

Ecological site R061XY002SD Wet Land

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 061X–Black Hills Foot Slopes

The Black Hills Foot Slopes (MLRA 61) is shared between Wyoming (WY) (58 percent) and South Dakota (SD) (42 percent). The MLRA is approximately 1,865 square miles. The towns of Spearfish, Sturgis, and Hot Springs, South Dakota, and Newcastle and Sundance, Wyoming, are all in this MLRA. Rapid City, South Dakota, is on the eastern edge of the MLRA. Wind Cave National Park, Devils Tower National Monument, and parts of Thunder Basin National Grassland and the Black Hills National Forest are also in MLRA 61. Devils Tower was the nation's first National Monument, designated by President Theodore Roosevelt in 1906.

The Black Hills Foot Slopes consists of steeply dipping rocks circling the domed mountains of the Black Hills. As the mountains were uplifted, older sediments were tipped up and dipped away from the core of the mountains. The Lower Cretaceous Fall River and Lakota (Inyan Kara Group) sandstones, which are on the outside edge of the area, are referred to as the Dakota Hogback. The next geologic formation is the Triassic-aged red beds of the Spearfish shale. It forms a low valley. This "red valley" surrounds the Black Hills between the two ridges formed by the Inyan Kara (hogback) and Minnekahta Formations associated with the Black Hills (MLRA 62). The Lakota referred to the red valley as the "Big Racecourse or the Red Racetrack." The red beds have gypsum and anhydrous layers. Ground water seepage can dissolve these layers, creating sinkholes on the surface.

The average elevation of MLRA 61 ranges from 2,950 to 3,940 feet with extremes to 5,580 feet. Slopes are generally hilly; however, the interior red beds are nearly level to moderately sloping. The exterior hogback is steep, erosion-resistant rock. The Belle Fourche River is the only river flowing through MLRA 61. It passes through Hulett, Wyoming.

The dominant soil orders in this MLRA are Alfisols, Entisols, and Mollisols. The soils in the area predominantly have frigid or mesic soil temperature regimes and aridic or ustic soil moisture regimes. The soils are shallow to very deep, generally well drained, and loamy.

Average annual precipitation is 16 to 22 inches. The majority of rainfall occurs early in the growing season. Some high-intensity thunderstorms occur in mid-late summer. This MLRA supports open grassland, open ponderosa forest, and savanna-like vegetation. The grassland is characterized by native grasses, such as big bluestem, little bluestem, western wheatgrass, needle and thread, prairie dropseed, and green needlegrass. Bur oak grows throughout the northern area and can develop into nearly pure stands.

The major resource concerns are water quality, wind erosion, water erosion, and urban expansion.

MLRA 61 is 54 percent privately owned rangeland and 19 percent forest land. Federal lands make up 7 percent of the rangeland and 5 percent of the forest land. The remaining 15 percent of the MLRA is privately owned cropland and urban development (USDA-NRCS, 2006: Ag Handbook 296).

LRU notes

LRU Notes:

For development of ecological sites, MLRA 61 is divided into three precipitation zones (PZ).

The northern area (18–22" PZ) extends from just south of Rapid City, South Dakota, north to the Wyoming border.

The southern area (16–18" PZ) extends from Newcastle, Wyoming, south to Hot Springs, South Dakota, then north to just south of Rapid City.

The western area (16–20" PZ) is primarily located in Wyoming, extending from Newcastle in the south, to north of the Bear Lodge Mountains, then south through the gap between the Bear Lodge Mountains and the Black Hills.

One additional grouping of ecological sites represents sites that are common for the entire MLRA and do not have a precipitation zone designation.

The forest lands in MLRA 61 are represented by three forest ecological sites, which are currently correlated to MLRA 62 Black Hills.

Classification relationships

USDA Land Resource Region G—Western Great Plains Range and Irrigated Region:

Major Land Resource Area (MLRA) 61—Black Hills Foot Slopes

US Environmental Protection Agency (EPA)

Level IV Ecoregions of the Conterminous United States:

Black Hills Foothills—17a

USDA Forest Service

Ecological Subregions: Sections and Subsections of Conterminous United States:

Black Hills Coniferous Forest Province—M334:

Black Hills Foothills Subsection—M334Aa

Ecological site concept

The Wet Land ecological site is found throughout MLRA 61. It is a run-in site located on drainageways, oxbows, and floodplains. Slopes range from 0 to 3 percent. The soils are very deep, very poorly drained and formed in alluvium. The surface layer is 5 to 14 inches in depth with silty clay surface textures. A permanent water table will fluctuate between 0 to 1 foot. Vegetation in Reference State (1.0) consists of grasses and grass-like, forbs, shrubs, and trees that can tolerate wet soil conditions or are classified as wetland obligate or facultative wet.

Associated sites

R061XY042SD	Lowland The Lowland ecological site is found on low stream terraces above the Wet Land ecological site.
R061XY003SD	Subirrigated The Subirrigated ecological site is found adjacent to the Wet Land ecological site but will have a seasonally water table within 1 to 3 feet of the surface.

Similar sites

R061XY003SD	Subirrigated The Subirrigated ecological site is found on similar landscape positions as the Wet Land site. The Subirrigated plant community will have more bluestem, less prairie cordgrass, and fewer obligate grass-like species and forbs than the Wet Land ecological site.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Spartina pectinata</i> (2) <i>Calamagrostis canadensis</i>

Physiographic features

The Wet Land ecological site normally occurs on level to nearly level valleys near springs, seeps, and sloughs. A water table generally occurs at or within 12 inches of the surface.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Oxbow (3) Flood plain
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Occasional to frequent
Elevation	2,900–4,000 ft
Slope	0–3%
Ponding depth	0–12 in
Water table depth	6–12 in

Climatic features

The climate in MLRA 61 is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland steppes to the east. Average annual precipitation ranges from 16 to 22 inches with most falling during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums. The wide range is due to the high elevation and dry air, which permit rapidly incoming and outgoing radiation. In winter, cold air outbreaks from Canada move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in the winter and bring rapid rises in temperature. Extreme storms may occur during the winter. They most severely affect ranch operations during late winter and spring.

