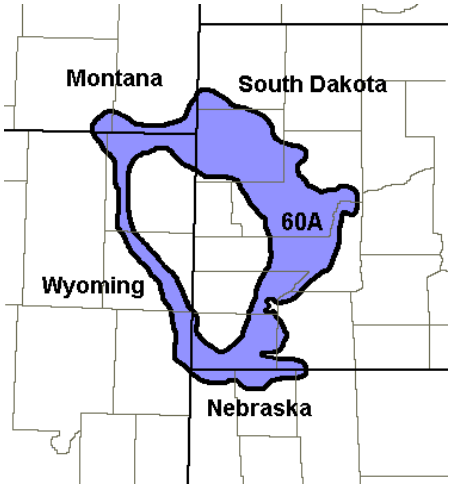
United States Department of Agriculture
Natural Resources Conservation Service

Ecological Site Description



Site Type: Rangeland

Site Name: Closed Depression

Site ID: R060AY019SD

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

Physiographic Features

This site occurs on level uplands.

Landform: depression, basin **Aspect:** N/A

	Minimum	Maximum
Elevation (feet):	2,500	4,300
Slope (percent):	0	2
Water Table Depth (inches):	0	80
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):	0	12
Frequency:	Occasional	Frequent
Duration:	Long	Long
Runoff Class:	Negligible	Negligible

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.

	Minimum	Maximum
Frost-free period (days):	122	129
Freeze-free period (days):	145	152
Mean Annual Precipitation (inches):	13	18

Average Monthly Precipitation (inches) and Temperature (ºF):

	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

Wetland Description:	**System**	**Subsystem**	**Class**	**Sub-class**
(Cowardin, et al., 1979):	Palustrine			

Representative Soil Features

The soils in this site are poorly drained and formed in clayey alluvium. The silt loam to clay surface layer is three to six inches thick. The soils have a moderate to very slow infiltration rate. The soils crack when dry and heavy traffic can cause surface compaction when wet. This site should show 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.

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
Parent Material Origin: sedimentary, unspecified
Surface Texture: silt loam, silty clay, clay
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments ≤3" (% Cover): 0
Surface Fragments >3" (%Cover): 0
Subsurface Fragments ≤3" (% Volume): 0-10
Subsurface Fragments >3" (% Volume): 0-1

	Minimum	Maximum
Drainage Class:	poorly	poorly
Permeability Class:	very slow	very slow
Depth (inches):	80	80
Electrical Conductivity (mmhos/cm)*:	0	16
Sodium Absorption Ratio*:	2	13
Soil Reaction (1:1 Water)*:	5.6	9.0
Soil Reaction (0.1M CaCl2)*:	NA	NA
Available Water Capacity (inches)*:	5	6
Calcium Carbonate Equivalent (percent)*:	0	15

