

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

Site Type: Rangeland

Site Name: Shallow Loamy

Site ID: R060AY024SD

Major Land Resource Area (MLRA): 60A – Pierre Shale Plains



Physiographic Features

This site occurs on gently sloping to steep uplands.

Landform: hill, knoll, ridge

Aspect: N/A

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	2,500	4,300
Slope (percent):	2	40
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:	High	Very high

Climatic Features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland steppes to the east. Annual precipitation ranges from 13 to 18 inches per year, with most occurring during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air masses from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring. The normal average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 19°F (Moorcroft CAA, Wyoming (WY)), to about 22°F (Belle Fourche, South Dakota (SD)). July is the warmest month with temperatures averaging from about 70°F (Moorcroft CAA, WY), to about 72°F (Belle Fourche, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 51°F. 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 can 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):	122	129
Freeze-free period (days):	145	152
Mean Annual Precipitation (inches):	13	18

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

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.32	0.43	7.1	34.1
February	0.44	0.57	12.6	40.1
March	0.65	0.94	19.7	46.5
April	1.43	1.72	29.4	60.2
May	2.45	3.19	39.7	70.6
June	2.34	3.38	48.5	80.1
July	1.60	2.78	54.8	88.0
August	1.24	1.76	53.1	87.7
September	1.01	1.50	42.3	77.0
October	0.90	1.11	31.4	64.9
November	0.40	0.61	19.8	47.5
December	0.40	0.48	10.2	38.0

Climate Stations		Period	
Station ID	Location or Name	From	To
SD0236	Ardmore 2 N	1948	1999
SD0559	Belle Fourche	1948	1999
SD1124	Buffalo Gap	1951	1999
WY6395	Moorcroft CAA	1948	1998
WY9207	Upton 13 SW	1949	1998

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

Influencing Water Features

No significant water features influence this site.

Representative Soil Features

The soils in this site are well to somewhat excessively drained and formed in soft siltstone, sandstone, mudstone, or shale. The loam to clay loam surface layer is two to nine inches thick. The soils have a moderate infiltration rate. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Subsurface soil layers are restrictive 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 15 percent. Very low to low available water capacity caused by the shallow rooting depth strongly influences the soil-water-plant relationship.

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: residuum, colluvium
Parent Material Origin: sedimentary, unspecified
Surface Texture: loam, silt loam, silty clay loam
Surface Texture Modifier: none
Subsurface Texture Group: loamy
Surface Fragments ≤3” (% Cover): 0-10
Surface Fragments >3” (%Cover): 0-20
Subsurface Fragments ≤3” (% Volume): 0-15
Subsurface Fragments >3” (% Volume): 0

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	well	somewhat excessively
Permeability Class:	moderately slow	moderate
Depth (inches):	10	20
Electrical Conductivity (mmhos/cm)*:	0	8
Sodium Absorption Ratio*:	0	5
Soil Reaction (1:1 Water)*:	6.6	9.0
Soil Reaction (0.1M CaCl₂)*:	NA	NA
Available Water Capacity (inches)*:	2	3
Calcium Carbonate Equivalent (percent)*:	0	40