The average annual temperature is about 47 °F. January and December are the coldest months with average temperatures ranging from about 23 °F (NNW of Edgemont, SD) to about 26 °F (Fort Meade, SD). July is the warmest month with average temperatures ranging from about 69 °F (Fort Meade, WY) to about 73 °F (Hot Springs, SD). The range of average monthly temperatures between the coldest and warmest months is about 47 °F. Wind speeds are estimated to 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 winds. Occasionally, storms 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. Cool-season plants may green-up in September and October if adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	94-114 days
Freeze-free period (characteristic range)	119-144 days

Precipitation total (characteristic range)	18-21 in
Frost-free period (actual range)	80-125 days
Freeze-free period (actual range)	115-158 days
Precipitation total (actual range)	16-22 in
Frost-free period (average)	106 days
Freeze-free period (average)	132 days
Precipitation total (average)	19 in

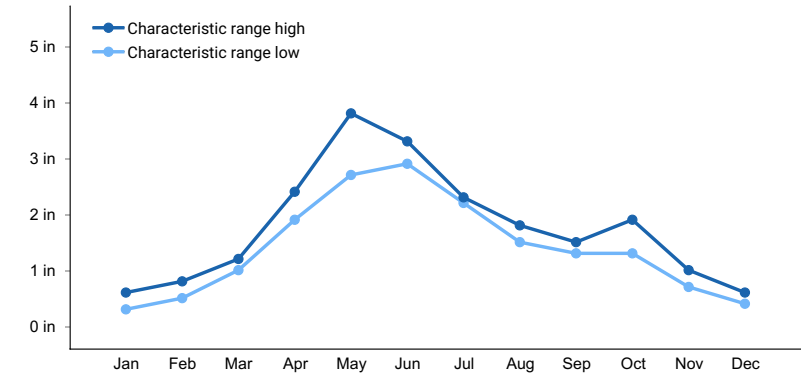


Figure 1. Monthly precipitation range

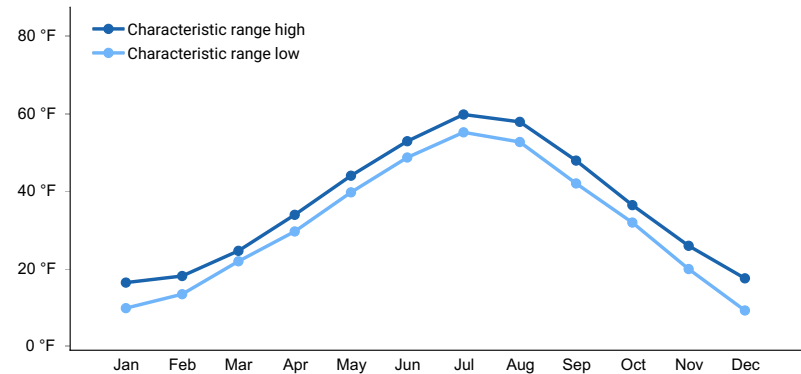


Figure 2. Monthly minimum temperature range

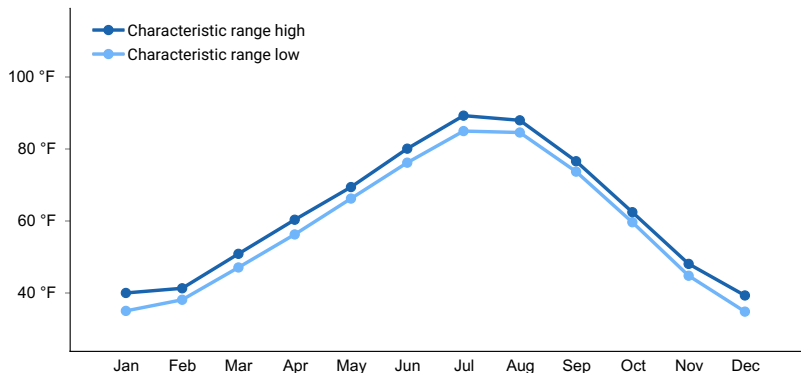


Figure 3. Monthly maximum temperature range

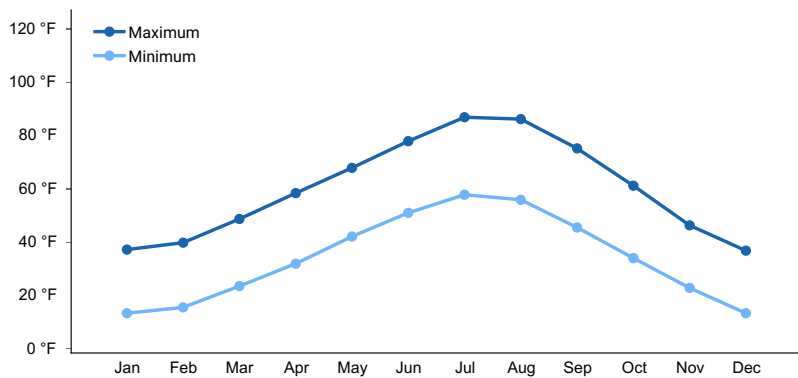


Figure 4. Monthly average minimum and maximum temperature

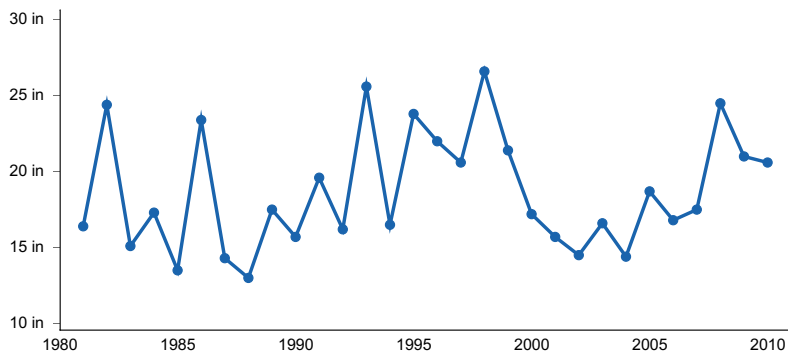


Figure 5. Annual precipitation pattern

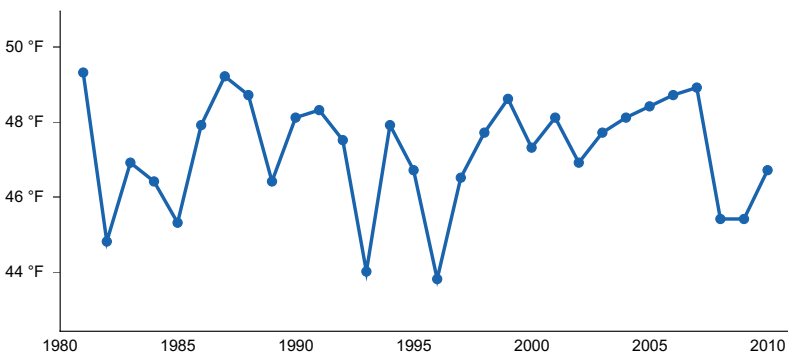


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BEAR RIDGE [USC00390554], Spearfish, SD
- (2) EDMONT [USC00392557], Edgemont, SD
- (3) EDMONT 23 NNW [USC00392565], Custer, SD
- (4) FT MEADE [USC00393069], Fort Meade, SD
- (5) HOT SPRINGS [USC00394007], Hot Springs, SD
- (6) RAPID CITY WFO [USC00396948], Rapid City, SD
- (7) SPEARFISH [USC00397882], Spearfish, SD
- (8) DEVILS TWR #2 [USC00482466], Devils Tower, WY
- (9) HULETT [USC00484760], Hulett, WY
- (10) NEWCASTLE [USC00486660], Newcastle, WY
- (11) SUNDANCE [USC00488705], Sundance, WY
- (12) UPTON 14ENE [USC00489208], Newcastle, WY

Influencing water features

The Wet Land ecological site has a combination of physical and hydrological features that: 1) provide season-long ground water within one foot of the surface, 2) allows relatively free movement of water and air in the upper part of

the soil, and 3) are occasionally or frequently flooded.

Wetland description

Wetland Description: Cowardin, et. al., 1979

System: Lacustrine

Subsystem: Littoral

Class: Unconsolidated Shore

Subclass: Organic, Vegetated

Water Regime: Permanently, or Semi-permanently, or Seasonally Flooded

Wetland Description: Cowardin, et. al., 1979

System: Palustrine

Subsystem: N/A

Class: Emergent Wetland

Subclass: Persistent

Water Regime: Permanently, or Semi-permanently, or Seasonally Flooded, or Saturated

Soil features

