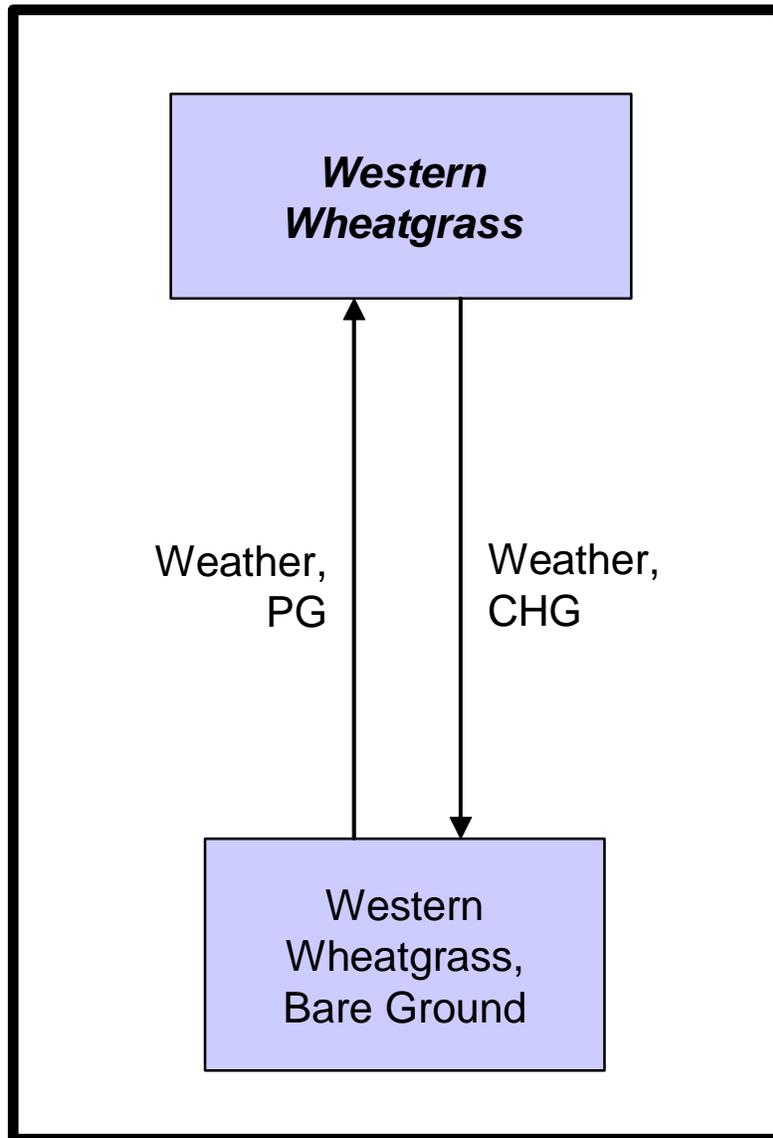
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur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

These soils are high in clay and have a low available water capacity. The shrink-swell potential is very high, resulting in cracks greater than 2 inches wide during dry periods. Western wheatgrass with its strong rhizomes and high drought tolerance is able to thrive in these soils. Western wheatgrass dominates the site and production is closely related to the vigor of western wheatgrass. Slickspots are sometimes associated with this site. Slickspots are bare ground areas that are affected by high sodium concentrations. The soil factors are the dominant influence and grazing management does not typically affect these areas.

Interpretations are primarily based on the Western Wheatgrass 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 diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

Plant Communities and Transitional Pathways



CHG – Continuous heavy grazing (heavy levels of grazing of a unit during most or all of the growing season); **PG** - Prescribed grazing (planned, controlled harvest of vegetation with grazing or browsing animals – see FOTG, Section IV, 528); **Weather** - Annual weather fluctuations