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

Plant Communities

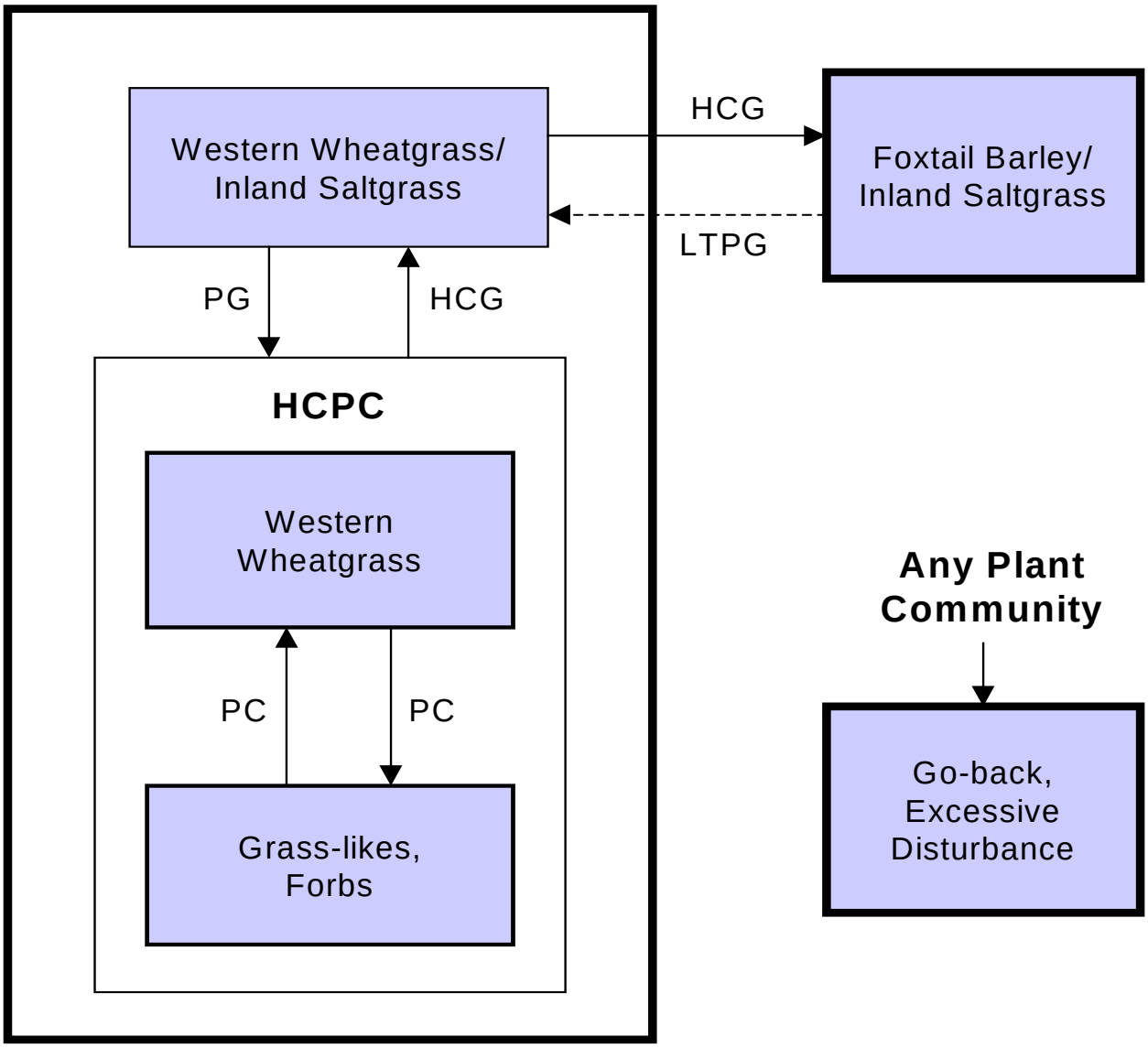
Ecological Dynamics of the Site:
This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term 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.

This site is very sensitive to precipitation fluctuations from year to year. With above average precipitation, the site becomes very wet, leading to a much different plant community than what would be present with average to below average precipitation. In dry years, plant density becomes very low. The two plant communities influenced strongly by precipitation alone (Western Wheatgrass and Grass-likes, Forbs) make up the natural fluctuation of what could be considered the Historic Climax Plant Community (HCPC).

The plant community upon which interpretations are primarily based is the 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



HCG - Heavy continuous grazing; **HCPC** - Historic Climax Plant Community; **LTPG** - Long-term prescribed grazing; **PC** - Precipitation cycles; **PG** - Prescribed grazing.