The features common to soils in this site are the silty clay textured surface layers and slopes of 0 to 3 percent. Soils may have surfaces of mucky peat or slightly decomposed plant material. The soils in this site are very poorly drained and formed in alluvium. The surface layer is 5 to 14 inches thick. The texture of the subsurface layers are silty clay. Subsurface soil layers are nonrestrictive to water movement and root penetration.

Soil series correlated to the Wet Land ecological site: Herdcamp.

Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Litter typically falls in place and signs of movement are not common. Chemical and physical crusts are rare to nonexistent.

More information regarding the soil is available in soil survey reports. Contact the local USDA Service Center for details specific to your area of interest, or go online to access USDA's Web Soil Survey.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silty clay
Family particle size	(1) Clayey
Drainage class	Very poorly drained
Permeability class	Moderate to slow
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4-6 in
Calcium carbonate equivalent (0-40in)	0-40%
Electrical conductivity (0-40in)	0-16 mmhos/cm
Sodium adsorption ratio (0-40in)	0-50
Soil reaction (1:1 water) (0-40in)	5.6-9.6

Subsurface fragment volume ≤3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Wet Land ecological site developed under Northern Great Plains climatic conditions; light to severe grazing by bison and other large herbivores; sporadic, natural or human-caused wildfire (often of light intensities); and other biotic and abiotic factors that typically influence soil and site development. Changes occur in the plant communities due to short-term weather variations, effects of native and exotic plant and animal species, and management actions. Although the following plant community descriptions are typical of the transitions between communities, severe disturbances, such as periods of well below average precipitation and the introduction of non-native cool-season grasses, and non-native deciduous trees, can cause significant shifts in plant communities and species composition.

Continuous season-long grazing (during the typical growing season of May through October), or repeated seasonal grazing (e.g., every spring, every summer), without adequate recovery periods following each grazing occurrence, causes this site to depart from the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1). Species such as spike sedge and Baltic rush increase. Grasses and grass-like species such as Nebraska sedge, bluejoint reedgrass, and northern reedgrass will decrease in frequency and production.

Interpretations are primarily based on the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1). 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 state-and-transition diagram illustrates the common plant communities 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.