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	Western Wheatgrass			Western Wheatgrass, Bare Ground			
		Group	lbs./acre	% Comp	Group	lbs./acre	% Comp	
GRASSES & GRASS-LIKES			1350 - 1425	90 - 95		720 - 760	90 - 95	
western wheatgrass	PASM	1	600 - 900	40 - 60	1	440 - 640	55 - 80	
WARM-SEASON GRASSES		2	0 - 150	0 - 10	2	0 - 40	0 - 5	
blue grama	BOGR2	2	0 - 75	0 - 5	2	0 - 24	0 - 3	
buffalograss	BUDA	2	0 - 150	0 - 10	2	0 - 24	0 - 3	
sideoats grama	BOCU	2	0 - 75	0 - 5	2	0 - 24	0 - 3	
NEEDLEGRASS		3	300 - 600	20 - 40	3	0 - 80	0 - 10	
green needlegrass	NAVI4	3	300 - 600	20 - 40	3	0 - 80	0 - 10	
NATIVE GRASSES & GRASS-LIKES		4	0 - 75	0 - 5	4	0 - 24	0 - 3	
prairie junegrass	KOMA	4	0 - 75	0 - 5	4	0 - 24	0 - 3	
Sandberg bluegrass	POSE	4	0 - 75	0 - 5	4	0 - 24	0 - 3	
sedge	CAREX	4	0 - 75	0 - 5	4	0 - 24	0 - 3	
other perennial grasses	2GP	4	0 - 75	0 - 5	4	0 - 24	0 - 3	
NON-NATIVE GRASSES		5			5	0 - 24	0 - 3	
cheatgrass	BRTE				5	0 - 24	0 - 3	
FORBS		6	0 - 150	0 - 10	6	0 - 40	0 - 5	
American vetch	VIAM	6	0 - 75	0 - 5	6	0 - 24	0 - 3	
bastard toadflax	COUM	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
bladderpod	LESQU	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
bluebells	MERTE	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
curlycup gumweed	GRSQ				6	0 - 24	0 - 3	
deervetch	LOUNU	6	0 - 75	0 - 5	6	0 - 24	0 - 3	
desert biscuitroot	LOFO	6	0 - 75	0 - 5	6	0 - 24	0 - 3	
gumbo lily	OECAC2	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
heath aster	SYER	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
Lambert crazyweed	OXLA3	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
milkvetch	ASTRA	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
Missouri goldenrod	SOMI2	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
pennycress	MICRO18				6	0 - 24	0 - 3	
phlox	PHLOX	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
prairie coneflower	RACO3	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
pussytoes	ANTEN	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
scarlet gaura	GACO5	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
scarlet globemallow	SPCO	6	0 - 75	0 - 5	6	0 - 24	0 - 3	
sweetclover	MELIL				6	0 - 40	0 - 5	
wavyleaf thistle	CIUN	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
western salsify	TRDU	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
western wallflower	ERCAC	6	0 - 30	0 - 2	6	0 - 8	0 - 1	
western yarrow	ACMI2	6	0 - 45	0 - 3	6	0 - 16	0 - 2	
wild onion	ALLIU	6	0 - 45	0 - 3	6	0 - 8	0 - 1	
wild parsley	MUDI	6	0 - 75	0 - 5	6	0 - 24	0 - 3	
other annual forbs	2FA				6	0 - 24	0 - 3	
SHRUBS		7	0 - 45	0 - 3	7	0 - 40	0 - 5	
brittle cactus	OPFR	7	0 - 30	0 - 2	7	0 - 24	0 - 3	
plains pricklypear	OPPO	7	0 - 45	0 - 3	7	0 - 40	0 - 5	
Annual Production lbs./acre			LOW	RV	HIGH	LOW	RV	HIGH
GRASSES & GRASS-LIKES			900	1403	-1795	500	760	-910
FORBS			0	75	-155	0	20	-45
SHRUBS			0	23	-50	0	20	-45
TOTAL			900	1500	-2000	500	800	-1000

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 are 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”. According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities (DPC’s) 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 Plant Community

Interpretations are based primarily on the Western Wheatgrass Plant Community (this is also considered to be climax). This plant community evolved with grazing by large herbivores and occasional fire, and can be maintained with prescribed grazing, prescribed burning, or areas receiving occasional short periods of rest. The potential vegetation is about 85% grasses or grass-like plants, 10% forbs, and 5% shrubs. Cool season grasses dominate the plant community. The major grasses include western wheatgrass and green needlegrass. The plant diversity is low. Other grasses and grass-like species occurring may include Sandberg bluegrass, buffalograss, blue grama, sideoats grama and sedge. The dominant forbs include biscuitroot, wild parsley, scarlet globemallow, and American vetch. Shrubs that may occur on the plant community include brittle cactus and plains pricklypear.

This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. However two to three years of drought can greatly reduce the vigor and abundance of the green needlegrass and western wheatgrass, increasing the percent bare ground and creating moderate to high soil erosion potential. The actual plant composition may not be greatly changed, however the production of this plant community varies greatly with fluctuations in precipitation. Water infiltration is low and runoff is moderate to high because of the high clay content in the soil. Plant litter is properly distributed with some movement off-site and natural plant mortality is low.