Plant Community Composition and Group Annual Production

			Historic Climax Plant Community		
COMMON/GROUP NAME	**SCIENTIFIC NAME**	**SYMBOL**	**Group**	**lbs./acre**	**% Comp**
GRASSES & GRASS-LIKES				*880 - 1980*	*40 - 90*
RHIZOMATOUS WHEATGRASSES			**1**	**330 - 1320**	**15 - 60**
western wheatgrass	Pascopyrum smithii	PASM	1	110 - 1320	5 - 60
thickspike wheatgrass	Elymus lanceolatus ssp. lanceolatus	ELLAL	1	0 - 660	0 - 30
OTHER NATIVE GRASSES			**2**	**110 - 550**	**5 - 25**
foxtail barley	Hordeum jubatum	HOJU	2	0 - 330	0 - 15
bluegrass	Poa spp.	POA	2	22 - 220	1 - 10
inland saltgrass	Distichlis spicata	DISP	2	22 - 220	1 - 10
Nuttall's alkaligrass	Puccinellia nuttalliana	PUNU2	2	22 - 440	1 - 20
slender wheatgrass	Elymus trachycaulus ssp. trachycaulus	ELTRT	2	0 - 110	0 - 5
American sloughgrass	Beckmannia syzigachne	BESY	2	0 - 110	0 - 5
alkali muhly	Muhlenbergia asperifolia	MUAS	2	22 - 220	1 - 10
ticklegrass	Agrostis scabra	AGSC5	2	0 - 110	0 - 5
other perennial grasses		2GP	2	0 - 220	0 - 10
GRASS-LIKES			**3**	**110 - 660**	**5 - 30**
prairie bulrush	Schoenoplectus maritimus	SCMA8	3	22 - 220	1 - 10
rush	Juncus spp.	JUNCU	3	22 - 220	1 - 10
sedge	Carex spp.	CAREX	3	110 - 330	5 - 15
common spikerush	Eleocharis palustris	ELPA3	3	110 - 550	5 - 25
needle spikerush	Eleocharis acicularis	ELAC	3	110 - 550	5 - 25
other grass-likes		2GL	3	0 - 330	0 - 15
FORBS			*5*	*110 - 1320*	*5 - 60*
alkali plantain	Plantago eriopoda	PLER	5	0 - 220	0 - 10
American licorice	Glycyrrhiza lepidota	GLLE3	5	0 - 330	0 - 15
bluebells	Mertensia spp.	MERTE	5	0 - 110	0 - 5
buttercup	Ranunculus spp.	RANUN	5	0 - 330	0 - 15
evening-primrose	Oenothera spp.	OENOT	5	0 - 330	0 - 15
lambsquarters	Chenopodium album	CHAL7	5	0 - 440	0 - 20
pepperweed	Lepidium spp.	LEPID	5	0 - 110	0 - 5
povertyweed	Iva axillaris	IVAX	5	0 - 220	0 - 10
prairie ironweed	Vernonia fasciculata	VEFA2	5	0 - 220	0 - 10
Pursh seepweed	Suaeda calceoliformis	SUCA2	5	0 - 330	0 - 15
purslane	Portulaca oleracea	POOL	5	0 - 220	0 - 10
showy deathcamas	Zigadenus elegans	ZIEL2	5	0 - 110	0 - 5
silverleaf cinquefoil	Potentilla argentea	POAR8	5	0 - 220	0 - 10
slender cinquefoil	Potentilla gracilis var. fastigiata	POGRF2	5	0 - 110	0 - 5
smartweed	Polygonum spp.	POLYG4	5	0 - 440	0 - 20
western dock	Rumex aquaticus	RUAQ	5	0 - 330	0 - 15
wild mint	Mentha arvensis	MEAR4	5	0 - 330	0 - 15
other perennial forbs		2FP	5	0 - 440	0 - 20

Annual Production lbs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	1295 -	1485	- 2200
FORBS	105 -	715	- 1800
TOTAL	1400 -	2200	- 4000