State and transition model

Wet Land – R061XY002SD 5/6/20

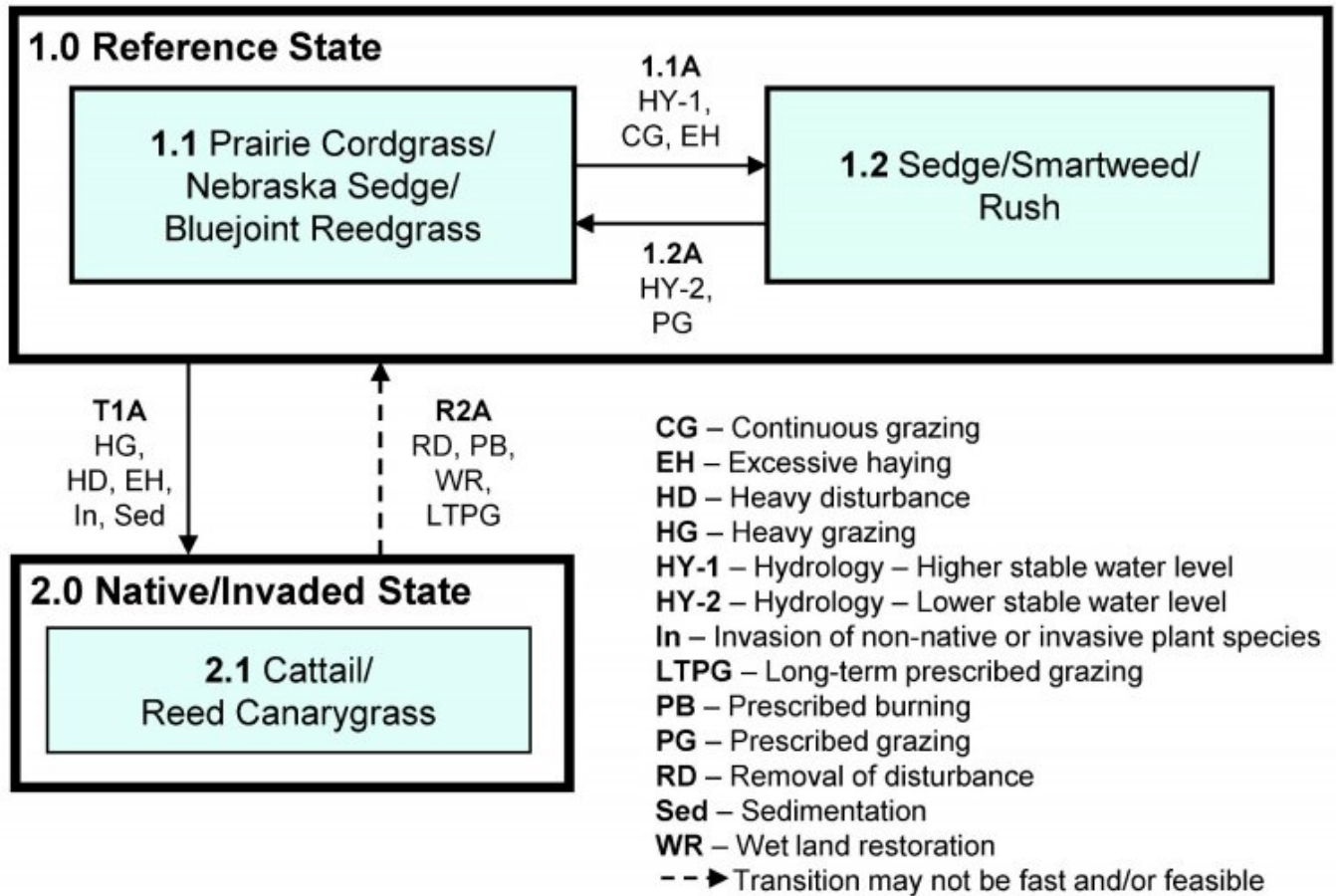


Diagram Legend: Wet Land - R061XY002SD

T1A	1.0 to 2.0	Heavy grazing without change in season of use, or adequate recovery periods; heavy disturbance; excessive haying; sedimentation; invasion of non-native or invasive plant species.
R2A	2.0 to 1.0	Removal of management induced disturbance; prescribed burning; or possibly wet land restoration; followed by long-term prescribed grazing with proper stocking rates, change in season of use, and adequate recovery periods. Recovery may not be fast or meet management objectives.
1.1A	1.1 to 1.2	Change to a wetter hydrologic cycle with a higher stable water level; continuous grazing without change in season of use, or adequate recovery time; or excessive haying.
1.2A	1.2 to 1.1	Return to a normal or slightly drier hydrologic cycle; prescribed grazing with proper stocking rates, change in season of use, and adequate recovery time.

State 1 Reference State

The Reference State represents the best estimate of the natural range of variability that dominated the dynamics of the Wet Land ecological site prior to European settlement. This site, in the Reference State, is dominated by grasses, grass-like species, and forbs. Variations in annual precipitation, and length of time the site is ponded, greatly influence the species composition from year to year. During wet years the plant community will respond to higher surface water levels and grass-like species and forbs will increase. During drier years the plant community will be dominated by grasses and obligate sedges and rushes. Grazing pressure on this site and surrounding sites also influence the plant community dynamics. Hoof action during wet periods can cause soil compaction and reduce rooting depth and soil saturation levels. Heavy animal concentrations or cropping on the surrounding landscapes can increase runoff and sedimentation. In pre-European settlement times, the primary disturbances included grazing by large ungulates, occasional fire, and drought. Favorable growing conditions occurred during the spring

and the warm months of June through August. Today a similar state can be found in areas where proper livestock management occurs.