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

Plant Communities

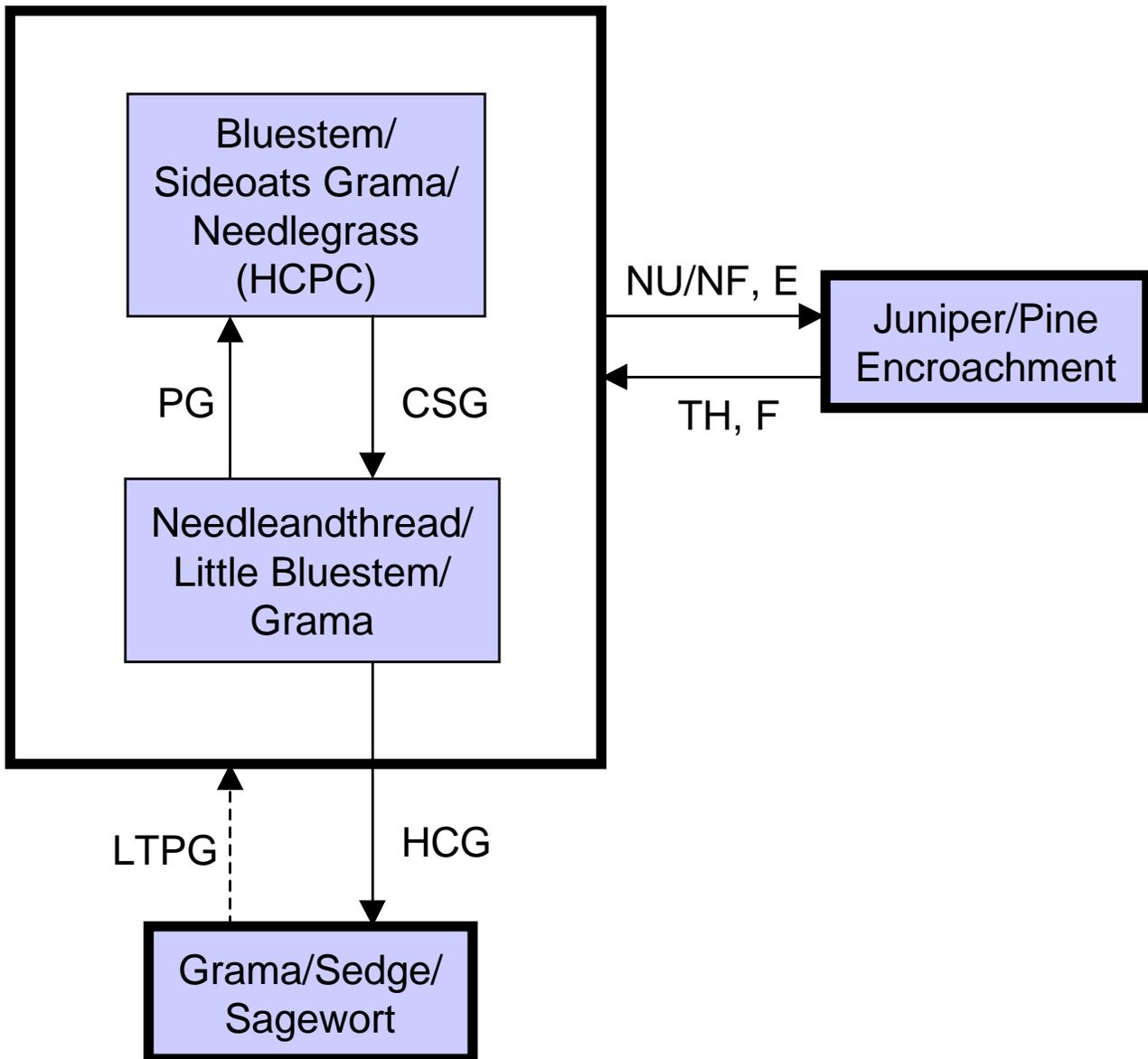
Ecological Dynamics of the Site:

This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, 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.

The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). The HCPC has been determined by studying 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 are discussed in more detail in the plant community descriptions following the diagram.

Plant Communities and Transitional Pathways



CSG - continuous seasonal grazing; **E** - encroachment; **F** - fire;
HCG - heavy continuous grazing; **HCPC** - Historical Climax Plant Community; **LTPG** - long-term prescribed grazing; **NU/NF** - non-use, no fire for extended periods; **PG** - prescribed grazing; **TH** - thinning.