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

		Historic Climax Plant Community			Western Wheatgrass/ Inland Saltgrass			Foxtail Barley/Inland Saltgrass		
COMMON/GROUP NAME	**SYMBOL**	**Grp**	**lbs./acre**	**% Comp**	**Grp**	**lbs./acre**	**% Comp**	**Grp**	**lbs./acre**	**% Comp**
GRASSES & GRASS-LIKES			*880 - 1980*	*40 - 90*		*1440 - 1620*	*80 - 90*		*640 - 720*	*80 - 90*
RHIZOMATOUS WHEATGRASSES		**1**	**330 - 1320**	**15 - 60**	**1**	**720 - 1080**	**40 - 60**	**1**	**40 - 120**	**5 - 15**
western wheatgrass	PASM	1	110 - 1320	5 - 60	1	720 - 1080	40 - 60	1	40 - 120	5 - 15
thickspike wheatgrass	ELLAL	1	0 - 660	0 - 30	1	180 - 540	10 - 30	1	0 - 120	0 - 15
OTHER NATIVE GRASSES		**2**	**110 - 550**	**5 - 25**	**2**	**360 - 900**	**20 - 50**	**2**	**320 - 640**	**40 - 80**
foxtail barley	HOJU	2	0 - 330	0 - 15	2	54 - 180	3 - 10	2	240 - 480	30 - 60
bluegrass	POA	2	22 - 220	1 - 10	2	18 - 180	1 - 10	2	16 - 80	2 - 10
inland saltgrass	DISP	2	22 - 220	1 - 10	2	360 - 720	20 - 40	2	80 - 240	10 - 30
Nuttall's alkaligrass	PUNU2	2	22 - 440	1 - 20	2	90 - 180	5 - 10	2	40 - 80	5 - 10
slender wheatgrass	ELTRT	2	0 - 110	0 - 5	2	0 - 90	0 - 5	2	0 - 40	0 - 5
American sloughgrass	BESY	2	0 - 110	0 - 5	2	0 - 90	0 - 5	2	0 - 40	0 - 5
alkali muhly	MUAS	2	22 - 220	1 - 10	2	0 - 90	0 - 5	2	8 - 80	1 - 10
ticklegrass	AGSC5	2	0 - 110	0 - 5	2	0 - 90	0 - 5	2	0 - 40	0 - 5
other perennial grasses	2GP	2	0 - 220	0 - 10	2	0 - 90	0 - 5	2	0 - 40	0 - 5
GRASS-LIKES		**3**	**110 - 660**	**5 - 30**	**3**	**90 - 360**	**5 - 20**	**3**	**16 - 160**	**2 - 20**
prairie bulrush	SCMA8	3	22 - 220	1 - 10	3	0 - 90	0 - 5	3	0 - 40	0 - 5
rush	JUNCU	3	22 - 220	1 - 10	3	36 - 180	2 - 10	3	16 - 80	2 - 10
sedge	CAREX	3	110 - 330	5 - 15	3	90 - 270	5 - 15	3	40 - 120	5 - 15
common spikerush	ELPA3	3	110 - 550	5 - 25	3	36 - 180	2 - 10	3	16 - 80	2 - 10
needle spikerush	ELAC	3	110 - 550	5 - 25	3	0 - 90	0 - 5	3	0 - 80	0 - 10
other grass-likes	2GL	3	0 - 330	0 - 15	3	0 - 180	0 - 10	3	0 - 80	0 - 10
NON-NATIVE GRASSES		**4**			**4**	**0 - 90**	**0 - 5**	**4**	**40 - 120**	**5 - 15**
cheatgrass	BRTE				4	0 - 90	0 - 5	4	0 - 80	0 - 10
Kentucky bluegrass	POPR				4	0 - 90	0 - 5	4	16 - 80	2 - 10
FORBS		*5*	*110 - 1320*	*5 - 60*	*5*	*90 - 360*	*5 - 20*	*5*	*40 - 160*	*5 - 20*
alkali plantain	PLER	5	0 - 220	0 - 10	5	0 - 90	0 - 5	5	0 - 40	0 - 5
American licorice	GLLE3	5	0 - 330	0 - 15	5	0 - 90	0 - 5	5	0 - 40	0 - 5
bluebells	MERTE	5	0 - 110	0 - 5	5	0 - 36	0 - 2			
buttercup	RANUN	5	0 - 330	0 - 15	5	0 - 90	0 - 5	5	0 - 40	0 - 5
cocklebur	XANTH2				5	0 - 180	0 - 10	5	0 - 80	0 - 10
curlycup gumweed	GRSQ				5	0 - 90	0 - 5	5	0 - 40	0 - 5
evening-primrose	OENOT	5	0 - 330	0 - 15	5	0 - 54	0 - 3	5	0 - 40	0 - 5
lambsquarters	CHAL7	5	0 - 440	0 - 20	5	0 - 180	0 - 10	5	0 - 80	0 - 10
pepperweed	LEPID	5	0 - 110	0 - 5	5	0 - 90	0 - 5	5	0 - 40	0 - 5
povertyweed	IVAX	5	0 - 220	0 - 10	5	0 - 180	0 - 10	5	8 - 80	1 - 10
prairie ironweed	VEFA2	5	0 - 220	0 - 10	5	0 - 90	0 - 5	5	0 - 40	0 - 5
Pursh seepweed	SUCA2	5	0 - 330	0 - 15	5	0 - 180	0 - 10	5	0 - 80	0 - 10
purslane	POOL	5	0 - 220	0 - 10	5	0 - 180	0 - 10	5	0 - 80	0 - 10
showy deathcamas	ZIEL2	5	0 - 110	0 - 5	5	0 - 36	0 - 2	5	0 - 16	0 - 2
silverleaf cinquefoil	POAR8	5	0 - 220	0 - 10	5	0 - 54	0 - 3	5	0 - 24	0 - 3
slender cinquefoil	POGRF2	5	0 - 110	0 - 5	5	0 - 54	0 - 3	5	0 - 24	0 - 3
smartweed	POLYG4	5	0 - 440	0 - 20	5	0 - 90	0 - 5	5	0 - 80	0 - 10
sweetclover	MELIL				5	0 - 360	0 - 20	5	0 - 80	0 - 10
western dock	RUAQ	5	0 - 330	0 - 15	5	0 - 270	0 - 15	5	0 - 120	0 - 15
wild mint	MEAR4	5	0 - 330	0 - 15	5	0 - 90	0 - 5			
other perennial forbs	2FP	5	0 - 440	0 - 20	5	0 - 180	0 - 10	5	0 - 80	0 - 10