Community 1.1
Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass

Interpretations are based primarily on the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1). This is also considered to be reference plant community. Potential vegetation is about 60 percent grasses, 25 percent sedges and rushes, 10 percent forbs, and 5 percent shrubs and trees. The major grasses and grass-likes include prairie cordgrass, Nebraska sedge, bluejoint reedgrass, and northern reedgrass. Grasses and grass-likes of lesser importance are mountain rush (Baltic rush) and low-growing, unpalatable sedges. The plant community is well adapted to the Northern Great Plains climatic conditions. It is a critical plant community providing water and habitat for the surrounding area. The diversity in plant species provides a variety of habitats for wildlife. It is resistant to drought due to a dependable water supply. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	4280	4648	5190
Forb	220	550	675
Shrub/Vine	0	274	600
Tree	0	28	60
Total	4500	5500	6525

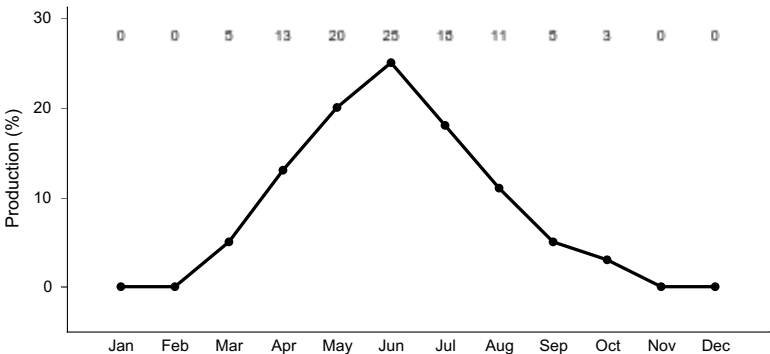


Figure 8. Plant community growth curve (percent production by month). SD6107, Black Hills Foot Slopes, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm-season sub-dominant, lowland.

Community 1.2
Sedge/Smartweed/Rush

This plant community developed with continuous grazing without adequate recovery periods between grazing events, or excessive haying, and wetter precipitation or hydrology cycle. This plant community is approximately 30 percent grasses and 40 percent grass-like species, 25 percent forbs, and 5 percent shrubs and trees. The plant community becomes dominated by grass-likes such as Nebraska sedge, various obligate and facultative wet sedges, spikerush, and mountain rush (Baltic rush). Forbs include Pennsylvania smartweed, swamp smartweed, and native cattails. When compared to the Prairie Cordgrass-Bluejoint Reedgrass/Nebraska Sedge Plant Community (1.1), prairie cordgrass, northern reedgrass, bluejoint reedgrass, and Nebraska sedge have decreased. Low growing unpalatable sedges, mountain rush (Baltic rush), and native cattails have increased. The abundant production and proximity to water make this plant community important for livestock and wildlife such as perching birds, shorebirds, waterfowl, elk, and deer. The plant community is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact. The watershed is usually functioning. While plant diversity has been reduced, the soil is stable. The water cycle, nutrient cycle, and energy flow is slightly reduced but continues to function adequately.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	980	1161	1735
Forb	220	585	650
Shrub/Vine	0	45	95
Tree	0	9	20
Total	1200	1800	2500

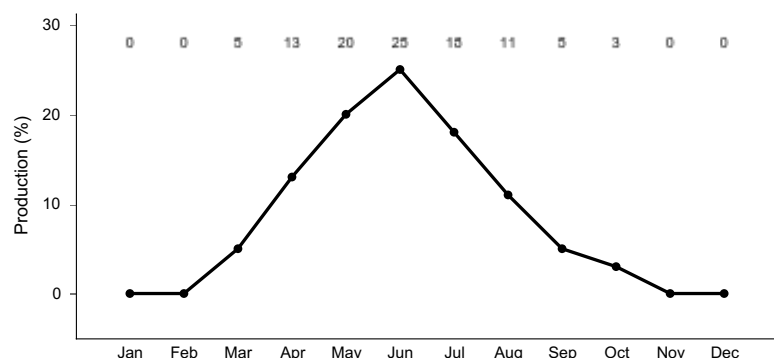


Figure 10. Plant community growth curve (percent production by month). SD6107, Black Hills Foot Slopes, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm-season sub-dominant, lowland.

Pathway 1.1A

Community 1.1 to 1.2

Change to a wetter hydrologic cycle with a higher stable water level, continuous grazing without adequate recovery periods, or excessive haying, will convert the Reference Plant Community (1.1) to the Sedge/Smartweed/Rush Plant Community (1.2).

Pathway 1.2A

Community 1.2 to 1.1

Prescribed grazing that provides change in season of use, and adequate recovery time, and a return to a normal or slightly drier precipitation and hydrologic cycle will shift the Sedge/Smartweed/Rush Plant Community (1.2) to the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community. (1.1).

Conservation practices

Prescribed Grazing

State 2

Native/Invaded State

The Native/Invaded State is dominated by native and non-native cool-season grasses and grass-like. The non-native cool-season grasses, primarily Kentucky bluegrass, make up 10 to 15 percent of the total annual production. This State is the result of heavy grazing, excessive haying, or heavy disturbances which can create soil compaction and sedimentation. Cattails and possibly reed canarygrass have increased and replaced the reference plant community. The Native/Invaded State is very resilient and resistant to change.

Community 2.1

Cattail/Reed Canarygrass

This plant community developed with further heavy grazing, excessive haying, or heavy disturbance and sedimentation. Cattails and possible reed canarygrass have invaded the site and displaced the more palatable

grasses and grass-like species. The drier areas of this plant community will likely be dominated by Kentucky bluegrass. When compared to the Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass Plant Community (1.1), prairie cordgrass, bluejoint reedgrass, and Nebraska sedge have decreased. Low growing unpalatable sedges, mountain rush (Baltic rush), and cattails have increased. The plant community is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact. The watershed is usually functioning.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1780	2160	2890
Forb	220	675	750
Shrub/Vine	0	150	325
Tree	0	15	35
Total	2000	3000	4000

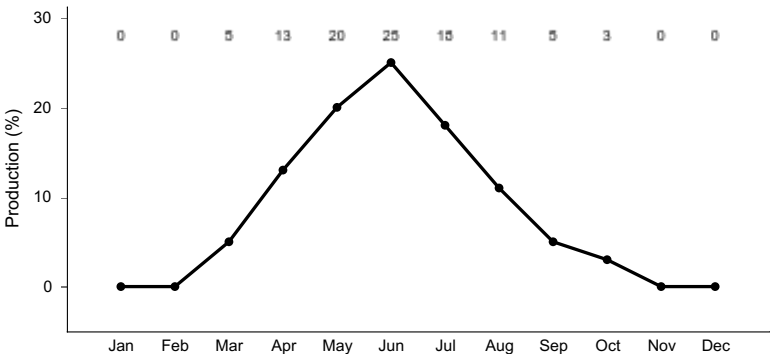


Figure 12. Plant community growth curve (percent production by month). SD6107, Black Hills Foot Slopes, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm-season sub-dominant, lowland.