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SCIENTIFIC NAME	SYMBOL	Bluestem/Sideoats Grama/ Needlegrass (HCPC)		
			Group	lbs./acre	% Comp
GRASSES & GRASS-LIKES				1120 - 1260	80 - 90
big bluestem	Andropogon gerardii	ANGE	1	28 - 140	2 - 10
little bluestem	Schizachyrium scoparium	SCSC	2	70 - 280	5 - 20
sideoats grama	Bouteloua curtipendula	BOCU	3	140 - 280	10 - 20
western wheatgrass	Pascopyrum smithii	PASM	4	0 - 210	0 - 15
NEEDLEGRASSES			5	70 - 280	5 - 20
needleandthread	Hesperostipa comata ssp. comata	HECOC8	5	70 - 210	5 - 15
green needlegrass	Nassella viridula	NAVI4	5	0 - 70	0 - 5
SHORT WARM-SEASON GRASSES			6	70 - 280	5 - 20
blue grama	Bouteloua gracilis	BOGR2	6	70 - 210	5 - 15
hairy grama	Bouteloua hirsuta	BOHI2	6	0 - 140	0 - 10
buffalograss	Buchloe dactyloides	BUDA	6	0 - 70	0 - 5
NATIVE GRASSES & GRASS-LIKES			7	70 - 280	5 - 20
sedge	Carex spp.	CAREX	7	70 - 140	5 - 10
plains muhly	Muhlenbergia cuspidata	MUCU3	7	0 - 70	0 - 5
prairie junegrass	Koeleria macrantha	KOMA	7	0 - 42	0 - 3
prairie sandreed	Calamovilfa longifolia	CALO	7	0 - 140	0 - 10
other perennial grasses		ZGP	7	0 - 140	0 - 10
FORBS			9	70 - 140	5 - 10
American vetch	Vicia americana	VIAM	9	0 - 28	0 - 2
cudweed sagewort	Artemisia ludoviciana	ARLU	9	14 - 42	1 - 3
dalea	Dalea spp.	DALEA	9	0 - 28	0 - 2
deervetch	Lotus unifoliolatus var. unifoliolatus	LOUNU	9	0 - 28	0 - 2
dotted gayfeather	Liatri punctata	LIPU	9	14 - 70	1 - 5
erigonum	Eriogonum spp.	ERIOG	9	0 - 28	0 - 2
false boneset	Brickellia eupatorioides	BREU	9	0 - 28	0 - 2
goldenrod	Solidago spp.	SOLID	9	14 - 42	1 - 3
hairy goldaster	Heterotheca villosa	HEVI4	9	0 - 28	0 - 2
heath aster	Symphyotrichum ericoides	SYER	9	0 - 28	0 - 2
Indian breadroot	Pediomelum esculentum	PEES	9	14 - 70	1 - 5
milkvetch	Astragalus spp.	ASTRA	9	0 - 42	0 - 3
penstemon	Penstemon spp.	PENST	9	0 - 28	0 - 2
prairie coneflower	Ratibida columnifera	RACO3	9	0 - 42	0 - 3
purple coneflower	Echinacea angustifolia	ECAN2	9	42 - 70	3 - 5
purple prairie clover	Dalea purpurea	DAPU5	9	42 - 70	3 - 5
pussytoes	Antennaria spp.	ANTEN	9	14 - 28	1 - 2
scarlet gaura	Gaura coccinea	GACO5	9	14 - 28	1 - 2
scarlet globemallow	Sphaeralcea coccinea	SPCO	9	14 - 28	1 - 2
scurfpea	Psoralegium spp.	PSORA2	9	14 - 70	1 - 5
spiny phlox	Phlox hoodii	PHHO	9	0 - 42	0 - 3
stemless hymenoxys	Tetranneuris acaulis	TEAC	9	0 - 14	0 - 1
stiff sunflower	Helianthus pauciflorus	HEPA19	9	14 - 42	1 - 3
western ragweed	Ambrosia psilostachya	AMPS	9	0 - 14	0 - 1
western yarrow	Achillea millefolium	ACMI2	9	0 - 28	0 - 2
other perennial forbs		ZFP	9	0 - 28	0 - 2
SHRUBS			10	28 - 140	2 - 10
big sagebrush	Artemisia tridentata	ARTR2	10	0 - 70	0 - 5
cactus	Opuntia spp.	OPUNT	10	0 - 28	0 - 2
creeping juniper	Juniperus horizontalis	JUHO2	10	0 - 70	0 - 5
fringed sagewort	Artemisia frigida	ARFR4	10	14 - 70	1 - 5
leadplant	Amorpha canescens	AMCA6	10	0 - 70	0 - 5
rose	Rosa spp.	ROSA5	10	0 - 70	0 - 5
saltbush	Atriplex spp.	ATRIP	10	0 - 70	0 - 5
skunkbush sumac	Rhus trilobata	RHTR	10	0 - 70	0 - 5
winterfat	Krascheninnikovia lanata	KRLA2	10	0 - 70	0 - 5
yucca	Yucca glauca	YUGL	10	0 - 28	0 - 2
other shrubs		ZSHRUB	10	0 - 70	0 - 5
TREES			11	0 - 14	0 - 1
juniper	Juniperus spp.	JUNIP	11	0 - 14	0 - 1
ponderosa pine	Pinus ponderosa	PIPO	11	0 - 14	0 - 1

Annual Production lbs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	810	1204	1595
FORBS	65	105	145
SHRUBS	25	84	145
TREES	0	7	15
TOTAL	900	1400	1900