Annual Production lbs./acre	LOW RV HIGH	LOW RV HIGH	LOW RV HIGH
GRASSES & GRASS-LIKES	1295 - 1485 - 2200	1115 - 1575 - 2025	465 - 700 - 935
FORBS	105 - 715 - 1800	85 - 225 - 375	35 - 100 - 165
TOTAL	1400 - 2200 - 4000	1200 - 1800 - 2400	500 - 800 - 1100

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 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.

Historic Climax Plant Community

The plant community upon which interpretations are primarily based is the HCPC. The HCPC is actually made up of two somewhat distinct plant communities, which are described below. The HCPC can be found on areas that are properly managed with grazing and/or prescribed burning, and on areas receiving occasional short periods of deferment.

The potential vegetation is about 40-90 percent grasses and grass-likes and 5-60 percent forbs. The dominant species fluctuate significantly depending on precipitation cycles. Significant grasses and grass-likes present include western wheatgrass, Nuttall's alkaligrass, slender wheatgrass, inland saltgrass, bluegrass, ticklegrass, common spikerush, needle spikerush, and other rushes and sedges. Significant forbs include smartweed, American licorice, buttercup, evening-primrose, silverleaf cinquefoil, slender cinquefoil, and western dock.

This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning at this sites potential. When present, plant litter is properly distributed with very little movement offsite. Natural plant mortality can be significant following periods of below average precipitation. The diversity in plant species allows for both the fluctuation of ponding, as well as, the occurrence of randomly occurring drought.

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: SD6008
Growth curve name: Pierre Shale Plains, lowland cool-season/warm-season codominant.
Growth curve description: Cool-season, warm-season codominant, lowland.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	4	11	19	23	20	12	6	5	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 *Western Wheatgrass/Inland Saltgrass Plant Community*.

The following describes the transitional plant communities that occur within the HCPC:

Western Wheatgrass Plant Community: Following several years of above average precipitation, the plant community stabilizes and becomes dominated with perennial grasses such as western wheatgrass. Other grasses and grass-likes present include Nuttall's alkaligrass, sedge, rush, bulrush, slender wheatgrass. The occurrence of forbs will be considerably lower, including some species such as American licorice, bluebells, seepweed, and western dock. The plant community is made up of

about 80-90 percent grasses and grass-likes and about 10-20 percent forbs. The total annual production (air-dry weight) of this plant community is typically about 3,500 lbs./acre.

Grass-likes, Forbs Plant Community: This plant community often occurs after a period of higher precipitation that follows an extended dry cycle. Grasses and grass-likes commonly occurring include sedge, bulrush, spikerush, rush, foxtail barley, ticklegrass, western wheatgrass, and bluegrasses. The forbs commonly found include western dock, mint, Pursh seepweed, lambsquarters, knotweed, evening-primrose, buttercup, and American licorice. The plant community is made up of about 5-10 percent grasses, 30-40 percent grass-likes, and about 50-60 percent forbs. The total annual production (air-dry weight) is about 2,500 lbs./acre.

Western Wheatgrass/Inland Saltgrass Plant Community

This plant community is the result of heavy continuous grazing, and in some cases repeated seasonal grazing such as spring grazing every year. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, high evaporation and increased percolation of the high water table, which increases salt concentrations on the surface. This gives inland saltgrass and other salt tolerant species a competitive advantage over less tolerant species.