Transition T1A

State 1 to 2

Heavy grazing or excessive haying with no recovery opportunity; heavy disturbance resulting in sedimentation; and the invasion of non-native or invasive plant species will transition the Reference State (1.0) to the Native/Invaded State (2.0).

Restoration pathway R2A

State 2 to 1

Removal disturbances coupled with long-term prescribed grazing, or prescribed burning in combination with prescribed grazing may eventually move the Native/Invaded State (2.0) toward the Reference State (1.0). This transition pathway is assuming an adequate seed and vegetative source is available. This process may require a long period of time to accomplish and may be difficult to attain depending on the degree of degradation. Wet land restoration may be an alternative but may be cost prohibitive and may not meet management objectives.

Conservation practices

Prescribed Burning
Prescribed Grazing

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)

Grass/Grasslike

1	Tall Warm-Season Grasses			2200–3025	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	2200–3025	–
2	Rhizomatous Cool-Season Grasses			550–1650	
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	550–1375	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	275–825	–
	slimstem reedgrass	CASTS5	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	55–550	–
3	Other Native Grasses			275–500	
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	110–275	–
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	0–275	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	110–275	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–275	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–275	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–275	–
	spiked muhly	MUGL3	<i>Muhlenbergia glomerata</i>	0–110	–
	fowl mannagrass	GLST	<i>Glyceria striata</i>	0–110	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–110	–
	American sloughgrass	BESY	<i>Beckmannia syzigachne</i>	0–55	–
4	Grass-Likes			1100–2200	
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	550–1375	–
	bulrush	SCHOE6	<i>Schoenoplectus</i>	275–550	–
	sedge	CAREX	<i>Carex</i>	275–550	–
	wheat sedge	CAAT2	<i>Carex atherodes</i>	55–275	–
	rush	JUNCU	<i>Juncus</i>	0–275	–
	spikerush	ELEOC	<i>Eleocharis</i>	55–275	–
	scouringrush horsetail	EQHY	<i>Equisetum hyemale</i>	0–275	–
	spike sedge	CANA2	<i>Carex nardina</i>	0–275	–
	inland sedge	CAIN11	<i>Carex interior</i>	0–275	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–110	–
5	Non-Native Cool-Season Grasses			0	

Forb

6	Forbs			275–825	
	Forb, native	2FN	<i>Forb, native</i>	0–275	–
	mint	MENTH	<i>Mentha</i>	0–165	–
	swamp milkweed	ASIN	<i>Asclepias incarnata</i>	0–110	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–110	–
	aster	ASTER	<i>Aster</i>	0–110	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–110	–
	broadleaf cattail	TYLA	<i>Typha latifolia</i>	0–110	–
	iris	IRIS	<i>Iris</i>	0–110	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–110	–
	Pennsylvania smartweed	POPE2	<i>Polygonum pennsylvanicum</i>	0–110	–
	swamp smartweed	POHY2	<i>Polygonum hydropiperoides</i>	0–110	–

	white water crowfoot	RAAQ	<i>Ranunculus aquatilis</i>	0–110	–
	water hemlock	CICUT	<i>Cicuta</i>	0–110	–
	curly dock	RUCR	<i>Rumex crispus</i>	0–110	–
	plantain	PLANT	<i>Plantago</i>	0–110	–
	duckweed	LEMNA	<i>Lemna</i>	0–110	–
	blue-eyed grass	SISYR	<i>Sisyrinchium</i>	0–55	–
	poison hemlock	COMA2	<i>Conium maculatum</i>	0–55	–
Shrub/Vine					
7	Shrubs			0–550	
	willow	SALIX	<i>Salix</i>	0–550	–
	false indigo bush	AMFR	<i>Amorpha fruticosa</i>	0–110	–
	redosier dogwood	COSE16	<i>Cornus sericea</i>	0–110	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–55	–
Tree					
8	Trees			0–55	
	cottonwood	POPUL	<i>Populus</i>	0–55	–
	willow	SALIX	<i>Salix</i>	0–55	–
	Tree	2TREE	<i>Tree</i>	0–55	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall Warm-Season Grasses			90–270	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	90–270	–
2	Rhizomatous Cool-Season Grasses			18–180	
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	18–180	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	18–90	–
	slimstem reedgrass	CASTS5	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	0–90	–
3	Other Native Grasses			90–180	
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	90–180	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–90	–
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	18–90	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–90	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–18	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–18	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–18	–
	American sloughgrass	BESY	<i>Beckmannia syzigachne</i>	0–18	–
	spiked muhly	MUGL3	<i>Muhlenbergia glomerata</i>	0–18	–
	fowl mannagrass	GLST	<i>Glyceria striata</i>	0–18	–
4	Grass-Likes			540–990	
	bulrush	SCHOE6	<i>Schoenoplectus</i>	180–360	–
	spikerush	ELEOC	<i>Eleocharis</i>	180–360	–
	Northern cordgrass	CANF5	<i>Coronopeltis</i>	90–270	–