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

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

- Heavy, continuous grazing or extended periods of below average precipitation will move this plant community to the *Western Wheatgrass, Bare Ground Plant Community*.

Western Wheatgrass, Bare Ground Plant Community

This plant community develops under droughty conditions or heavy continuous grazing. The potential vegetation is made up of 90% grasses & grass-likes, 5% forbs and 5% shrubs. The grass component

is almost entirely western wheatgrass. Other perennial grasses are generally not found. Forbs found in this plant community include pennycress, curlycup gumweed, sweetclover and annual forbs. Shrubs found include brittle cactus and plains pricklypear.

When compared to the Western Wheatgrass Plant Community, the vigor, production and basal density of the grasses has been reduced. Often the site will be bare ground with a few sprigs of western wheatgrass, and cheatgrass will likely invade this plant community. The plant diversity is extremely low. Due to the low basal density, soil erosion hazards are high. Moving this plant community toward the Western Wheatgrass Plant Community can be accomplished through prescribed grazing and favorable climatic 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: 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

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

- With prescribed grazing and/or above average precipitation, this plant community will move to the *Western Wheatgrass Plant Community*.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

Wheatgrass Plant Community:

Wheatgrass, Bare Ground Plant Community:

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses and Grass-likes							
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
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
western wheatgrass	U P D U	N D N N	U P D U	N D N N	N D N N	U P D U	U P D U
Forbs							
American vetch	U D P U	U P P U	U D P U	U P P U	U P P U	U D P U	U P P U
bastard toadflax	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
bladderpod	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
bluebells	U D U U	U P P U	U D U U	U P P U	U P P U	U D U U	U P P U
deervetch	U U U U	U D D U	U U U U	U D D U	U D D U	U U U U	U D D U
desert 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
gumbo lily	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
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
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
Missouri goldenrod	U U D U	N U U N	U U D U	N U U N	N U U N	U U D U	N U U N
phlox	U D U U	U P P U	U D U U	U P P U	U P P U	U D U U	U P P U
prairie coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
pussytoes	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
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
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 salsify	U U D U	U U D U	U U D U	U U D U	U U D U	U U D U	U U D U
western wallflower	U D U U	N U U N	U D U U	N U U N	N U U N	U D U U	N U U N
western yarrow	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
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							
brittle cactus	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
plains pricklypear	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N

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

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

Animal Community – Grazing Interpretations

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site 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	1500	0.47
Western Wheatgrass, Bare Ground	800	0.25

* Based on 790 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25% 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 herbage production on this site. The site is dominated by soils in hydrologic group D. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for higher infiltration and lower runoff. An exception would be where short grasses form a dense sod and dominate the site. Areas where ground cover is less than 50% 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 variety 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

- (064XY014NE) – Clayey 14-17" P.Z.
- (064XY035NE) – Clayey 17-20" P.Z.
- (064XY046NE) – Thin Claypan
- (064XY044NE) – Claypan

Similar Sites

- (064XY014NE & 064XY035NE) – Clayey 14-17" P.Z. & Clayey 17-20" P.Z.
[more green needlegrass; higher production]
- (064XY046NE) – Thin Claypan
[lower production; greater dominance of short grass and salt tolerant species]

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; Jill Epley, Range Management Specialist, NRCS; Rick Peterson, Range Management Specialist, NRCS; David Steffen, Range Management Specialist, NRCS; Jeff Vander Wilt, Range Management Specialist, NRCS; 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				

State Correlation

This site has been correlated with Nebraska, South Dakota and Wyoming in MLRA 64.

Field Offices/Counties

Alliance, NE	Box Butte	Kadoka, SD	Jackson	Rushville, NE	Sheridan
Bridgeport, NE	Morrill	Lusk, WY	Niobrara	Scottsbluff, NE	Scottsbluff
Chadron, NE	Dawes/Sioux	Martin, SD	Bennett/Shannon	Torrington, WY	Goshen
Custer, SD	Custer	Pine Ridge, SD	Pine Ridge IR	Valentine, NE	Cherry
Douglas, WY	Converse	Rapid City, SD	Pennington	Wall, SD	East Pennington
Hot Springs, SD	Fall River	Rosebud, SD	Rosebud IR	Wheatland, WY	Platte
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://hpccsun.unl.edu>)

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

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

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

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

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