Western wheatgrass and inland saltgrass drastically increase and are the dominant species with the balance being a few species of cool-season grasses, and grass-likes including Nuttall's alkaligrass, plains bluegrass, ticklegrass, common spikerush, needle spikerush, and other sedges and rushes. Early cool-season grasses including foxtail barley and bluegrass begin to increase and/or invade. Forbs that will invade are curly dock, sweet clover, curlycup gumweed, and cocklebur while lambsquarters, pepperweed, povertyweed, purslane, and western dock will increase. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur.

This plant community is relatively stable and well adapted to increased salinity. Plant vigor, litter, frequency, and production have decreased. The biological integrity, water, and nutrient cycles of this plant community are becoming impaired. This plant community is less productive than the HCPC.

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: SD6008
Growth curve name: Pierre Shale Plains, lowland cool-season/warm-season codominant.
Growth curve description: Cool-season, warm-season codominant, lowland.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	4	11	19	23	20	12	6	5	0	0

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

- Heavy continuous grazing without adequate recovery opportunity between grazing events will move this plant community across an ecological threshold to the *Foxtail Barley/Inland Saltgrass Plant Community*.

- Prescribed grazing that includes changing season of use and allowing adequate recovery periods between grazing events will lead this plant community back to the *Historic Climax Plant Community*.

Foxtail Barley/Inland Saltgrass Plant Community

This plant community developed with heavy continuous grazing where adequate recovery periods between grazing events were not allowed. Patches of inland saltgrass sod are typical and foxtail barley and bluegrass is well distributed throughout the community. Nuttall's alkaligrass and western wheatgrass have been greatly reduced in production and vigor, and may persist in remnant amounts.

This plant community is resistant to change due to the grazing tolerance of inland saltgrass and increased surface salts. A significant amount of production and diversity has been lost when compared to the HCPC. Loss of key cool-season grasses and increased bare ground have negatively impacted energy flow and nutrient cycling. Water infiltration is reduced significantly due to the massive shallow root system "root pan," characteristic of inland saltgrass and increased bare ground.

It will take a long time to bring this plant community back to the HCPC with management alone. Renovation (mechanical and/or chemical inputs) is not recommended due to high salt content of the soil and saltgrass persistence.

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: SD6007
Growth curve name: Pierre Shale Plains, cool-season dominant, warm-season subdominant.
Growth curve description: Cool-season dominant, warm-season subdominant, lowland.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	5	13	20	25	18	11	5	3	0	0

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

- Under long-term prescribed grazing, including adequate recovery periods, this plant community will move through the successional stages, and may eventually lead to the *Western Wheatgrass/Inland Saltgrass Plant Community*. This process will take a long period of time (25+ years).

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 Closed Depression Ecological Site provides upland and wetland complexes cover with an associated forb component. It was typically part of an expansive grassland landscape that included combinations of Shallow Loamy, Shallow Clayey, Thin Loamy, Thin Claypan, Sandy, Sandy Claypan, Loamy, Loamy Terrace, Sandy Terrace, and Clayey Ecological Sites.

The Closed Depression Ecological Site has remained relatively intact but may be subject to haying under drier conditions. This site has sufficient hydrology to support hydrophytic vegetation and wildlife species associated with ponded and saturated soil conditions. This site receives surface water from adjacent upland sites, snow melt and rainfall events. The site provides important wetland habitat for birds, small rodents, bats, mammalian predators, reptiles, and insects. These sites also provide forage sites for greater sage-grouse broods.

Western Wheatgrass and Grass-likes, Forbs (HCPC): This site fluctuates between two separate climax plant communities depending upon the precipitation cycle. During drier cycles the site is dominated by western wheatgrass. During wetter cycles the site is dominated by grass-like plants (e.g. sedges and rushes) and forbs.

During drier cycles the western wheatgrass dominated site provides upland wildlife habitat. Mixed-grass species and/or species associated with the adjacent ecological sites will utilize this site.

During wetter cycles the sedge, rush, forb site provides wetland wildlife habitat.