	Nebraska sedge	CANEZ	<i>Carex nebrascensis</i>	90–270	—
	sedge	CAREX	<i>Carex</i>	18–180	—
	wheat sedge	CAAT2	<i>Carex atherodes</i>	90–180	—
	spike sedge	CANA2	<i>Carex nardina</i>	90–180	—
	inland sedge	CAIN11	<i>Carex interior</i>	0–90	—
	rush	JUNCU	<i>Juncus</i>	18–90	—
	scouringrush horsetail	EQHY	<i>Equisetum hyemale</i>	0–90	—
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–36	—
5	Non-Native Cool-Season Grasses			0	
Forb					
6	Forbs			270–900	
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	270–540	—
	broadleaf cattail	TYLA	<i>Typha latifolia</i>	90–270	—
	swamp smartweed	POHY2	<i>Polygonum hydropiperoides</i>	90–180	—
	curly dock	RUCR	<i>Rumex crispus</i>	36–180	—
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	36–180	—
	duckweed	LEMNA	<i>Lemna</i>	0–90	—
	Forb, native	2FN	<i>Forb, native</i>	0–90	—
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–90	—
	mint	MENTH	<i>Mentha</i>	0–54	—
	swamp milkweed	ASIN	<i>Asclepias incarnata</i>	0–54	—
	poison hemlock	COMA2	<i>Conium maculatum</i>	0–36	—
	plantain	PLANT	<i>Plantago</i>	0–36	—
	iris	IRIS	<i>Iris</i>	0–36	—
	white water crowfoot	RAAQ	<i>Ranunculus aquatilis</i>	0–36	—
	water hemlock	CICUT	<i>Cicuta</i>	0–36	—
	aster	ASTER	<i>Aster</i>	0–36	—
	milkvetch	ASTRA	<i>Astragalus</i>	0–18	—
	blue-eyed grass	SISYR	<i>Sisyrinchium</i>	0–18	—
Shrub/Vine					
7	Shrubs			0–90	
	willow	SALIX	<i>Salix</i>	0–90	—
	false indigo bush	AMFR	<i>Amorpha fruticosa</i>	0–36	—
	redosier dogwood	COSE16	<i>Cornus sericea</i>	0–36	—
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–18	—
Tree					
8	Trees			0–18	
	cottonwood	POPUL	<i>Populus</i>	0–18	—
	willow	SALIX	<i>Salix</i>	0–18	—
	Tree	2TREE	<i>Tree</i>	0–18	—

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
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Grass/Grasslike				
1	Tall Warm-Season Grasses			300–450
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	300–450
2	Rhizomatous Cool-Season Grasses			150–600
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	150–300
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	150–300
	slimstem reedgrass	CASTS5	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	0–60
3	Other Native Grasses			450–750
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	300–600
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	150–300
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–150
	American sloughgrass	BESY	<i>Beckmannia syzigachne</i>	0–60
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–60
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–60
	saltgrass	DISP	<i>Distichlis spicata</i>	0–30
	spiked muhly	MUGL3	<i>Muhlenbergia glomerata</i>	0–30
	fowl mannagrass	GLST	<i>Glyceria striata</i>	0–30
4	Grass-Likes			450–750
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	150–450
	bulrush	SCHOE6	<i>Schoenoplectus</i>	150–450
	sedge	CAREX	<i>Carex</i>	150–450
	rush	JUNCU	<i>Juncus</i>	150–300
	spikerush	ELEOC	<i>Eleocharis</i>	60–150
	scouringrush horsetail	EQHY	<i>Equisetum hyemale</i>	0–150
	spike sedge	CANA2	<i>Carex nardina</i>	30–150
	wheat sedge	CAAT2	<i>Carex atherodes</i>	30–150
	inland sedge	CAIN11	<i>Carex interior</i>	0–60
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–60
5	Non-Native Cool-Season Grasses			150–600
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	150–600
	timothy	PHPR3	<i>Phleum pratense</i>	0–300
Forb				
6	Forbs			300–1050
	broadleaf cattail	TYLA	<i>Typha latifolia</i>	300–750
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	30–300
	curly dock	RUCR	<i>Rumex crispus</i>	30–300
	Forb, native	2FN	<i>Forb, native</i>	0–150
	Forb, introduced	2FI	<i>Forb, introduced</i>	0–150
	swamp smartweed	POHY2	<i>Polygonum hydropiperoides</i>	0–150
	duckweed	LEMNA	<i>Lemna</i>	0–150
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–150
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–60
	poison hemlock	COMA2	<i>Conium maculatum</i>	0–60

	poison hemlock	COMAR	<i>Coronilla maculata</i>	0-60	—
	mint	MENTH	<i>Mentha</i>	0-60	—
	water hemlock	CICUT	<i>Cicuta</i>	0-60	—
	iris	IRIS	<i>Iris</i>	0-60	—
	milkvetch	ASTRA	<i>Astragalus</i>	0-60	—
	aster	ASTER	<i>Aster</i>	0-60	—
	plantain	PLANT	<i>Plantago</i>	0-60	—
Shrub/Vine					
7	Shrubs			0-300	
	willow	SALIX	<i>Salix</i>	0-300	—
	false indigo bush	AMFR	<i>Amorpha fruticosa</i>	0-60	—
	redosier dogwood	COSE16	<i>Cornus sericea</i>	0-60	—
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-30	—
Tree					
8	Trees			0-30	
	cottonwood	POPUL	<i>Populus</i>	0-30	—
	willow	SALIX	<i>Salix</i>	0-30	—
	Tree	2TREE	<i>Tree</i>	0-30	—

Animal community

Wildlife Interpretations:

MLRA 61 is in the drier areas of a northern mixed-grass prairie ecosystem in which sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this MLRA consisted of diverse grassland and shrubland habitats interspersed with varying densities of depressional, instream wetlands and woody riparian corridors. These habitats provided critical life cycle components for many users. Many species of grassland birds, small mammals, reptiles, and 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 species of small mammals and insects, were the primary consumers linking the grassland resources to large predators, such as the gray wolf, mountain lion, and grizzly bear, and to smaller carnivores, such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant and remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox are associated with prairie dog complexes.