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	Bluestem/Sideoats Grama/ Needlegrass (HCPC)			Needleandthread/Little Bluestem/Grama			Blue Grama/Sedge/ Sagewort			Juniper/Pine Encroachment		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES													
big bluestem	ANGE	1	28 - 140	2 - 10	1	10 - 50	1 - 5	1			1	0 - 60	0 - 5
little bluestem	SCSC	2	70 - 280	5 - 20	2	100 - 250	10 - 25	2	0 - 25	0 - 5	2	0 - 120	0 - 10
sideoats grama	BOCU	3	140 - 280	10 - 20	3	50 - 150	5 - 15	3	0 - 50	0 - 10	3	60 - 180	5 - 15
western wheatgrass	PASM	4	0 - 210	0 - 15	4	0 - 100	0 - 10	4	0 - 25	0 - 5	4	0 - 180	0 - 15
NEEDLEGRASSES													
needleandthread	HECOC8	5	70 - 210	5 - 15	5	100 - 250	10 - 25	5	25 - 75	5 - 15	5	60 - 180	5 - 15
green needlegrass	NAVI4	5	0 - 70	0 - 5	5	0 - 30	0 - 3				5	0 - 60	0 - 5
SHORT WARM-SEASON GRASSES													
blue grama	BOGR2	6	70 - 210	5 - 15	6	100 - 200	10 - 20	6	75 - 150	15 - 30	6	60 - 180	5 - 15
hairy grama	BOHI2	6	0 - 140	0 - 10	6	50 - 150	5 - 15	6	25 - 75	5 - 15	6	0 - 120	0 - 10
buffalograss	BUDA	6	0 - 70	0 - 5	6	0 - 50	0 - 5	6	0 - 50	0 - 10	6	0 - 60	0 - 5
NATIVE GRASSES & GRASS-LIKES													
sedge	CAREX	7	70 - 140	5 - 10	7	100 - 200	10 - 20	7	75 - 150	15 - 30	7	60 - 180	5 - 15
plains muhly	MUCU3	7	0 - 70	0 - 5	7	0 - 50	0 - 5				7	0 - 60	0 - 5
prairie junegrass	KOMA	7	0 - 42	0 - 3	7	0 - 50	0 - 5	7	0 - 50	0 - 10	7	0 - 60	0 - 5
prairie sandreed	CALO	7	0 - 140	0 - 10	7	0 - 100	0 - 10	7	0 - 15	0 - 3	7	0 - 60	0 - 5
threeawn	ARIST							7	10 - 50	2 - 10	7	0 - 60	0 - 5
sand dropseed	SPCR							7	10 - 50	2 - 10	7	0 - 60	0 - 5
other perennial grasses	ZGP	7	0 - 140	0 - 10	7	0 - 100	0 - 10	7	0 - 50	0 - 10	7	0 - 120	0 - 10
NON-NATIVE GRASSES													
cheatgrass	BRTE	8			8	0 - 30	0 - 3	8	10 - 40	2 - 8	8	0 - 120	0 - 10
Kentucky bluegrass	POPR				8	0 - 50	0 - 5	8	0 - 40	0 - 8	8	0 - 120	0 - 10
FORBS													
American vetch	VIAM	9	70 - 140	5 - 10	9	100 - 150	10 - 15	9	25 - 100	5 - 20	9	60 - 120	5 - 10
cudweed sagewort	ARLU	9	0 - 28	0 - 2	9	10 - 50	1 - 5	9	5 - 25	1 - 5	9	0 - 24	0 - 2
dalea	DALEA	9	14 - 42	1 - 3	9	20 - 70	2 - 7	9	25 - 50	5 - 10	9	12 - 36	1 - 3
deervetch	LOJUNU	9	0 - 28	0 - 2	9	0 - 20	0 - 2	9	0 - 10	0 - 2	9	0 - 24	0 - 2
dotted gayfeather	LIPU	9	0 - 28	0 - 2	9	10 - 50	1 - 5	9	5 - 25	1 - 5	9	0 - 24	0 - 2
erigonum	ERIOG	9	14 - 70	1 - 5	9	20 - 70	2 - 7	9	25 - 50	5 - 10	9	12 - 60	1 - 5
false boneset	BREU	9	0 - 28	0 - 2	9	10 - 50	1 - 5	9	5 - 25	1 - 5	9	0 - 24	0 - 2
goldenrod	SOLID	9	0 - 28	0 - 2	9	0 - 20	0 - 2				9	0 - 24	0 - 2
hairy goldaster	HEVI4	9	14 - 42	1 - 3	9	20 - 50	2 - 5	9	15 - 35	3 - 7	9	12 - 36	1 - 3
heath aster	SYER	9	0 - 28	0 - 2	9	10 - 50	1 - 5	9	10 - 35	2 - 7	9	0 - 24	0 - 2
Indian breadroot	PEES	9	0 - 28	0 - 2	9	10 - 50	1 - 5	9	15 - 35	3 - 7	9	0 - 24	0 - 2
milkvetch	ASTRA	9	14 - 70	1 - 5	9	10 - 30	1 - 3				9	12 - 60	1 - 5