The predominance of hydrophytic vegetation, including a high diversity of sedges and other grass-like species, favors shorebirds (e.g. plovers, sandpipers, and snipe) and wetland associated songbirds. This plant community provides habitat for salamanders, various frog and toad species, and various snake species. Invertebrates are an important component of the food web. Raptors such as northern harrier, short-eared owl, Swainson's hawk, and American kestrel will use this site. Prey populations are limited to small mammals such as water shrew and meadow vole and invertebrates. When associated with ecological sites dominated by big sagebrush, greater sage-grouse will use the site for brood rearing/foraging habitat.

Western Wheatgrass/Inland Saltgrass and Foxtail Barley/ Inland Saltgrass:
Resulting from heavy continuous grazing this site becomes dominated by shorter more saline tolerant species. The predominance of saline tolerant hydrophytic vegetation does not favor any particular wildlife group. However, the site may receive limited shorebird use. This plant community provides habitat for limited invertebrate populations. Herptile use is either extremely limited or nonexistent. Raptors such as northern harrier, short-eared owl, Swainson's hawk, and American kestrel will use this site. Prey populations are limited to small mammals such as water shrew and meadow vole and invertebrates.

Go-back: This site 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.

Excessive Disturbance: This plant community develops under severe disturbance and/or excessive defoliation. This can result from heavy livestock concentration or cropping. The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to invasion of foxtail barley, quackgrass, and other nonnative species due to severe soil disturbances and relatively high percent of bare ground. Wildlife use improves with lower levels of foxtail barley and quackgrass invasion. Significant concentrations of these two species will significantly limit wildlife use. Wildlife use may remain relatively unchanged if the annual/pioneer plants are not invasive because of the relative high seed and flower production.

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

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses & Grass-likes							
alkali 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
American sloughgrass	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
bluegrass	U D U U	D P U D	U D U U	U P N D	U P N D	U D U U	U D U U
common spikerush	N U D U	N U U N	N U D U	N U U N	N U U N	N U D U	N U D U
foxtail barley	U D N N	N P N N	U D N N	N P N N	N P N N	U D N N	U D N N
inland saltgrass	N U U N	N N N N	N U U N	N N N N	N N N N	N U U N	N U U N
needle spikerush	N U D U	N U U N	N U D U	N U U N	N U U N	N U D U	N U D U
Nuttall's alkaligrass	U P D D	P P P P	U P D D	P P P P	P P P P	U P D D	U P D D
prairie bulrush	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	U U U U
rush	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
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
slender wheatgrass	U P U U	U D U U	U P U U	N D U N	N D U N	U P U U	U P U U
thickspike wheatgrass	U D D U	U D U U	U D D U	N D N N	N D N N	U D D U	U D D U
ticklegrass	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 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							
alkali plantain	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
American licorice	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
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
buttercup	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
evening-primrose	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
lambsquarters	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
pepperweed	N N N N	N N N N	N U N N	N N N N	N N N N	N N N N	N N N N
povertyweed	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
prairie ironweed	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
Pursh seepweed	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
purslane	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
showy 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
silverleaf cinquefoil	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
slender cinquefoil	N N N N	N U D N	N N N N	N U D N	N U D N	N N N N	N U D N
smartweed	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 dock	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 mint	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

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)
Historic Climax Plant Community	2,200	0.70
Western Wheatgrass/Inland Saltgrass	1,800	0.56
Foxtail Barley/Inland Saltgrass	800	0.25

*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 herbage production on this site. The site is dominated by soils in hydrologic groups D. Infiltration varies from moderate to very slow and the site is a depression without any runoff potential. 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, Natural Resources Conservation Service (NRCS) National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational Uses

This site provides hunting opportunities for both waterfowl and upland game species. The wide varieties of plants that 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

(060AY011SD) – Clayey 13-16" P.Z.
(060AY040SD) – Clayey 16-18" P.Z.

Similar Sites

(060AY007SD) – Saline Lowland
[Less western wheatgrass; less dock and smartweed, slightly more production]

Inventory Data References

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used. Those involved in developing this site description include: Stan Boltz, Range Management Specialist (RMS), NRCS; Cheryl Nielsen, RMS, NRCS; Rick Peterson, RMS, NRCS; and Mike Stirling, RMS, NRCS.

Data Source	Number of Records	Sample Period	State	County
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