Historically, the northern mixed-grass prairie was a disturbance-driven ecosystem in which fire, herbivory, and climate functioned 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 affected plant and animal communities. The bison was a historical keystone species but has been extirpated in this area as a free-ranging herbivore. The loss of the bison and the reduction of prairie dog populations and fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development reduced habitat quality for area-sensitive species.

Within MLRA 61, the Wet Land ecological site provides upland grassland cover with an associated forb component. It was typically part of an expansive grassland landscape that included combinations of Clayey, Loamy, Shallow, Stony Hills, Overflow, and Subirrigated ecological sites.

This site provided habitat for species requiring unfragmented grassland. Important habitat features, and components found commonly or exclusively on this site may include sharp-tailed grouse leks; upland nesting habitat for grassland birds, forbs and insects for brood habitat; and a forage source for small and large herbivores. Many grassland and shrub steppe nesting bird populations are declining. Extirpated species include free-ranging American bison, grizzly bear, gray wolf, black-footed ferret, mountain plover, Rocky Mountain locust, and swift fox.

Beaver may inhabit adjacent surface waters associated with the Wet Land ecological site along streams and

drainages. Beaver occupation serves as a mechanism to maintain water tables along flood plains and will expand the extent of the Wet Land site in drainages and valley floors. During pre-European times the extent of the Wet Land site was likely much more wide-spread and persistent during dry periods, however excessive trapping and removal since that time has changed hydrology and limited the extent of the site while drying former mesic areas throughout the MLRA.

Grazing Interpretations:

The following list suggests annual, initial stocking rates for average growing conditions. These estimates are conservative and should be used only as guidelines in the initial stages of conservation planning. Commonly, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Therefore, a resource inventory is necessary to document plant composition and production. More accurate estimates of carrying capacity 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. In consultation with the land manager, a more intensive grazing management program that results in improved harvest efficiencies and increased carrying capacity may be developed.

The following suggested initial stocking rates are based on 912 lb/acre (air-dry weight) per animal-unit-month (AUM) with a 25 percent harvest efficiency of preferred and desirable forage species (refer to USDA-NRCS, National Range and Pasture Handbook). An AUM is defined as the equivalent amount of forage required by a 1,000-pound cow, with or without calf, for one month.

Plant Community: Prairie Cordgrass/Nebraska Sedge/Bluejoint Reedgrass (1.1)

Average Production (lb/acre, air-dry): 5,500

Stocking Rate (AUM/acre): 1.51

Plant Community: Sedge/Smartweed/Rush (1.2)

Average Production (lb/acre, air-dry): 1,800*

Stocking Rate (AUM/acre): Variable*

*Plant Community: Cattails/Reed Canarygrass (2.1)

Average Production (lb/acre, air-dry): Variable*

Stocking Rate (AUM/acre): Variable*

Plant Community: All other plant communities identified in this document have variable annual production values and require onsite sampling to determine initial stocking rates.

* Total annual production and stocking rates are highly variable and require onsite sampling.

Total onsite annual production may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may need to be reduced to reflect only preferred or desirable forage species.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for livestock. During the dormant period, the forage for livestock likely has insufficient protein to meet livestock requirements. Added protein allows 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.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups C and D. Infiltration 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 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, bluegrass, or smooth brome will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Recreational uses

This site provides opportunities for hiking, hunting upland game species and waterfowl, bird watching, and photography. The wide variety of plants that bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

Harvesting the seeds of native plants can provide additional income on this site.

Other information

Revision Notes: "Previously Approved" Provisional

This provisional ecological site description (ESD) has passed quality control (QC) and quality assurance (QA) to ensure the it meets the 2014 NESH standards for a "Provisional" ecological site description.

This ecological site description (ESD) is an updated "Previously Approved" ESD that represented a first-generation tier of documentation that met all requirements as an "Approved" ESD as laid out in the 1997 National Range and Pasture Handbook (NRPH). The requirements for approved status changed with the release of the 2014 National Ecological Site Handbook (NESH). The previously approved document fully described the reference state and community phase in the state-and-transition model. All other alternative states were at least described in narrative form. The "Previously Approved" ESD has been field-tested for a minimum of five years and is a proven functional document for conservation planning. The "Previously Approved" ESD may not contain all tabular and narrative entries as required in the current "Approved" level of documentation, but it is expected this ESD will continue refinement toward the current "Approved" status.

Site Development and Testing Plan

Future work, as described in an official project plan, is necessary to validate the information in this provisional ecological site description. The plan will include field activities for low-, medium-, and high-intensity sampling, soil correlations, and analysis of the data. Annual field reviews should be done by soil scientists and vegetation specialists. Final field review, peer review, quality control, and quality assurance reviews are required to produce the final document.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, range management specialist (RMS), NRCS; Cynthia Englebert, RMS, Forest Service; George Gamblin, RMS, NRCS; Tate Lantz, RMS, NRCS; Ryan Murray, RMS, NRCS; Cheryl Nielsen, RMS, NRCS; L. Michael Stirling, RMS, NRCS; and Jim Westerman, soil scientist, NRCS.

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Approval

Suzanne Mayne-Kinney, 7/17/2024

Acknowledgments

This ecological site description was updated by Rick L. Peterson on October 17, 2019.

The ESDs were reviewed for quality control by Emily Helms, John Hartung, Mitch Faulkner, and Ryan Murray.

All ecological sites were then reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS in September 2020.

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	07/17/2024
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**