penstemon	PENST	9	0 - 42	0 - 3	9	0 - 30	0 - 3	9	15 - 25	3 - 5	9	0 - 36	0 - 3
prairie coneflower	RAC03	9	0 - 28	0 - 2	9	0 - 20	0 - 2	9	0 - 10	0 - 2	9	0 - 24	0 - 2
purple coneflower	ECAN2	9	0 - 42	0 - 3	9	0 - 30	0 - 3	9	15 - 25	3 - 5	9	0 - 36	0 - 3
purple prairie clover	DAPU5	9	42 - 70	3 - 5	9	30 - 50	3 - 5	9	15 - 25	3 - 5	9	36 - 60	3 - 5
pussytoes	ANTEN	9	42 - 70	3 - 5	9	30 - 50	3 - 5	9	15 - 25	3 - 5	9	36 - 60	3 - 5
scarlet gaura	GACO5	9	14 - 28	1 - 2	9	0 - 20	0 - 2	9	0 - 15	0 - 3	9	12 - 24	1 - 2
scarlet globemallow	SPOCO	9	14 - 28	1 - 2	9	0 - 20	0 - 2				9	12 - 24	1 - 2
scurfspea	PSORA2	9	14 - 28	1 - 2	9	10 - 30	1 - 3	9	15 - 25	3 - 5	9	12 - 24	1 - 2
spiny phlox	PHHO	9	14 - 70	1 - 5	9	10 - 50	1 - 5	9	5 - 25	1 - 5	9	12 - 60	1 - 5
sterile hymenoxys	TEAC	9	0 - 42	0 - 3	9	0 - 30	0 - 3	9	0 - 15	0 - 3	9	0 - 36	0 - 3
stiff sunflower	HEPA19	9	0 - 14	0 - 1	9	0 - 20	0 - 2	9	0 - 15	0 - 3	9	0 - 12	0 - 1
western ragweed	AMPS	9	14 - 42	1 - 3	9	0 - 20	0 - 2				9	12 - 36	1 - 3
western yarrow	ACMI2	9	0 - 14	0 - 1	9	0 - 20	0 - 2	9	0 - 15	0 - 3	9	0 - 12	0 - 1
woolly Indianwheat	PLPA2	9	0 - 28	0 - 2	9	0 - 30	0 - 3	9	0 - 25	0 - 5	9	0 - 24	0 - 2
woolly verbena	VEST	9	0 - 28	0 - 2	9	0 - 30	0 - 3	9	0 - 25	0 - 5	9	0 - 24	0 - 2
other perennial forbs	ZFP	9	0 - 28	0 - 2	9	0 - 30	0 - 3	9	0 - 25	0 - 5	9	0 - 24	0 - 2
SHRUBS													
big sagebrush	ARTR2	10	28 - 140	2 - 10	10	50 - 150	5 - 15	10	25 - 100	5 - 20	10	24 - 120	2 - 10
cactus	OPUNT	10	0 - 70	0 - 5	10	0 - 50	0 - 5	10	0 - 25	0 - 5	10	0 - 60	0 - 5
creeping juniper	JUHO2	10	0 - 28	0 - 2	10	0 - 20	0 - 2	10	5 - 50	1 - 10	10	0 - 24	0 - 2
fringed sagewort	ARFR4	10	0 - 70	0 - 5	10	0 - 50	0 - 5	10	0 - 5	0 - 1	10	0 - 60	0 - 5
leadplant	AMCA6	10	14 - 70	1 - 5	10	30 - 70	3 - 7	10	25 - 75	5 - 15	10	12 - 60	1 - 5
rose	ROSA5	10	0 - 70	0 - 5	10	0 - 50	0 - 5	10	0 - 25	0 - 5	10	0 - 60	0 - 5
saltbush	ATRIP	10	0 - 70	0 - 5	10	0 - 50	0 - 5	10	0 - 15	0 - 3	10	0 - 60	0 - 5
skunkbush sumac	RHTR	10	0 - 70	0 - 5	10	0 - 50	0 - 5	10	0 - 25	0 - 5	10	0 - 60	0 - 5
winterfat	KRLA2	10	0 - 70	0 - 5	10	0 - 50	0 - 5						
yucca	YUGL	10	0 - 70	0 - 5	10	0 - 50	0 - 5	10	5 - 50	1 - 10	10	0 - 24	0 - 2
other shrubs	ZSHRUB	10	0 - 28	0 - 2	10	0 - 50	0 - 5	10	0 - 25	0 - 5	10	0 - 60	0 - 5
TREES													
juniper	JUNIP	11	0 - 14	0 - 1	11	0 - 10	0 - 1	11			11	60 - 240	5 - 20
ponderosa pine	PIPO	11	0 - 14	0 - 1	11	0 - 10	0 - 1	11			11	60 - 240	5 - 20
Annual Production lbs./acre													
GRASSES & GRASS-LIKES		LOW	RV	HIGH	LOW	RV	HIGH	LOW	RV	HIGH	LOW	RV	HIGH
FORBS		810	1204	1595	460	770	1175	310	375	590	570	888	1200
SHRUBS		65	105	145	95	125	165	20	63	105	55	90	125
TREES		25	84	145	45	100	155	20	63	105	20	72	125
TOTAL		0 - 7	-15		0 - 5	-15		55	150	250	700	1200	1700
TOTAL		900	1400	1900	600	1000	1500	350	500	800	700	1200	1700

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 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 information is collected, some of these plant community descriptions may be revised or removed, and new ones 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.

Bluestem/Sideoats Grama/Needlegrass Plant Community

The plant community upon which interpretations are primarily based is the Bluestem/Sideoats Grama/Needlegrass Plant Community. This is also considered to be the HCPC. 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 deferment. The potential vegetation is about 80-90 percent grasses or grass-like plants, 5-10 percent forbs, and 2-10 percent shrubs. A mixture of cool-season and warm-season grasses dominates the site.

Major grasses include the sideoats grama, little bluestem, needleandthread, big bluestem, western wheatgrass, and blue grama. Other grasses and grass-likes occurring include hairy grama, plains muhly, and sedge. Significant forbs include purple coneflower and purple prairie clover. Shrubs occurring in this plant community include fringed sagewort and yucca, with big sagebrush, winterfat, and saltbush being common on the western portion of the MLRA.

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. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance.

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: SD6004

Growth curve name: Pierre Shale Plains, 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	18	25	25	15	7	1	0	0

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

- Continuous seasonal grazing or patch grazing under continuous season-long grazing will convert this plant community to the *Needleandthread/Little Bluestem/Grama Plant Community*.
- Encroachment (or escaped), nonuse, and no fire will lead to a *Juniper/Pine Encroachment Plant Community*. This occurs when this plant community is protected from natural fires, or controlled burning.

Needleandthread/Little Bluestem/Grama Plant Community

This plant community evolved under continuous seasonal grazing or in some cases with patch grazing under continuous season-long grazing. Needleandthread, little bluestem, and blue grama are significant species in this plant community. Big bluestem and sideoats grama have decreased, while the short grasses and grass-likes, such as blue grama, hairy grama, and sedge have increased. Other grasses occurring in this plant community include western wheatgrass, prairie Junegrass, and prairie sandreed. Forbs commonly found in this plant community include purple coneflower, purple prairie clover, and dotted gayfeather. Significant shrubs include yucca, cactus, rose, and fringed sagewort.

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: SD6003

Growth curve name: Pierre Shale Plains, cool-season/warm-season codominant.

Growth curve description: Cool-season, warm-season codominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	20	28	21	10	5	3	0	0

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

- Heavy continuous grazing will convert the plant community to the *Grama/Sedge/Sagewort Plant Community*.
- Prescribed grazing will convert this plant community to the *Bluestem/Sideoats Grama/Needlegrass Plant Community*.

Blue Grama/Sedge/Sagewort Plant Community

This plant community evolves from heavy grazing over several years time. Diversity is lost as the short grasses become dominant in the plant community. The grazing tolerant blue or hairy grama, and threadleaf sedge have replaced big bluestem, little bluestem, western wheatgrass, and green needlegrass. Sideoats grama and needleandthread remains in the plant community, but is less productive because of the grazing pressure. Because of the grazing pressure, threeawn, fringed sagewort, green sagewort, broom snakeweed, yucca, Hood’s phlox, woolly Indianwheat, pussytoes, western ragweed, and cactus become more prevalent in the plant community.

This plant community is typically resistant to change. Runoff will increase and infiltration will decrease. Continued overuse results in an increase of bare ground and higher erosion potential.

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: SD6004

Growth curve name: Pierre Shale Plains, 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	18	25	25	15	7	1	0	0

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

- Long-term prescribed grazing may convert this plant community to the *Needleandthread/Little Bluestem/Grama Plant Community*.

Juniper/Pine Encroachment Plant Community

This plant community more commonly occurs in the 16 to 18 inch precipitation zone of this MLRA. Historically, ponderosa pine and juniper was confined to rocky ridges and steep shallow slopes with rock outcrops located adjacent to this ecological site. Currently, ponderosa pine and juniper are expanding on to this ecological site due to the suppression of fire. Juniper/pine canopy is greater than 15 percent of mature trees. The understory is made up of about 60-85 percent grasses and grass-like species, 5-10 percent forbs, and 2-10 percent shrubs.

Dominant grasses and grass-likes include needleandthread, little bluestem, sideoats grama, blue grama, and sedge. Grasses of secondary importance include Canada wildrye, green needlegrass, western wheatgrass, and big bluestem. As the canopy increases, warm-season grasses tend to decrease as the cool-season grasses initially increase. Forbs commonly found in this community include green sagewort, western yarrow, and pussytoes. Nonnative species such as cheatgrass and bluegrass will tend to invade this plant community. The total annual herbaceous production (air-dry weight) of this plant community is about 1,000 lbs./acre, but it can vary greatly depending on the canopy cover of the overstory.

When compared to the Bluestem/Sideoats Grama/Needlegrass Plant Community, ponderosa pine or juniper increases significantly. The grass component decreases dramatically as the buildup of pine and juniper needles increases. Annual herbaceous production also decreases significantly. While the juniper/pine canopy provides excellent protection from the weather for both livestock and wildlife, it is not capable of supporting large numbers of wildlife and livestock due to decreased production.

This plant community is resistant to change. A significant reduction of juniper/pine can only be accomplished through timber harvesting or crown fire. The vegetation in the understory is capable of enduring fire; however, very hot crown fires will have a detrimental effect to the plant community. Reclamation of juniper/pine dominated areas can be costly and prove to be temporary without proper management (i.e., prescribed burning and 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: SD6011

Growth curve name: Pierre Shale Plains, heavy conifer canopy.

Growth curve description: Mature ponderosa pine/juniper overstory.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	3	7	11	24	27	12	5	4	3	2	1

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

- Wildfire (hot, crown fires) will move this plant community towards the *Needleandthread/Little Bluestem/Grama Plant Community*.
- Removal of juniper/pine by timber harvest will allow the understory to develop and convert to the *Needleandthread/Little Bluestem/Grama Plant Community*.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

The MLRA 60A lies within the drier portion of the 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, in-stream 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. Bison was a historical keystone species but have been extirpated as a free-ranging herbivore. The loss of the bison and prairie dog, 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 60A, the Shallow Loamy Ecological Site provides upland grassland cover with an associated forb and shrub component. It was typically part of an expansive grassland landscape that included combinations of Loamy, Thin Sandy, Shallow Clayey, Thin Loamy, Claypan, Sands, Sandy, Sandy Claypan, Clayey, and Thin Claypan Ecological Sites. This site provided habitat for species requiring unfragmented grassland. Important habitat features include 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 Shallow Loamy Ecological Site remains intact and provides increasingly important habitat for grassland nesting birds, small rodents, coyotes, and a variety of reptiles, amphibians, and insects. Invasive species such as annual brome grasses and crested wheat have impacted the biological integrity of the site for some grassland birds.

Bluestem/Sideoats Grama/Needlegrass (HCPC) and Needleandthread/ Little Bluestem/ Grama:

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, chestnut-collared longspur, Sprague's pipit, horned lark, lark bunting, and sharp-tailed grouse are common and benefit from the structure and composition this plant community

provides. Species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail will rarely use this site. 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, thirteen-lined ground squirrel, white-tailed jackrabbit, and deer. Juniper and Ponderosa pine may occur in low abundance on this site. The higher stature of this plant community provides thermal, protective, and escape cover for 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 herptiles such as the spade foot toad, bull snake, and western rattlesnake.

Resulting from continuous seasonal grazing the grass component a shift to a medium to short height plant community occurs. Forb and shrub abundance increased. Juniper and Ponderosa pine may occur in low abundance on this site. The plant community changes do not significantly change the wildlife community form the HCPC.

Grama/Sedge/Sagewort: Resulting from heavy, continuous grazing grama species (e.g. blue), sedges, and sagewort will dominate. The decrease in diversity of grasses, forbs, and shrubs will result in less seed production or lower quality nutrition for small herbivores including voles, mice, and thirteen-lined ground squirrel. Species such as Brewer's sparrow, greater sage-grouse, as well as, desert cottontail 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.

Juniper/Ponderosa Pine: Resulting from no fire, nonuse, and/or encroachment, juniper and Ponderosa pine will expand from ridges and steep shallow slopes. Forb diversity has decreased while shrub abundance has increased. Juniper and Ponderosa pine increase significantly. Grass species decline dramatically and species composition shifts and can become dominated by invasive species. Juniper and Ponderosa pine stands provide nesting cover, escape cover, and den sites for a variety of species. Species such as mule deer, white-footed mice, bushy-tailed woodrat, black-billed magpie, Townsend's solitaire, western meadowlark, Bohemian waxwing, dark-eyed junco, brown thrasher, lark sparrow, and white-crowned sparrow will increase. Species such as meadow voles, thirteen-lined ground squirrel, northern grasshopper mice, and western harvest mice will not utilize this site. Grassland nesting songbirds will be significantly reduced. Raptors such as the long-eared owl will increase.

If the tree canopy is high enough, then bare ground will likely increase and excessive runoff, nutrient and sediment loads may impact offsite aquatic habitat.

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses & Grass-like							
big bluestem	U D P D	U U D 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 D	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 P D	U U P D	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
hairy grama	U D P D	D P P D	U D P U	D P P D	D P P D	U D P U	U D P U
little bluestem	U D D U	U U D U	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
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
sedge	U P U D	U P U 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 D	U P D D	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 D	U D U U	U P D U	N D N N	N D N N	U P D U	U P D U
Forbs							
American vetch	U D P U	U P P U	U D P U	U P P U	U P P U	U D P U	U P P U
cudweed sagewort	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U D U
dalea	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
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
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
erigonum	U U D U	U U U U	U U D U	U U U U	U U U U	U U D U	U U U 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
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
hairy goldaster	U U D U	N N N N	U U D U	N N N N	N N N N	U U D U	N N N N
heath aster	U U D U	U U P U	U U D U	U U P U	U U P U	U U D U	U U P U
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
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
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
purple prairie clover	U D P U	U P P U	U D P U	U P P U	U P P U	U D P U	U P P U
pussytoes	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
scarlet gaura	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
scarlet globemallow	U U D U	U D D U	U U D U	U D D U	U D D U	U U D U	U D D U
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
spiny phlox	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
stemless hymenoxys	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
western ragweed	U U U U	U U U U	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
Shrubs							
big sagebrush	U U U U	D U U D	U N U U	P U D P	P P P P	U N U U	D 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
creeping juniper	U N N U	U N N U	U N N U	U N N U	U N N U	U N N U	U N N U
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
saltbush	P D D P	P D D P	P D D P	P D D P	P D D P	P D D P	P D D P
skunkbush sumac	D U U D	D D D D	D U U D	D U U D	D U U D	D U U D	D U U D
winterfat	P P P P	P P P P	P P P P	P P P P	P P P P	P P P P	P P P P
yucca	D N N D	D U U D	D N N D	D U U D	D U U D	D N N D	D U U D
Trees							
juniper	U N N U	U N N U	U N N U	D U U D	U N N U	U N N U	U N N U
ponderosa pine	U T T U	U N N U	U N N U	U N N U	U N N U	U T T U	U N N 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 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)
Bluestem/Sideoats Grama/Needlegrass	1,400	0.44
Needleandthread/Little Bluestem/Grama	1,000	0.32
Blue Grama/Sedge/Sagewort	500	0.16
Juniper/Pine Encroachment	1,200	**

*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).

**Highly variable; stocking rate needs to be determined on site.

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 varies from moderately slow to moderate and runoff varies from high to very high depending on 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 exception would be where short grasses form a dense sod and dominate the site. Normally, 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 opportunities for upland game species. The wide varieties of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood Products

Other Products

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

Supporting Information

Associated Sites

(060AY012SD) – Thin Upland
(060AY009SD) – Sandy

(060AY010SD) – Loamy 13-16” P.Z.
(060AY041SD) – Loamy 16-18” P.Z.

Similar Sites

(060AY012SD) – Thin Upland [more little bluestem, slightly higher production]
(060AY016SD) – Very Shallow [lower production, lower diversity, more rocks on the surface]

Inventory Data References (narrative)

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 description include: Stan Boltz, Range Management Specialist (RMS), NRCS; Darrel DuVall, RMS, NRCS; Jill Epley, RMS, NRCS; Cheryl Nielsen, RMS, NRCS; Rick Peterson, RMS, NRCS; and Mike Stirling, RMS, 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 between Montana (MT), Nebraska (NE), SD, and WY in MLRA 60A.

Field Offices

Belle Fourche, SD	Custer, SD	Hot Springs, SD	Pine Ridge, SD	Sundance, WY
Broadus, MT	Ekalaka, MT	Lusk, WY	Rapid City, SD	Wall, SD
Buffalo, SD	Faith, SD	Martin, SD	Rushville, NE	
Chadron, NE	Gillette, WY	Newcastle, WY	Sturgis, SD	

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 43e – Sagebrush Steppe, 43g – Semi-arid Pierre Shale Plains, and 43k – Dense Clay Prairie.

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, 2002. National Soil Survey Handbook, Title 430-VI. (<http://soils.usda.gov/technical/handbook/>)

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

MT, State Range Management Specialist Date

NE, State Range Management Specialist Date

SD, State Range Management Specialist Date

WY, State Range Management Specialist Date